DART+ Maynooth Line

Iarnród Éireann

Preliminary Options Selection Report

Main Report

MAY-MDC-GEN-ROUT-RP-Y-0001

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GLOSSARY

Abbreviation	Meaning
AA	Appropriate Assessment
AADT	Annual Average Daily Traffic
ABP	An Bord Pleanála
ATP	Automatic Train Protection
BEMU	Battery Electric Multiple Unit
CAF	Common Appraisal Framework
CAWS	Continuous Automatic Warning System
CBI	Computer-Based Interlocking
CCRP	City Centre Resignalling Project
CCTV	Closed Circuit Television
CIÉ	Córas Iompair Éireann
COP21	Paris Climate Agreement
DART	Dublin Area Rapid Transit (IÉ's Electrified Network)
DCACN&T	Department of Climate Action, Communications Networks and Transport
DCDP	The Dublin City Development Plan
DMU	Diesel Multiple Unit
DNO	Distribution Network Operator
DOO	Driver Only Operation
DPS	Depot Protection System
DRM	Design Review Meeting
DTTAS	Department of Transport, Tourism and Sport
DU	DART Underground
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
EMRA	Eastern and Midland Regional Assembly
EMU	Electric Multiple Unit
ERM	Eastern Regional Model
ERTMS	European Rail Traffic Management System
ESB	Electricity Supply Board
ESBN	ESB Network
ETCS	European Train Control System
FRS	Functional requirement specifications
GDA	Great Dublin Area
GHG	Greenhouse gas

Abbreviation	Meaning
GI	Geotechnical Investigations (Same as Site Investigations)
GSM	Global System for Mobile communications (originally from the French: Groupe Spécial Mobile)
GSM-R	GSM – Railway
GSWR	Great Southern & Western Railway
HABD	Hot Axle Box Detector
HV	High voltage
IÉ	Iarnród Éireann/Irish Rail
IM	Interface Management
IR	Iarnród Éireann/Irish Rail
INCOSE	International Council on Systems Engineering
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IDC	Interdisciplinary Check
ISO	International Standards Organizations
LV	Low voltage
MASP	Dublin Metropolitan Area Strategic Plan
MCA	Multicriteria analysis
MDC	Multi-Disciplinary Consultant (i.e. IDOM)
MGWR	Midlands Great Western Railway
MIC	Maximum Import Capacity
MOS	Motor operating switch
MPLS	Multi-Protocol Label Switching
NDP	National Development Plan 2018–2027
NMU	Non Motorised User
NPF	National Planning Framework
NSO	National Strategic Outcomes
NTA	National Transport Authority
NTCC	National Train Control Centre
OB	Overbridge
OCC	Operational Control Centre
OCR	Overhead Conductor Rail
OHLE	Overhead Line Equipment
OSD	Over Station Development
PABX	Private Automatic Branch Exchange
PAC	Pre-Application Consultations
PLUTO	Planning Land Use and Transport Outlook 2040

Abbreviation	Meaning
PPT	Phoenix Park Tunnel
RFI	Request for Information
PSCS	Project Supervisor Construction Stage
PSDS	Project Supervisor Design Stage
RMP	Record of Monuments and Places
RM	Requirement Management
RO	Railway Order
RPG	Regional Planning Guidelines
RRI	Route Relay Interlockings
RS	Rolling Stock
RSES	Regional Spatial and Economic Strategy
RTP	Rural Transport Programme
RVTM	Requirements Verification Traceability Matrix
SE	Systems Engineering
SCADA	Supervisory Control and Data Acquisition
SDZ	Strategic Development Zone
SEA	Strategic Environmental Assessment
SET	Signalling, Electrical, Telecommunication
SLD	Single line diagram
SMR	Sites and Monuments Record
SSI	Solid State Interlockings
TBM	Tunnel Boring Machine
TPHPD	Trains Per Hour Per Direction
TPS	Train Protection System project implementing a discontinuous Train Protection System.
TSS	Train Service Specification
VFD	Vehicle Fall Detector
UIC	International Union of Railways (Union Internationale des Chemins de fer)
WHO	World Health Organisation
WTT	Working Timetable

DEFINITIONS

A number of terms arise throughout the body of this report which warrant explicit definition from the outset. They are defined below in bulleted form.

- **Base Case** – The current business state adopted as the usual scenario which the Do-something options are usually compared against, as well as sensitivity analyses.
- **Do-nothing** – This option requires a clear description of what is likely to occur in the absence of the intervention.
- **Do-minimum** – The least burdensome option to maintain an intervention, in some cases (e.g. where legal commitments are in place) this can act as the base case.
- **Do-something** –The options that are available to address the objective of the intervention.
- **Multi Criteria Analysis** – MCA can be used to describe any structured approach to determine overall preferences among alternative options, where the options should accomplish multiple objectives. The term covers a wide range of techniques that share the aim of combining a range of positive (benefits) and negative (costs) effects in a single framework to allow for easier comparison of alternative options in decision-making.
- **Base Year** – This is the year consistent with the Base Case In the case of the DART + Maynooth and City Centre Capacity Enhancement this is 2020.
- **Opening Year** – This is the anticipated year during which the enhanced or new infrastructure associated with the project is anticipated to come into service. In the case of the DART Expansion Maynooth and City Centre Capacity Enhancement this is 2025.
- **Design Year** – This is the year for which the enhanced or new infrastructure associated with the project is designed. In the case of the DART + Maynooth and City Centre Capacity Enhancement this is 2040 (Opening Year + 15yrs).

EXECUTIVE SUMMARY

ES1.1 DART+ Overview

The DART+ Programme comprises of a number of rail improvement projects that will provide frequent, modern and fully electrified services to Drogheda on the Northern Line, Hazelhatch - Celbridge on the Kildare Line, Maynooth and M3 Parkway on the Maynooth/Sligo Line, while improving southern DART services as far as Greystones. The DART+ Programme also includes the purchase of new electrified fleet.

The DART+ Programme will have a transformative effect in improving rail services in the Greater Dublin Area (GDA). The DART+ Programme will increase the length of the existing DART network from 50km to 150km of railway corridor through the upgrades and extensions of existing lines.

Figure ES-1 DART+ Programme Capacity Improvements

The DART+ Programme is consistent with and supports Project Ireland 2040, the National Development Plan 2017 to 2028, the National Planning Framework and the Climate Action Plan 2019. DART+ is a key deliverable measure in the Climate Action Plan 2019 to achieve targets for modal shift.

It will provide additional capacity by utilizing existing infrastructure with targeted improvement works:

- This greatly improved integrated transport system will encourage a move away from private cars to public transport;
- It will assist in achieving targets for the reduction in greenhouse gas emissions; and
- Enable transition to a low carbon and climate resilient society.

DART+ delivers on each of the three pillars of sustainable development:

- **Social:** Increased passenger capacity and train frequency: Thus enabling all sectors of society to quality public transport network. It will also provide people with options over the travelling by private car thereby alleviation of road congestion and improving quality of life.

- **Environmental:** Building a more sustainable city region: Electric trains will positively assist in the decarbonization of the transport sector and enable a transition to a low carbon society. It will also future proof the public transport network: The DART+ programme will significantly upgrade the existing infrastructure and improve multimodal connectivity through interchange with other public transport networks.
- **Economic:** The DART+ programme will bring fast, frequent, reliable and sustainable transport services to existing communities along the routes, making it easier to travel for work, education or leisure purposes. It will also help to facilitate the development of new communities and development that will greatly benefit from the connectivity that DART+ will deliver.

ES1.2 DART+ Maynooth Line Overview

On the Maynooth and M3 Parkway Lines, DART+ will introduce electrified high capacity trains at increased frequency for all stations between Maynooth/ M3 Parkway to Dublin City Centre (40km corridor). The overall scope of the DART + Maynooth Line project includes the following key elements of infrastructural work:

- Electrification and re-signalling of the Maynooth & M3 Parkway line from City Centre to Maynooth (40km approx.);
- Capacity enhancements at Connolly (platforms, junctions & station modifications) to increase train numbers per hour;
- Capacity enhancements in the Docklands, incorporating a new station at Spencer Dock, to better serve all routes entering the city centre and to improve interchange with Luas;
- Closure of level crossings and the provision of bridge crossings where required;
- Construction of a new DART Depot facility west of Maynooth Station for the maintenance and stabling of trains;
- Development of an interchange station with MetroLink at Glasnevin serving both the Maynooth Line.

All civil engineering and bridge studies into the development of options and the assessment of these options and the Emerging Preferred Options for the overall scheme are currently underway.

The preliminary options assessment studies have led to the identification of the Emerging Preferred Options as presented below.

Figure ES-2 Schematic of DART+ Maynooth Maynooth Line Extents

To describe the project, it has been divided into sections describing the project in an east west direction, as follows:

1. General Linear Works
2. City Centre Enhancements (Connolly Station & Docklands Station)
3. City Centre Enhancements (Connolly Station & Docklands Station - Phibsborough / Glasnevin)
4. Phibsborough / Glasnevin – Clonsilla Station
5. Clonsilla Station – Maynooth Depot
6. Clonsilla Station – M3 Parkway

This report has been produced to provide interim characterisation of the options selection process for the project at the time of advancing the first round of public consultation. It summarizes the current status of the process for the principal elements of the project. Given the largely online nature of much of the project some elements have greater impact beyond the core railway corridor than others and require more extensive options assessment. This includes the infrastructure proposals necessary to replace level crossings. It is noted that greater detail is presented in the report on such elements than others. The End to End Emerging Preferred Route is illustrated in the Layout Figures included in Annex ES 1.1 to this report. The figures are numbered, typically, from east to west and references are added throughout the Executive Summary to the relevant figures.

ES1.3 General Linear Works

A number of elements of the works will be common to all sections of the project. In order to avoid repetition the following is a summary of these 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. Each of the following elements will be required along all sections included in the linear works:

Figure ES-3 OHLE Infrastructure

- Overhead electrification equipment will be required to provide electrical power to the network's new electrified train fleet. This will be similar in style to that currently used on the DART network;
- Bridge clearances – Where existing bridges do not provide the necessary headroom for provision of the overhead electrification of the lines the following options are being considered on a case by case basis to facilitate the provision of the necessary clearances for electrical equipment at existing bridges:
    - Demolition of the existing structure to accommodate new structures with appropriate online or offline vertical realignments;
    - Modification of the existing bridge structure with modification to the bridge decks;
    - Lowering the rail track;
    - Provision of specialist electrical solutions with reduced clearance;
    - Or a combination of the above.
- Substations will be required at intervals along the full length of the line to provide power to the network;
- Signalling upgrades and additional signalling will be required to the upgraded infrastructure;
- Improving boundary walls and fencing to ensure public safety due to the electrification of the line. This will require increasing the height of walls in some instances to provide the necessary protection and physical segregation between public areas and the railway corridor.

- Utility diversions, vegetation management and other ancillary works provided for along the length of the project.

ES1.4 City Centre Enhancements (Connolly Station & Spencer Dock Station)

ES1.4.1 **Connolly Station** (See Annex ES 1.1: Figure 01)

Connolly Station is one of the main railway stations in Dublin and a focal point for the Iarnród Éireann network.

The station today consists of four terminal platforms, (numbered 1 - 4), primarily for Northern Line services, including the Enterprise service to Belfast. Platform 4 can also be used for Sligo services, via Ossory Road Junction and Maynooth. Three through platforms (numbered 5-7) connect the Loop Line to the Northern line and the Phoenix Park Tunnel and Maynooth lines via Ossory Road Junction and Phibsborough. The station complex also includes a number of stabling roads (train parking) and maintenance facilities, primarily used to service the Enterprise train sets. The station facilitates Intercity, Commuter and DART services.

The principal objective of the project at Connolly station is to achieve the maximum level of service of 23 trains per hour per direction. The key issue with the current layout is that the terminal platforms are on the east side of the station, while the loop line through platforms are on the west of the station. The station capacity is constrained by the number of trains and by track crossing conflicts. DART+ is seeking to modify the northern throat of Connolly Station rail lines with additional crossovers and track modifications to facilitate an increase in the station capacity. These modifications will facilitate additional operational flexibility at Connolly Station. As well as the track reconfiguration it is proposed to upgrade the platforms and the station itself to provide greater capacity for the predicted increase in passenger demand.

Figure ES-4 Connolly Station looking North

The emerging preferred option in respect of Connolly Station is a Do Minimum proposal in respect of alterations to track alignments with all track modifications carried out within the existing railway viaduct boundary. It includes for minor alterations to platforms and egress provisions. Details of the emerging preferred station alterations are illustrated in Figure ES-4.

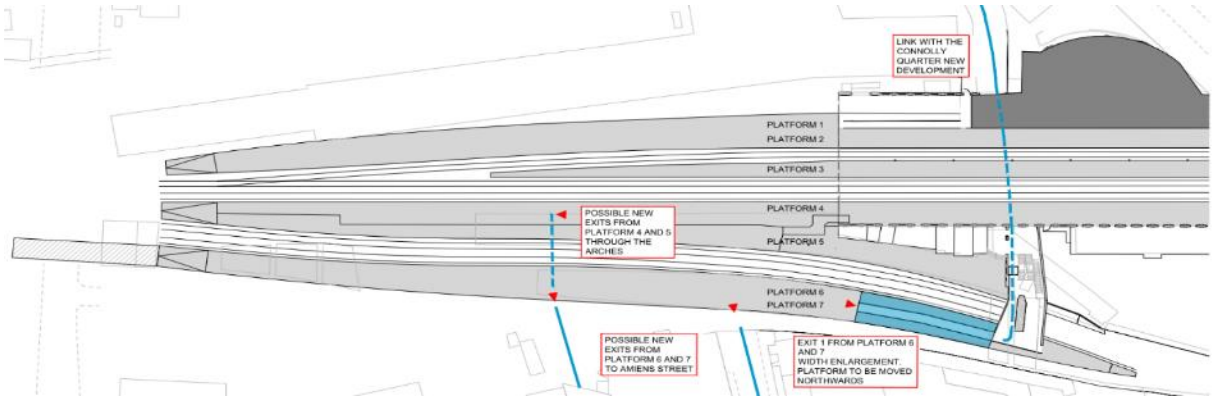


Figure ES-5 Emerging Preferred Station Alterations

ES1.4.2 Spencer Dock Station (See Annex ES 1.1: Figure 01)

Southeast of Connolly Station lies Docklands Station which operates as an overflow terminus station to Connolly Station in the morning and evening peak times. DART+ seeks to enable Conolly and Docklands Stations to work more effectively together.

Subject to further assessment, DART+ is seeking to construct a new station at Spencer Dock adjacent the Luas Stop to increase the overall rail capacity in the City Centre, to better serve the Docklands area and to maximise the interchange potential with Luas.

Figure ES-6 Emerging Preferred Option: Spencer Dock Station

ES1.4.3 City Centre to Phibsborough / Glasnevin (See Annex ES 1.1: Figure 03)

It is proposed that both of the existing lines between Connolly and Docklands to Phibsborough/Glasnevin will be electrified with the installation of overhead electrical equipment, associated upgrades, resignalling, telecoms and electricity substations as required.

The two lines are the Maynooth line which lies next to and to the north of the Royal Canal and the Pheonix Park Tunnel line which runs to the north of Croke Park and through Drumcondra Station. Both of these lines converge at Phibsborough/Glasnevin, to the west of Cross Guns Bridge.

At Phibsborough/Glasnevin, a new fully integrated station serving both the DART+ Maynooth Line Project and the proposed MetroLink project is proposed. Iarnród Éireann and Transport Infrastructure Ireland (TII) are collaborating to provide this station which will comprise:

- DART+ surface station. The station will have an eastwest orientation on both Iarnród Éireann lines (Maynooth Line and Pheonix Park Tunnel Line);
- MetroLink underground station will have a northsouth orientation;
- A shared concourse with full passenger integration;
- Street level access and public realm improvements

See here for link to Metrolink Website

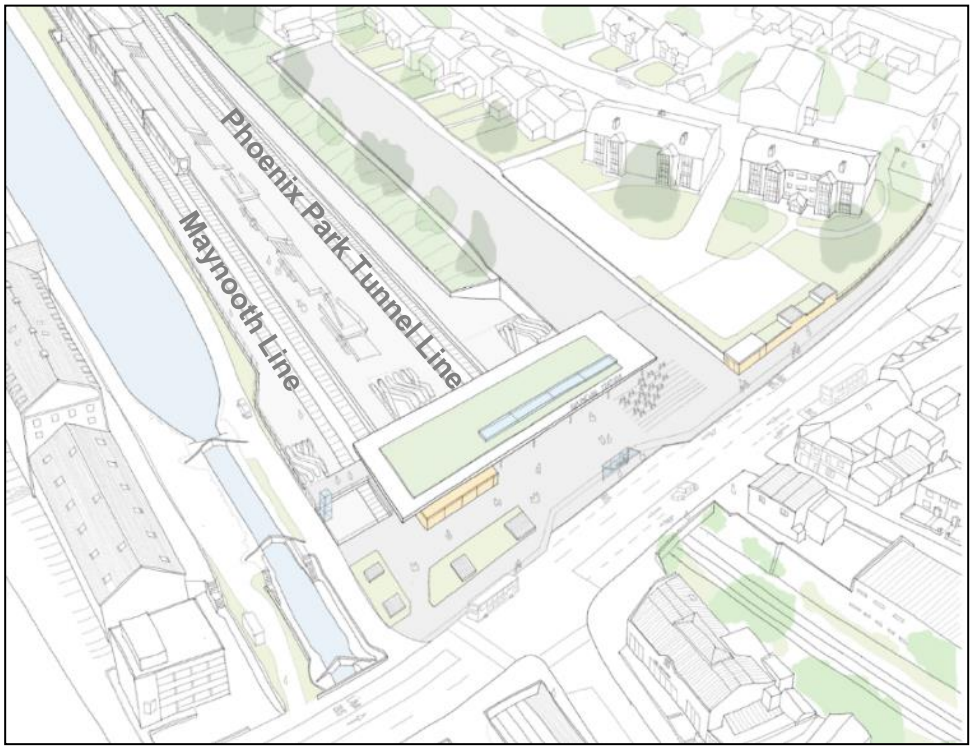


Figure ES-7 Proposed Glasnevin Station

A number of issues arise in the vicinity of OBD226, the North Strand Bridge in respect of the effective delivery of capacity enhancements. Specific constraints include:

- The proximity of the Royal Canal to the railway. It runs parallel to and is located immediately south of the railway;
- The existing railway underbridge (UB225) carrying the Newcomen Chord over the royal canal. This is an opening bridge and is located immediately adjacent to OBD226;
- The reduced clearances available under OBD226;
- The presence of a low point in the railway alignment in the vicinity of OBD226;
- Prexisting drainage problems on the railway in the vicinity of OB226.

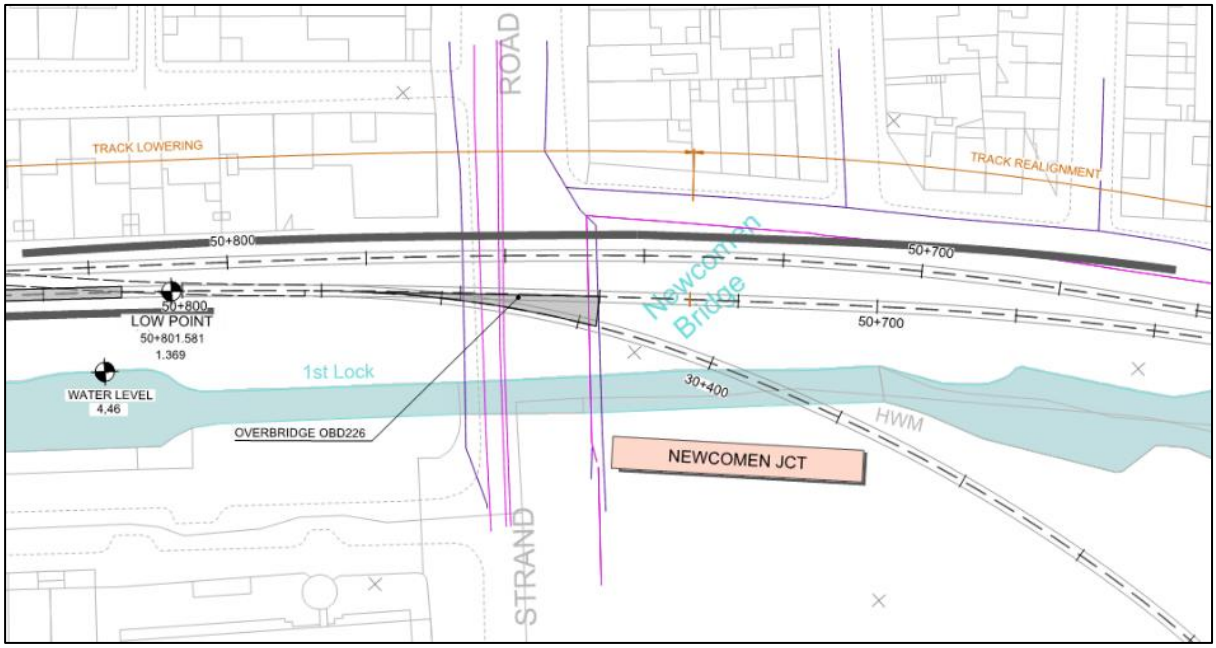


Figure ES-8 Newcomen Junction (See Annex ES 1.1: Figure 01)

The emerging preferred design at this location includes the following principal elements:

- Remove the Newcomen Chord from the railway network;
- Realign the Maynooth Line through OBD226 to provide adequate clearance for electrification;
- Carry out works to address the prexisting drainage problems and to accommodate the lowered track alignment.

The following provisions are proposed as part of the emerging preferred design at other bridges on the City Centre to Phibsborough / Glasnevin section of the project to address limited clearance for OHLE:

- OBD227 Ch 50+550: Reduced Clearance Envelope;
- OBD225 Clarkes Bridge Ch51+020: Bridge and/or track modification work;
- OBD224 Clonliffe Bridge Ch51+500: Bridge and/or track modification work;
- OBD223 Binns Bridge Ch51+940: Bridge and/or track modification work;

(See Annex ES 1.1: Figures 01 to 03)

The bridges will typically require parapet walls to be heightened where directly over the railway to provide containment and protection in respect of the OHLE.

ES1.5 Glasnevin Junction to Clonsilla Junction

Between Phibsborough / Glasnevin and Clonsilla Station the Maynooth line runs alongside the Royal Canal The line then passes through Broombridge Station, where it interfaces with the Luas. Travelling in a westerly direction the line along this section includes the following stations: Ashtown Station, Navan Road Parkway Station, Castleknock Station, Coolmine Station and Clonsilla Station. (See Annex ES 1.1: Figures 04 to 09)

Level Crossing Replacements

The level crossings along this section of the railway corridor is constraining train capacity on the railway corridor by having to share road capacity for vehicles, pedestrians and cyclists. In order to provide a modern transportation network and to achieve the required increase in train capacity it is proposed to be permanently close the four level crossings along this section.

It is not possible to retain the level crossings in their current form. The permanent closure is necessary to achieve the proposed increased train frequency proposed by DART+

The closure of these level crossings will improve train efficiencies, safety and remove road interfaces and the associated delays caused by the road network. Their closure will also remove the periodic blockages on the road system, which is currently very pronounced in this area especially in the morning and evening peak commuter periods (For example Coolmine Level Crossing is closed for approximately 40 minutes between 08.00-09.00 each weekday)

Following an option selection process, that included developing and assessing a number of options/alternatives at each of these locations, the Emerging Preferred Options at each location was established. The description of the level crossing replacement along this section of the Maynooth line, are described in the following sections at Ashtown, Coolmine, Portersown and Clonsilla level crossings.

ES1.5.1 Ashtown Level Crossing

Figure ES-9 Ashtown Option 2 - Emerging Preferred Option at Ashtown Level Crossing Replacement

The Emerging Preferred Option at this location is a full vehicular road bridge with pedestrian and cycle facilities, to offset the permanent level crossing closure. The new bridge is deemed necessary to maintain traffic flows and mitigate against community severance. The new road bridge runs under the railway and the canal to the west of the existing Ashtown Level Crossing along the line of the Mill lane. (See Annex ES 1.1: Figure 05)

We have presented below a sectional elevation along the scheme looking west to illustrate the proposed works.

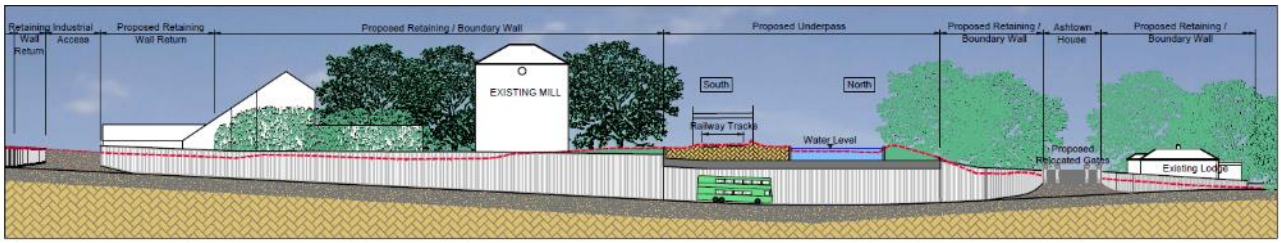


Figure ES-10 Ashtown Emerging Preferred Option Sectional Elevation Looking West

ES1.5.2 Coolmine Level Crossing

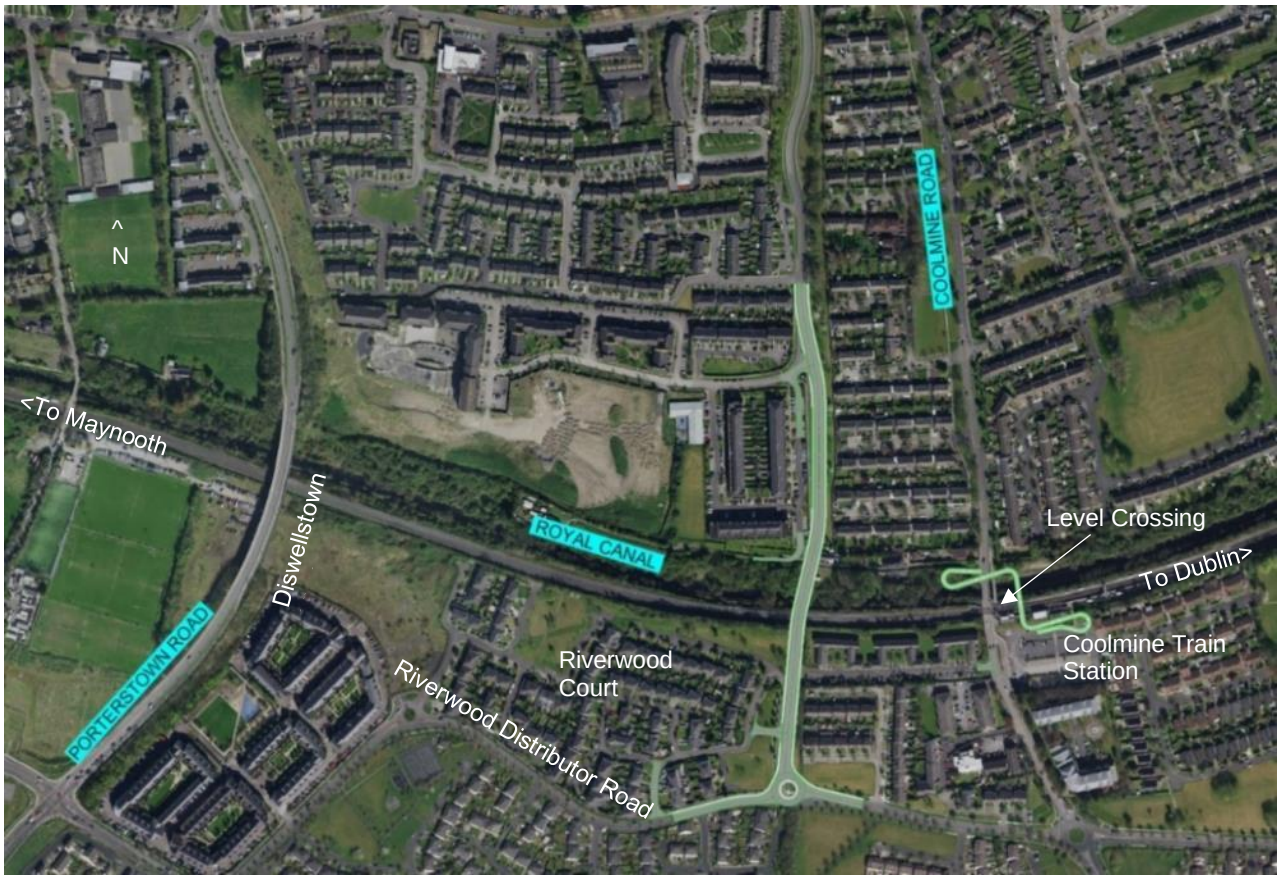


Figure ES-11 Coolmine Option 3 - Emerging Preferred Option Coolmine Level Crossing Replacement

The Emerging Preferred Option provides a new road bridge over the railway line and canal connecting to the north of St. Mochta's Grove / Station Court and to the south of the Riverwood Court Road. A new standalone pedestrian and cycle bridge will be provided over the railway line immediately adjacent to Coolmine Station.

At Coolmine the maintenance of road access north-south across the railway is important due to the high level of traffic using the existing road. The proposed replacement roadway will provide a critical link for traffic flows between Castleknock/Carpenterstown to the south with Blanchardstown/Coolmine to the north. (See Annex ES 1.1: Figure 08)

We have presented below a sectional elevation along the proposed roadway and bridge to illustrate the proposed works.

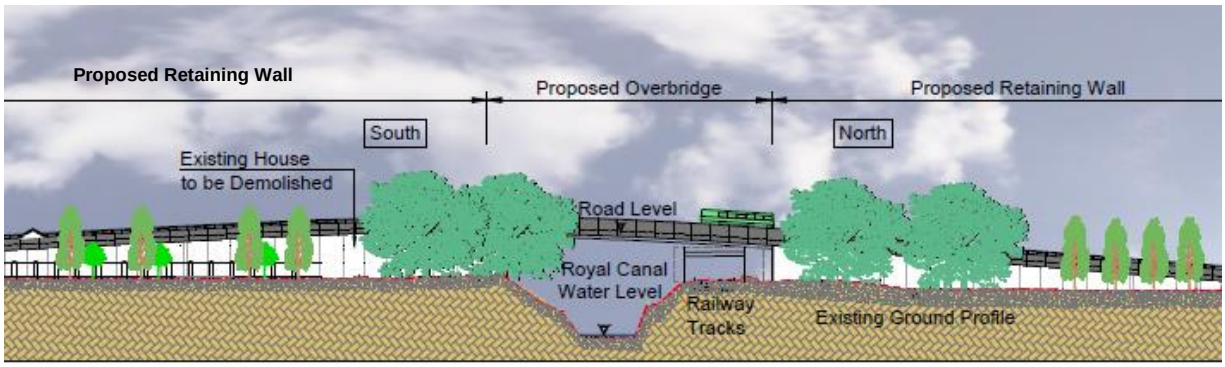


Figure ES-12 Coolmine Emerging Preferred Option: Road Bridge - Sectional Elevation

The proposed pedestrian cycle bridge associated with the proposed roadbridge is presented below in sectional elevation looking west to illustrate nature of the proposed works.

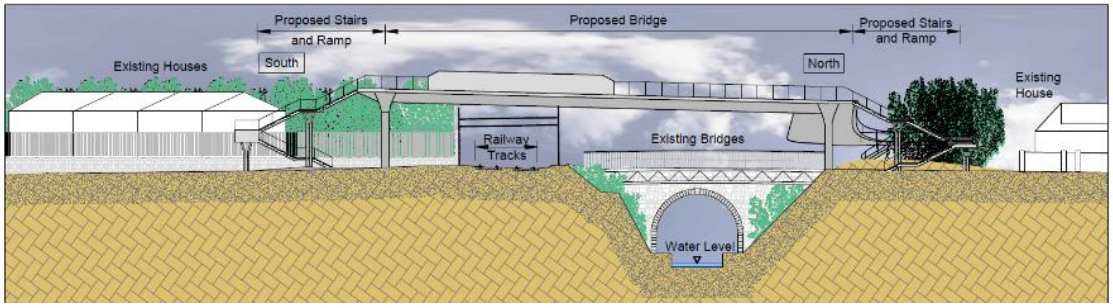


Figure ES-13 Coolmine Emerging Preferred Option: Cycle Bridge - Sectional Elevation

ES1.5.3 Porterstown Level Crossing

Figure ES-14 Porterstown Option 2 - Emerging Preferred Option Porterstown Level Crossing Replacement

The Emerging Preferred Option provides a new pedestrian and cycle bridge over the rail at the existing crossing. Vehicular traffic will utilise the existing local road network including the Diswellstown Road (R121 at Dr. Troy bridge).

Porterstown Road is a narrow local road with single lane bridge crossing the canal. Traffic levels on Porterstown Road are very low. The Diswellstown Road / Dr Troy Bridge were built to provide the necessary level of traffic linkage from north to south communities and provide the primary passage for road users crossing the railway. (See Annex ES 1.1: Figure 08)

The proposed pedestrian cycle bridge is presented below in sectional elevation looking west to illustrate nature of the proposed works.

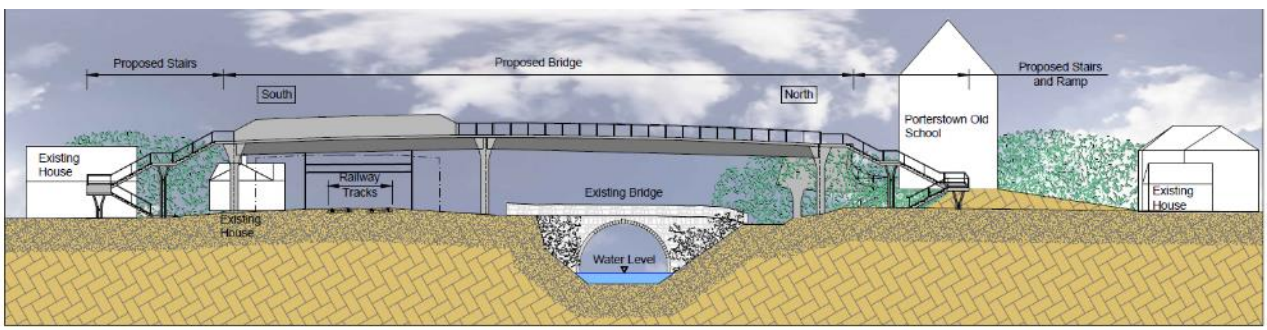


Figure ES-15 Porterstown Emerging Preferred Option: Cycle Bridge - Sectional Elevation

ES1.5.4 Clonsilla Level Crossing

Figure ES-16 Clonsilla Option 1 - Emerging Preferred Option Clonsilla Level Crossing Replacement

The Emerging Preferred Option provides a new pedestrian and cycle bridge over the railway to the west of the existing level crossing. Given the low traffic flows utilising the crossing combined with the proposed new road bridge at Barberstown to the west and the Diswellstown Link Road to the east of the crossing,a new pedestrian and cyclist bridge is considered the optimal solution.

The proposed pedestrian cycle bridge is presented below in sectional elevation looking west to illustrate nature of the proposed works.

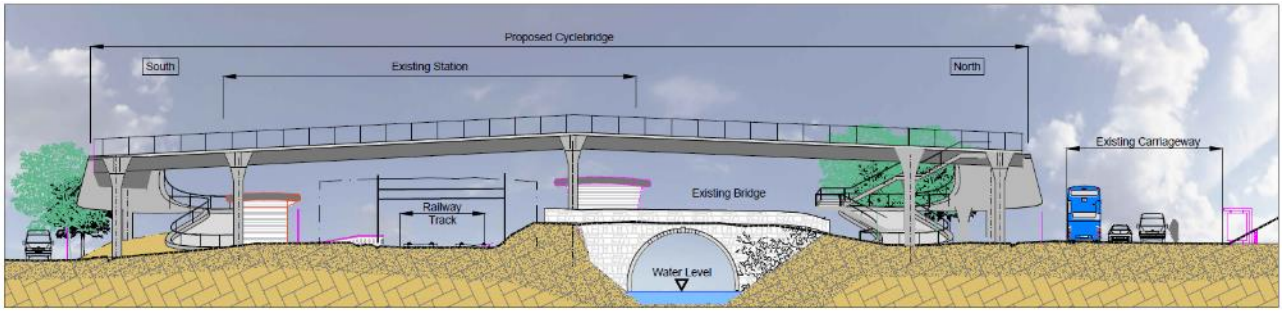


Figure ES-17 Clonsilla Emerging Preferred Option: Cycle Bridge - Sectional Elevation

ES1.5.5 Bridge Alterations

Bridges at Castleknock and Broombridge have been identified as having insufficient clearance to accommodate the overhead electrical equipment while further bridges are currently being assessed to confirm clearances. It is likely that the Emerging Preferred Design for the bridges at Castleknock and Broombridge will include for replacement of the bridges to facilitate electrification.

The following provisions are proposed as part of the emerging preferred design at other bridges on the Glasnevin Junction to Clonsilla Junction section of the project to address limited clearance for OHLE:

- OBG7A West M50 Roundabout Ch 65+460 Reduced OHLE Clearance Envelope;
- OBG7C East M50 Roundabout Ch 65+640 Reduced OHLE Clearance Envelope;
- OBG9 Old Navan Road Bridge Ch 65+720: Bridge and/or track modification work.

(See Annex ES 1.1: Figure 07)

The bridges will typically require parapet walls to be heightened where directly over the railway to provide containment and protection in respect of the OHLE.

ES1.6 Clonsilla Junction – Maynooth Depot

This section of the scheme continues from west of Clonsilla Station through to the new proposed maintenance and stabling depot located west of Maynooth. Immediately west of Clonsilla Station, the railway diverges, with the mainline continuing westwards to Maynooth & Sligo, and a branch line continuing northwards towards Dunboyne & M3 parkway. The Maynooth Line and M3 Parkway branchline will be electrified as part of this project. (See Annex ES 1.1: Figures 10 to 19)

Between Clonsilla Station and the proposed Depot the existing rail line continues parallel and to the north of the Royal Canal, passing through Leixlip Confey Station, Leixlip (Louisa Bridge) Station, and Maynooth Station.

In this section of the scheme there are two existing level crossings which have been identified for closure at Barberstown and Blakestown.

ES1.6.1 Barberstown Level Crossing

Figure ES-18 Barberstown Option 4 - Emerging Preferred Option Barbertown Level Crossing Replacement

The Emerging Preferred Option provides a new road bridge over the railway line and canal, southwest of the current level crossing and connecting the existing R121 to the east of the rail to the Barberstown Lane to the west of the rail line. (See Annex ES 1.1: Figure 10)

ES1.6.2 Blakestown Level Crossing

Figure ES-18a Blakestown - Emerging Preferred Option – No Replacement Infrastructure

The Emerging Preferred Option is not to provide replacement infrastructure following the closure of the level crossing. Access and diversions will be via the local road network and R449 to the east of the crossing. (See Annex ES 1.1: Figure 14)

ES1.6.3 Bridge Alterations

The Jackson's Bridge (protected structure) to the West of Maynooth just south of the R148 crossing the railway line and Royal Canal has been identified as having insufficient clearance for overhead electrical equipment. The location also includes crossing of the Lyreen river and the area has been subject to flooding in the past. Options here include track lowering, bridge reconstruction and offline diversion of the railway with the construction of new bridges. The option to reconstruct Jacksons bridge at a higher level is currently the emerging preferred. Other bridges in this section are currently being investigated and surveyed to confirm clearances and potential options for improving electrical clearance.

The following provisions are proposed as part of the emerging preferred design at other bridges on the Clonsilla Junction to Maynooth Depot section of the project to address limited clearance for OHLE:

- OBG13 Collins Bridge Ch 72+700: Bridge and/or track modification work;
- OBG14 Cope Bridge Ch 74+600: Bridge and/or track modification work;
- OBG16 Louisa Bridge Ch 76+450 Bridge and/or track modification work;
- OBG18 Pike Bridge Ch 79+930: Bridge and/or track modification work.

(See Annex ES 1.1: Figures 10 to 19)

The bridges will typically require parapet walls to be heightened where directly over the railway to provide containment and protection in respect of the OHLE.

ES1.6.4 Proposed Twin Track West of Maynooth

Between Maynooth and the proposed Depot the current single-line track will be upgraded to a double-track section. The Emerging Preferred option for this enhancement if for the new track to be located to the south of the existing single line track within CIE property and to the south of the Royal Canal. (See Annex ES 1.1: Figures 16 to 18)

ES1.6.5 Proposed Depot location (Maynooth West)

The proposed Depot will be located to the west of Maynooth and south of the rail line and canal. It will be used for train maintenance and stabling. (See Annex ES 1.1: Figures 18 & 19)

Figure ES-19 Proposed Depot location in Maynooth West

The total length of the proposed Depot along the mainline is just over 2.5km, and the widest section measures approximately 260 metres at the workshop and stabling area. The site facilitates this without truncation of public roads. The total area of the site is approximately 30 hectares.

The proposed Depot and will include the following principal components:

- Main Depot Building with maintenance shed;
- office and administrative building;
- train washing and cleaning facilities and other maintenance facilities;
- a section of test track;
- stabling for trains and storage facilities;
- an electrical substation;
- staff parking and facilities for staff.

The Emerging Preferred Option for providing access to the Depot utilises the existing road network for the majority of route with only minor modifications required. The access will be from the R148 which will require the construction of a new bridge and the demolition of the existing agricultural bridge. The proposed bridge

enables a new connection to the R148 crossing the Royal Canal and the rail line providing the required access to the proposed depot.

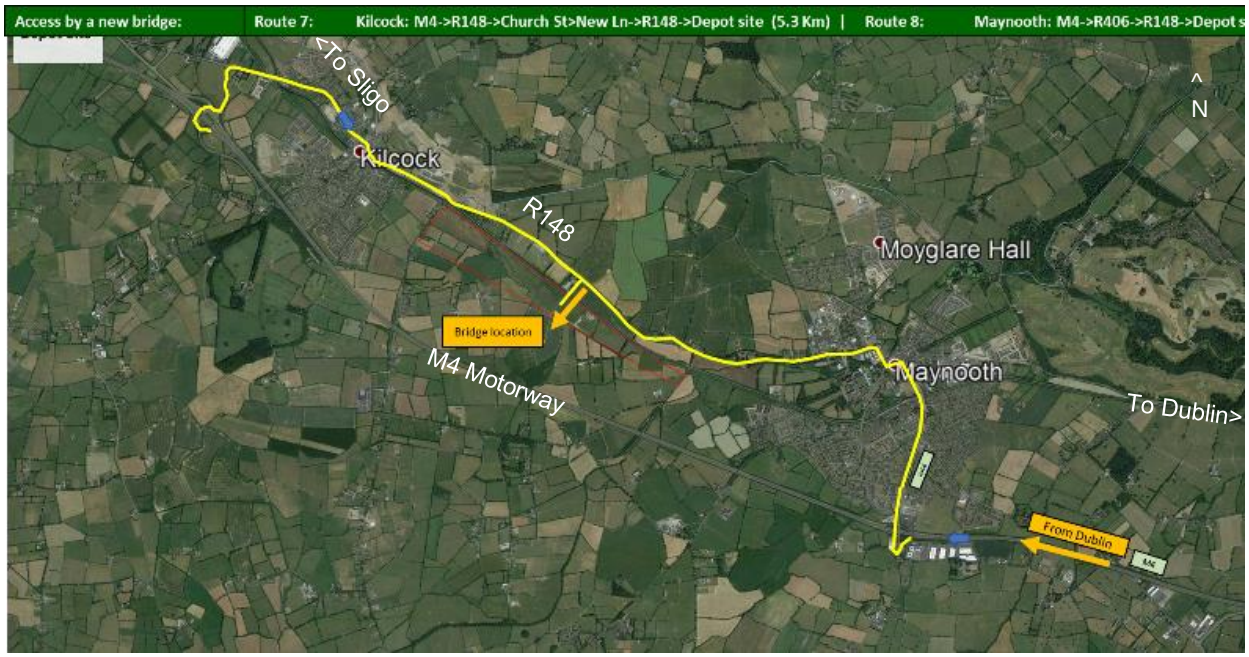


Figure ES-20 Emerging Preferred Access to Proposed Depot location in Maynooth West

ES1.7 Clonsilla Junction – M3 Parkway

West of Clonsilla Station the line splits with a line continuing out towards Maynooth and a line to M3 Parkway. The Pace line spurs northwards passing through Hansfield Station and Dunboyne Station before terminating at M3 Parkway Station which lies to the north of Dunboyne and west of Junction 5 off the M3 Motorway. (See Annex ES 1.1: Figures 20 to 23)

The line will be provided with electrification over the entire section though the installation of overhead electrical equipment, associated upgrades of signals and communications, and the provision of electrical substations as required.

A number of rail bridges are currently being assessed for potential options to provide the necessary clearance for the overhead electrical equipment.

The bridges include:

- OBCN286 Barnhill Bridge Ch 100+700 – Reduced OHLE Clearance Proposed;
- OBCN290 and OBCN290A Dunboyne Bridge, Ch 104+900, – Bridge and/or track modification work.

The bridges will typically require parapet walls to be heightened where directly over the railway to provide containment and protection in respect of the OHLE.

ES1.8 Further Design Development & Option Selection

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.

Once the public consultation process is complete all feedback and submissions received will be reviewed and assessed as part of the next stage of the design development. Following a full appraisal of the feedback, a public consultation report will be prepared to document this process and it will be incorporated into the Options Selection Report.

Further studies, assessments and consultations will lead to development of the Preferred Option which will be presented to the public at Public Consultation in Autumn 2020.

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.

1 INTRODUCTION

DART+ Programme

The DART+ Programme (also known as DART Expansion) is a transformative railway project, which will modernise and improve the existing rail network, which radiates from Dublin City Centre. It will provide a sustainable, electrified, faster, reliable and user-friendly rail system, which increases train frequencies and customer carrying capacity.

It will create a full metropolitan area DART network for Dublin, with all of the lines linked and connected. This will transform the rail system in the Greater Dublin Area (GDA), delivering new DART services between the City Centre and Drogheda on the Northern Line, Hazelhatch and Celbridge (formerly Celbridge) on the Kildare Line, Maynooth and M3 Parkway on the Maynooth/Sligo Line, while improving capacity on southern DART services as far as Greystones. DART+ will enable an increase in network capacity from the Regions to the GDA. The overall DART+ Programme will be delivered in a number of separate but interrelated infrastrucutral projects to expand the heavy rail electrified commuter network in Dublin from the existing c.50 km to c.150km. The individual projects within the overall DART+ programme will consist of:

- **DART+ Maynooth Line** - c.40km from west of Maynooth to Connolly/Docklands in the City Centre. Including the M3 Parkway, connection to the Phoenix Park Tunnel and includes a new EMU Depot. It also includes upgrade and reconfiguration of existing railway infrastructure in the city centre.
- **DART+ Kildare Line** - c.20km from Hazelhatch into Heuston and the Phoenix Park Tunnel including 4-tracking from Parkwest to Heuston.
- **DART+ Coastal Line** comprising of:
  - **DART+ Northern Line** - c. 38km with electrification and related works from Malahide to Drogheda, also includes works from Connolly to Malahide & on the Howth Branch.
  - **DART+ Southeast line** - removal of level crossings andrelated works, construction of turn back facilities and increases to the capacity of the Bray-Greystones section.

The sequence of delivery for the DART+ Programme will commence with the DART + Maynooth Line.

Customer capacity and train service frequency on these lines will be significantly increased as a result of the programme. This will help to deliver a more efficient transport system, allowing more people to make sustainable travel choices that reduce their carbon footprint and prevent chronic road congestion helping to meet the goals set out in the state's Climate Action Plan.

Iarnród Éireann's ambition is to increase train frequency from the current ten-minute frequency to a five-minute all-day frequency and to lengthen all trains to eight carriages. To achieve this ambition it is imperative that constraints along the track are rectified and level crossings are removed.

The cumulative network effect of DART+, subject to Government authorisation and funding, will increase customer capacity from circa 26,000 customers per hour per direction (2019) to circa 50,000-60,000 (peak) passengers per hour per direction under the National Development Plan investment and future growth capacity potential to 70,000-80,000 (peak) passengers per hour per direction thereafter, subject to further fleet procurement.

DART+ Maynooth Line

The DART+ Maynooth Line project will introduce electrified high capacity trains at increased frequency for all station between Maynooth/M3 Parkway and Dublin City Centre at Connolly Station and Docklands station (c.40km in length). The new DART+ trains will be similar in configuration to the current DART trains operating on the Malahide/Howth to Bray/Greystones line but with higher passenger carrying capabilities (i.e. each 8 carriage train will have maximum capacity for 1,400 passengers per train). The project will increase services from the current 7 trains per hour per direction to 15 trains per hour per direction by 2027 increasing passenger capacity from 4,500 to 13,750 subject to passenger demand, see Figure 1-1. This will be achieved through modifications to the track, removal closure of level crossings and the purchase of a new fleet of trains.

Figure 1-1 DART+ Programme Capacity Improvements

1.1 DART+ Programme Description

1.1.1 DART+ Programme

The DART+ Programme involves development of, and enhancements to the City Centre Stations and network. This will include electrification and re-signalling across the 3 main routes (see Figure 1.1 above) primarily over existing alignments extending the DART system on the:

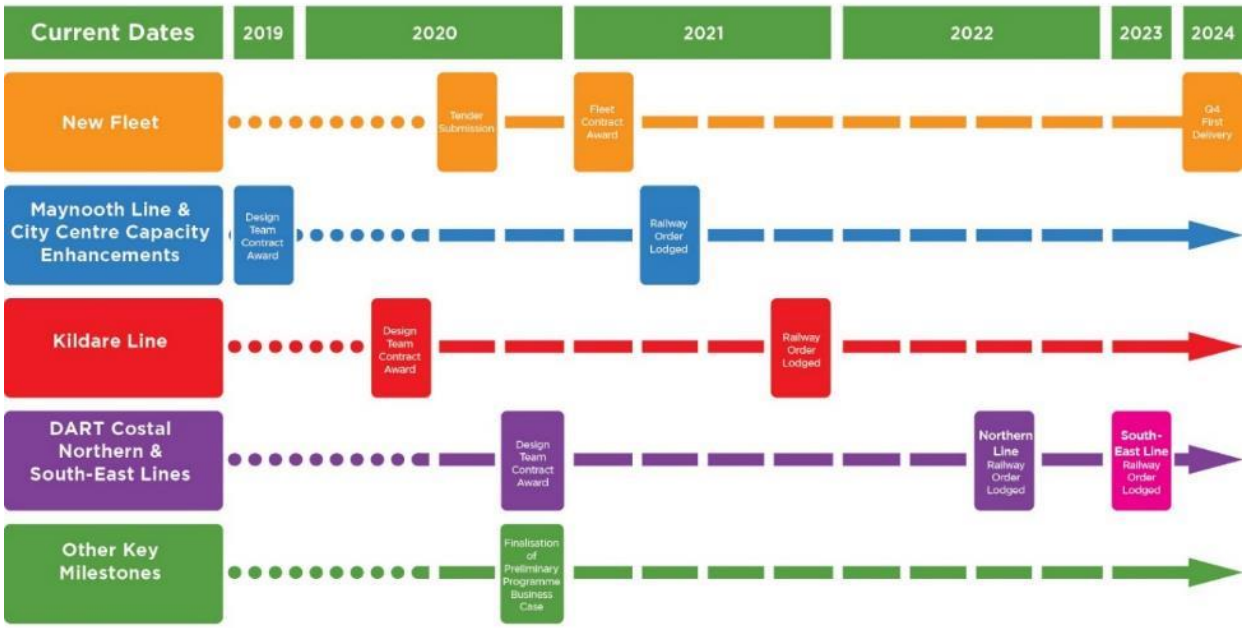
- **DART+ Maynooth Line** - c.40km from west of Maynooth to Connolly/Docklands in the City Centre. Including the M3 Parkway, connection to the Phoenix Park Tunnel and includes a new EMU Depot. It also includes upgrade and reconfiguration of existing railway infrastructure in the city centre.
- **DART+ Kildare Line** - c.20km from Hazelhatch into Heuston and the Phoenix Park Tunnel including 4-tracking from Parkwest to Heuston.
- **DART+ Coastal Line** comprising of:
  - **DART+ Northern Line** - c. 38km with electrification and related works from Malahide to Drogheda, also includes works from Connolly to Malahide & on the Howth Branch.
  - **DART+ Southeast Line** - removal of level crossings and related works, construction of turn back facilities and increases to the capacity of the Bray-Greystones section.

The sequence of delivery for the DART+ Programme will commence with the DART + Maynooth Line.

1.1.2 Timeline of DART+ Programme

Table 1-1 below gives a high-level timeline for the main infrastructure projects comprising DART+.

Table 1-1 Anticipated timeline for delivery of DART+ Programme



1.1.3 DART+ Maynooth Line Project

On the Maynooth and M3 Parkway Lines, DART+ will introduce electrified high capacity trains at increased frequency for all stations between Maynooth/ M3 Parkway to Dublin City Centre (40km corridor). The overall scope of the DART + Maynooth Line Project includes the following key elements of infrastructural work:

- Remodelling Connolly Station to increase capacity
- Subject to further assessment, construct new Spencer Dock Station, adjacent the Luas Stop, to increase capacity and better serve the Docklands area,
- Modifications at key junction approaching Connolly/Docklands Station from north and west to support increased services and flexibility;
- Elimination of level crossings on the Maynooth Line and provision of alternatives such as new bridges for pedestrians, cyclists and vehicles;
- Electrification and power supply to support the projected capacity increases;
- Signalling and telecommunications infrastructure to support the projected capacity increases;
- Provision of a new train depot;
- Infrastructure modifications to facilitate overall project;
- Facilitate the integration of *DART+ with MetroLink and other public transport schemes.*

Figure 1-2 View of Typical Electrified section of Southern Line

1.2 Purpose of Report

The purpose of this report is to present the options selection process undertaken to identify an Emerging Preferred Option across each of the distinct project components leading to the definition of the Emerging Preferred End to End option. The principal components are as follows:

- Stations;
- SET;
- Permanent Way;
- Level crossings;

- Structures (Overhead line clearances required at existing structures) and;
- Proposed Depot.

This report identifies the key constraints relevant to the various components of the project within the respective study areas, to develop feasible options for each aspect and documents a Multi-Criteria Analysis process on the options leading to the selection of an Emerging Preferred End to End Option for the project.

The report also describes the stakeholder engagement and public consultations that have occurred during the Option Selection Stage and following the identification of the Emerging Preferred Options (Note this process is incomplete at this time).

1.2.1 Format of the Report

This Preliminary Option Selection Report is presented in 2 volumes:

- Volume 1 – Main report and appendices
- Volume 2 – Drawings

The Main Report is structured in order to bring the reader through the selection of the Emerging Preferred Option process undertaken to date and which will remain open to change and modification throughout the design process. The report sets out the DART+ Programme and the planning and policy needed both for the DART+ Programme and for the DART+ Maynooth Maynooth Line project. The previous studies undertaken, and base options considered which have helped to underpin this scheme, are summarised in Sections 3 and 4 of this report. Section 5 to 12 set out the option selection process and the two stage Multi Criteria Analysis (MCA) undertaken to identify the Emerging Preferred Options. Section 13 identifies the next steps in the process. Sections 14 and 15 will present the Stakeholder Engagement and Public Consultation process and findings from Public Consultation No.1. These consultations are ongoing and therefore these sections are not included at this time. Section 16 will present recommendations for improvements to the Emerging Preferred Option following the feedback received at Public Consultation No.1 and the ongoing surveys, assessments, and consultations. These recommendations will then be considered in the development of the Preferred Option to be presented at Public Consultation No.2.

1.2.2 Authors of the Report

This Preliminary Option Selection Report has been compiled with assistance from the following specialists who have prepared the appropriate sections of the report. Table 1-2 shows the qualifications and years of experience of all contributors.

Table 1-2 Report Contributors

Topic	Specialist Contributors	Company	Qualifications	Experience (Years)
Chapters 1-2 Introduction, Need & Strategic Fit	Frances O'Kelly	ROD	MSc, BSc, MIPI	12
Chapter 3 Traffic Assessment	Marcin Kulinicz	IDOM	MA	10
Chapter 4 Consideration of Options	Mark Kilcullen	ROD	BE (Civil), MSc, CEng MIEI, FCons EI	27
	Morgan Hart	ROD	BTech, MIEI	23
	Javier Durán	IDOM	MSc	15
	Borja Aróstegui	IDOM	MSc, PhD Architect	15
	Cristina Chalé	IDOM	MSc	17
Chapter 5 Option Selection Process	Frances O'Kelly	ROD	MSc, BSc, MIPI	12
	Mark Kilcullen	ROD	BE (Civil), MSc, CEng MIEI, FCons EI	27
	Morgan Hart	ROD	BTech, MIEI	23
	Thomas Leonard	ROD	BEng (Hons), BE, CEng MIEI	12
	Cristina Chalé	IDOM	MSc	17
	Tom McKay	IDOM	BEng (Hons), CEng, MICE	29
Chapter 6 & 7 Stage 1 MCA, Stage 2 MCA	Frances O'Kelly	ROD	MSc, BSc, MIPI	12
	Mark Kilcullen	ROD	BE (Civil), MSc, CEng MIEI FCons EI	27
	Cristina Chalé	IDOM	MSc	17
	Morgan Hart	ROD	BTech, MIEI	23
	Thomas Leonard	ROD	BEng (Hons), BE, CEng MIEI	12
Chapter 6.3 & 7.3 Level Crossings Selection Process	Morgan Hart	ROD	BTech, MIEI	23
Chapter 6.4 & 7.4 Stations	Borja Aróstegui	IDOM	MSc, PhD Architect	15
Chapter 6.5 & 7.5 Depot	Javier Durán	IDOM	MSc	15
Chapter 6.6 & 7.6 Permanent Way	Manel de Riquer	IDOM	MSc	27
Chapter 6.7. & 7.7. SET	Miguel Ángel Piñeiro	IDOM	MSc Telecom Eng	22
	Carlos Azuaga	IDOM	BEng, BEng(Hons) CEng MIET	11
	Dolores Sanz	IDOM	MSc Telecom Eng	15
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Chapter 6.8 & 7.8 Structures	Manel de Riquer	IDOM	MSc	27
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Topic	Specialist Contributors	Company	Qualifications	Experience (Years)
Chapter 8 Recommendation on Emerging Preferred Option	Morgan Hart	ROD	BTech, MIEI	23
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	Borja Aróstegui	IDOM	MSc, PhD Architect	15
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Chapter 9-11 Stakeholder Engagement Process, Findings From Public Consultation No 1., Summary of Recommendations for Preferred Route	Barry Corrigan	ROD	BSc Hons, DIP EIA, CEnv	19
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Air Quality & Climate	Dr. Avril Challoner	AWN	CSci, BSc, MSc, MIAQM MIEnvSc	
	Dr. Edward Porter	AWN	BSc Hons, PhD	
Landscape and Visual (including Light)	Thomas Burns	Brady Shipman Martin	BAgrSc (Landscape), DIP EIA, Adv Dip Planning and Environmental Law	25
Biodiversity	Patrick O'Shea	ROD	BA, MSc	6
	Kate Moore	ROD	BSc (Hons)	4
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	Rob Goodbody	IAC	BA(MOD), DIP Env P, DIPABRC, MUBC, MA	30
Water resources	Warren Vokes	ROD	BA, MSc, MCIWEM	4
Agriculture and Non-Agricultural	John Bligh	John Bligh & Associates	BA.Ag, MSc MASA MACA	20
Soils and Geology	Paul Kissane	ROD	BA, BAI, PhD, CEng, MIEI	20
Radiation & Stray Current	Nigel Duignan	CEI	MSc	11
	John McAuley	CEI	MSc, BSc	35

1.1.4 Status of the Report

This Preliminary Option Selection Report is presented as a working draft of the Option Selection Report which will be presented at Public Consultation No.2 when additional surveys and assessments have been completed and the Preferred Option is identified. None of the information or assessments presented herein are final. They are subject to change and further review.

The purpose of presenting this Preliminary Option Selection Report at this stage is to show to the public the status of the Options Selection, the process being followed in order to identify the Emerging Preferred Option and to assist the consultation feedback process. As part of the Public Consultation Process the public will be invited to make observations on the proposals for consideration by the design team.

2 NEED, STRATEGIC FIT

2.1 Project Objectives

DART+ Programme's primary objective is to support urban compact growth and contribute to reducing transport congestion and emissions in the Dublin region by enhancing the heavy rail network between Dublin City Centre and the areas of Drogheda, Maynooth, Dunboyne, Celbridge and Greystones, providing a sustainable, safe, 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 support long-term patronage growth 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, through the provision of a higher capacity heavy rail network
- 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, modern vehicles and a reliable and punctual service with regulated and integrated fares

The first of the infrastructural projects of the DART+ programme to be delivered is the DART+ Maynooth Line project. The project will be a predominantly online project with electrification of the line and the majority of the works will be undertaken within existing Iarnród Éireann lands. Interventions outside of Iarnród Éireann lands will be required at a number of locations for some of the scheme elements such as the level crossing replacements, the depot, the provision of power to the line and modifications required along the main permanent way (railway corridor).

2.1.1 The Need for Level Crossing Replacements

The DART+ project proposes to increase train service levels from 7 trains per hour per direction to 15 trains per hour per direction (in peak hours). Any increased train frequencies along the Maynooth line will make the retention of the existing level crossings untenable, as there will be insufficient crossing time available to accommodate the desired movements for pedestrians, cyclists and vehicles. Furthermore, the retention of the crossings, at significantly higher closure periods, could increase the risk of incidents along the train line, as pedestrians, cyclists and motorists may take unsafe opportunities to cross the railway corridor.

Tables 3-3 and 3-4 , reproduced below present the existing situation in relation to the level crossing closures in the AM (08:00-09:00) and PM (17:00-18:00) peak hours.

Table 2-1 AM Railway Stats for the Level Crossings – CSEA Systra Oct 2019

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Ashtown	13	6	00:36:42	00:06:07
Coolmine	12	9	00:41:35	00:04:37
Porterstown	12	7	00:32:46	00:04:41
Clonsilla	12	7	00:30:58	00:04:25
Barberstown	9	6	00:26:03	00:04:21
Blakestown	7	5	00:23:48	00:04:46

Table 2-2 PM Railway Stats for the Level Crossings – CSEA Systra Oct 2019

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Ashtown	11	6	00:36:32	00:06:05
Coolmine	11	7	00:34:14	00:04:53
Porterstown	10	6	00:19:57	00:03:20
Clonsilla	10	4	00:26:30	00:06:38
Barberstown	7	6	00:20:37	00:03:26
Blakestown	7	6	00:21:54	00:03:39

The level crossings are closed for up to 41.5 minutes every hour (Coolmine). With the proposal to increase the number of trains to 30 it is clear that these level crossings would not be able to operate as an efficient crossing point for pedestrians, cyclists and motorists.

DART+ is seeking to eliminate 6 level crossings between Maynooth and the city centre. Where considered appropriate to maintain a sufficient level of service on the road network, new bridge crossings will be provided to maintain pedestrian, cycle and vehicular continuity across the railway corridor. To assist with identifying where replacement of access is appropriate the traffic impact of varied configurations of access removal has been assessed. The detail of the assessment is set out in Chapter 3 and the outcome has been used to inform the multi-criteria analysis for each level crossing.

Figure 2-1 View of traffic queuing during a closure of Ashtown Level Crossing

The proposed level crossing closure programme will be similar to the recently completed Level Crossing Replacement along the Ratoath Road Regional R103 Road at Reilly's Level Crossing. The R103 connects Cabra to Finglas and in 2018, Iarnród Éireann opened a bridge above the railway, which facilitated the permanent closure of Reilly's Level Crossing and enabled free flow of road traffic for pedestrians, cyclists and motorist. The elimination of the level crossing had a significant positive impact on the connectivity between Cabra and Finglas, by the elimination of traffic queueing, particularly during peak commuter periods. The images below (Figure 2-2 – Figure 2-4) show how the situation with the Level crossing in place and following the construction of the new bridge and closure of the level crossing.

Figure 2-2 Before: Traffic queuing along Ratoath Road on approach to (Reilly's) Level crossing

Figure 2-3 After: The overhead bridge constructed at Ratoath Road in 2018

Figure 2-4 View of the canal and towpath beneath the Ratoath Road (Reilly's) bridge

2.2 Project Specific Need

The DART+ is central to the delivery of planning and transportation policy objectives at national, regional and local level. The policy hierarchy and some of the relevant documents which reference and support the DART+ are shown in Table 2-3.

Table 2-3 Planning and Policy Documents

National Level
Project Ireland 2040
National Planning Framework – Ireland, Our Plan 2040
National Development Plan, 2018-2027
Smarter Travel: A Sustainable Transport Future; 2009-2020
Strategic Investment Framework for Land Transport (SIFLT)
Planning Land Use and Transport Outlook 2040 (PLUTO)
National Mitigation Plan 2017
Climate Action Plan 2019
Regional Level
Regional Planning Guidelines for Greater Dublin Area 2010-2022
Eastern and Midland Regional Spatial and Economic Strategy 2019-2031
NTA Transport Strategy for the Greater Dublin Area 2016-2035
Greater Dublin Area Cycle Network Plan
Integrated Implementation Plan 2019-2024
Local Level
Dublin City Development Plan 2016–2022
North Lotts and Grand Canal Dock SDZ 2014
Ashtown-Pelletstown LAP (January 2014)
Fingal County Development Plan 2017 – 2023
Hansfield SDZ
Barnhill LAP
Kellystown Issues Paper
Kildare County Development Plan 2017 – 2023
Kilcock Local Area Plan 2015-2021
Leixlip Local Area Plan 2020-2023
Meath County Development Plan 2013 - 2019

2.3 National Policy

2.3.1 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 2040 is a long-term overarching strategy which aligns investment decisions with a clearly defined development strategy and ten National Strategic Outcomes (NSO), as shown in Figure 2-5.

2.3.1.1 National Planning Framework 2040

The National Planning Framework (NPF) will guide development and exchequer investment up to 2040. It is a blueprint to guide public and private investments to promote and enhance opportunities and infrastructure for an increasing population and sets out the development principles that subsequent plans must follow. The Framework provides each region with a set of objectives and key principles from which detailed plans are to be developed.

As one of the ten National Strategic Outcomes identified within the framework, 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 Framework aims to expand the range of public transport services available and to reduce congestion and emissions. Under NSO 4 the policy also commits to invest in key transport projects such as the DART+, BusConnects and Metro link.

The DART+ will also support other NSOs identified within the Framework such as NSO 1, Compact Growth and NSO 8, Transition to a Low Carbon and Climate Resilient Society.

NSO 1 identifies the need to deliver a greater proportion of residential development within existing built-up areas and the role that an integrated transport network will play in the regeneration and revitalization of urban areas while NSO 8 includes the electrification of transport fleets as a requirement to support a move away from polluting and carbon intensive propulsion systems.

Figure 2-5 National Strategic Outcomes

The Framework points to an increase in population of one million people from 2016 figures, bringing the total to 5.7 million by 2040; 2.85 million of which will be located within the Eastern and Midlands region. It highlights the impact that this population increase will have on transport along the motorway and railway corridors connecting the region with Dublin, where it is recognised that the provision of a well-functioning, integrated public transport systems is essential to maintain economic development and enhance competitiveness.

2.3.1.2 National Development Plan 2018 – 2027

Project Ireland 2040's National Development Plan 2018–2027 (NDP) is the most recent infrastructure investment plan adopted by the government. The Plan sets out the investment priorities of the State 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 over the next two decades. The NDP provides government departments with greater visibility of their investment capacity over the term of the Plan. The Plan caters for an increase in population of over 1 million people by 2040 and identifies €116 billion for investment in capital projects targeted at enhancing regional development and driving economic growth.

The NDP expands on the objectives of NSO 4, Sustainable Mobility and outlines how increases in passenger demand are to be catered for by a sustainable public transport system significantly less reliant on vehicles. As shown **in Figure 2-5** the DART+, along with BusConnects and Metrolink are included in the NDP 2018-27 (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 proposed BusConnects network in the vicinity of DART+ is shown in Figure 2-6.

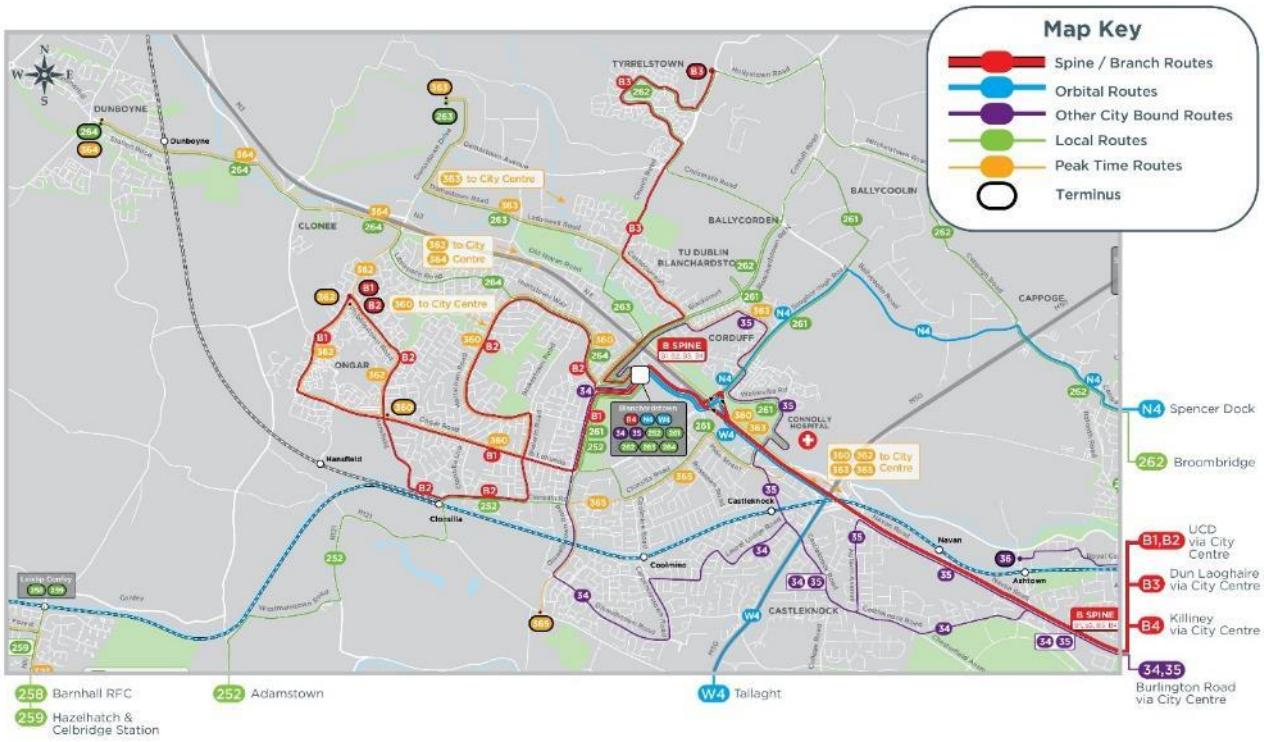

Figure 2-6 BusConnects Network - Blanchardstown

The NDP 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 Kildare line to Celbridge/Hazelhatch to create a full metropolitan area DART network with all lines linked and connected as shown in Figure 2-7.

Table 2-4 Indicative resource allocations for the delivery of NSOs, and for named Strategic Investment Priorities under each NSO, over the period 2018-2027

National Strategic Outcome		Allocation (€ Bn)
1	Compact Growth	14.5
2	Enhanced Regional Accessibility	7.3
3	Strengthened Rural Economies and Communities	8.8
4	Sustainable Mobility, of which:	8.6
	DART Expansion	*2*
	Metro Link	*3*
	BusConnects Programme (Dublin, Cork and Galway)	*2.4*
	Other	*1.2*
5	A Strong Economy, supported by Enterprise, Innovation and Skills	9.4
6	High-Quality International Connectivity	4.8
7	Enhanced Amenity and Heritage	1.4

National Strategic Outcome		Allocation (€ Bn)
8	Transition to a Low-Carbon and Climate-Resilient Society	21.8
9	Sustainable Management of Water and other Environmental Resources	8.8
10	Access to Quality Childcare, Education and Health Services	20.1
11	Other sectors	3.0
12	Contingency	7.4
	Total	**116**

The Plan does not make provisions for any new tunneling but does include the utilization of the existing Phoenix Park tunnel and requires that the route for any future DART Underground is protected to allow for its future delivery. The indicative resource allocation for delivery of each NSO over the period 2018-2027 is shown in Figure 2.7 below.

Figure 2-7 NDP Public Transport Network (including DART+)

2.3.2 Smarter Travel: A Sustainable Transport Future 2009-2020 (DTTAS, 2009)

This National Government policy outlines clear targets to:

- Address the current unsustainable transport and travel patterns and to reduce the health and environment impacts of current trends;
- To 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 document outlines five key goals necessary for achieving sustainability in transport. These are:
- Reduce overall travel demand and commuting distances travelled by car;
- Improve economic competitiveness through maximising the efficiency of the transport network and alleviating congestion and infrastructure bottlenecks;
- Reduce reliance on fossil fuels and thus improve security of energy supply;
- Minimise the negative impacts of transport on the local and global environment by reducing air pollutants and Greenhouse Gas emissions attributed to travel. Improve accessibility to transport and improve quality of life with an emphasis on people with reduced mobility and those experiencing isolation as a result of reduced accessibility.

2.3.3 Strategic Investment Framework for Land Transport (SIFLT)

The Department of Transport, Tourism and Sport's (DTTAS) Strategic Investment Framework for Land Transport (2015) lays out the role of transport in the future development of the Irish economy. It estimates the appropriate level of investment in the land transport system and sets out the priorities for the allocation of investment to best develop Irelands land transport network. The Framework considers the objective of transport investment in light of current and projected transport demand and spells out the key issues for policy makers when investing in land transport.

The Framework identifies the rationale for investment in transport networks, citing their role in driving economic growth, and supporting the delivery of economic development objectives by enabling efficiency and competitiveness across the economy. The framework highlights Irelands obligations regarding the reduction of carbon emissions and identifies the need for radical transformation within the transport sector if the targeted reduction in carbon emissions of 80% by 2050 is to be achieved. The need for investment now is also established by illustrating that the existing land transport systems cannot cater for the projected increases in population and a 35% increase in commuting trips by 2040.

The Framework's priorities outlined below echo the Project Ireland 2040 National Strategic Outcomes (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 DART+'s objectives are aligned with these SIFLT priorities.

2.3.4 Planning Land Use and Transport Outlook 2040 (PLUTO)

Following the publication of Project Ireland 2040, DTTAS commenced the PLUTO 2040 initiative to update the SIFLT to ensure the alignment of planning with regard to land use and transport projects across government departments and agencies. The review to date has identified several priorities to be incorporated into the planning framework going forward. Within PLUTO there is continued focus on the need to address climate change through the delivery of reduced emissions for transport networks supported by technological initiatives. PLUTO has established priorities for transport projects up to 2040 which include;

A land transport network which delivers a high level of service for the population of Ireland;

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

The PLUTO 2040 initiative is still in progress, but the above priorities align with and support the DART+.

2.3.5 National Mitigation Plan 2017

The National Mitigation Plan published by the Department of Communications, Climate Action and Environment in 2017 outlines a series of medium and long-term measures to be undertaken to facilitate the transition to a low carbon, climate resilient and environmentally sustainable economy by 2050. The Plan includes over 100 individual actions across numerous government departments and public bodies within the electricity, built environment and transport sectors. The Plan responds to targets laid out previously in the Paris Climate Agreement (COP21), 2015 which mandated member states to move towards decarbonised economies by 2050 and sets a target of an 80% reduction in emissions across the Electricity, Built Environment and Transport sectors by 2050.

Recognising transport as one of the largest contributors of greenhouse gas emissions and that emissions within the sector have shown a steady rate of increase in recent years the Plan identifies specific measures to develop and invest in public transport and encourage a modal shift away from private cars.

Specifically, the Plan states that:

"Exchequer current funding of over €275 million is being provided to the NTA in 2017 for PSO and Rural Transport Programme (RTP) public transport services. This will allow for improved services on the publicly funded bus and rail networks including increased service frequencies on the high capacity DART network."

2.3.6 Climate Action Plan 2019

The Climate Action Plan published by the Department of Communications, Climate Action and Environment in 2019 includes measures to guide Ireland towards achieving the European Union's net zero greenhouse gas (GHG) emissions target by 2050. These measures are detailed in the roadmaps developed for each public sector with an objective to deliver a cumulative reduction in GHG emissions over the 2021 to 2030 period.

In relation to the Transport sector, the Plan identifies that electrification of transport, namely of private vehicles, bus and rail services is the most cost-effective approach in reducing the sector's GHG emissions. Concerning the rail network, this is reflected in the following Actions:

Action Number 92 "Commence the transition to hybrid trains to allow extended electrification of rail services"

Action Number 93 "Extend the Dublin area railway electrification for the Maynooth Line (to Maynooth), Kildare Line (to Celbridge), and Northern Line (to Drogheda)"

The Actions of the Climate Action Plan align with and support the DART+.

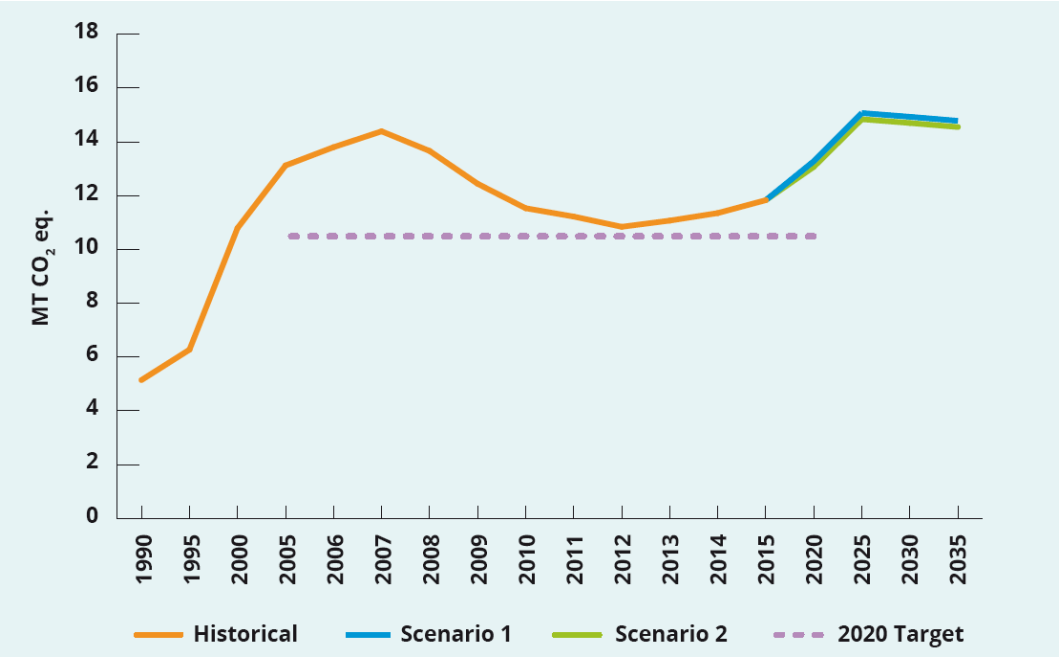

Figure 2-8 Projections of Greenhouse Gas Emissions from the Transport Sector1

2.4 Regional Policy

2.4.1 Eastern and Midland Regional Spatial and Economic Strategy 2019 - 2031

The Eastern and Midland Regional Assembly's (EMRA) 2019 Regional Spatial and Economic Strategy (RSES) provides regional specific policy objectives for the Midlands, Eastern and Dublin regions. The RSES address 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 Strategy highlights the DART+ and its role in the consolidation of Dublin City and the regeneration of locations such as Dublin Docklands and Poolbeg. Along the North-West corridor, the DART+ to Maynooth will enhance rail services on the Dublin – Sligo line. The RSES also emphasizes the role of DART+ in increasing capacity to support the ongoing development of lands adjacent to the line at Leixlip and Maynooth.

Eastern and Midlands Regional Spatial & Economic Strategy (RSES) supports the project through Regional Policy Objective **RPO 8.8** "*The RSES supports delivery of the rail projects set out in Table 8.2, subject to the outcome of appropriate environmental assessment and the planning process*". The DART+ Programme is listed as one of the rail projects in Table 8.2 *"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 Line, Maynooth and M3 Parkway on the Maynooth/ Sligo Line, while continuing to provide DART services on the South-Eastern Line as far south as Greystones"*.

The Strategy highlights the importance of provision of enabling infrastructure for growth in Maynooth, identifying that the "DART + project and proposed electrification of the rail line to Maynooth represents a significant opportunity for sequential growth in Maynooth".

[1] Source, EPA

Dublin Metropolitan Area Strategic Plan (MASP)

The requirement for the development of MASP for Dublin City as part of the RSES is outlined in the Project Ireland 2040. The objectives of the MASP are complementary to the objectives of the RSES. Strategy requires the development of the Dublin MASP and include the management of sustainable and compact growth of Dublin City and better use of under used lands. One of the Guiding Principles for the growth of the Dublin MASP is **Integrated Transport and Land use** which includes the following:

The MASP contains a number of objectives for the Dublin Metropolitan Area, including Sustainable Transport Objective 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 priorities of the Eastern and Midland RSES align with and support the DART+.

2.4.2 Transport Strategy for the Greater Dublin Area 2016 – 2035

This document published by the National Transport Authority (NTA) lays out the transport strategy for the Greater Dublin Area (GDA) up to 2035. The Strategy which was adopted by Government and is now Government Policy is modally balanced and designed to cater for the future needs of the Greater Dublin Area and enable people to move efficiently around the Dublin region. It integrates short, medium and long-term plans for rail, bus, cycling, walking and roads as shown in Figure 2-9 it 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."

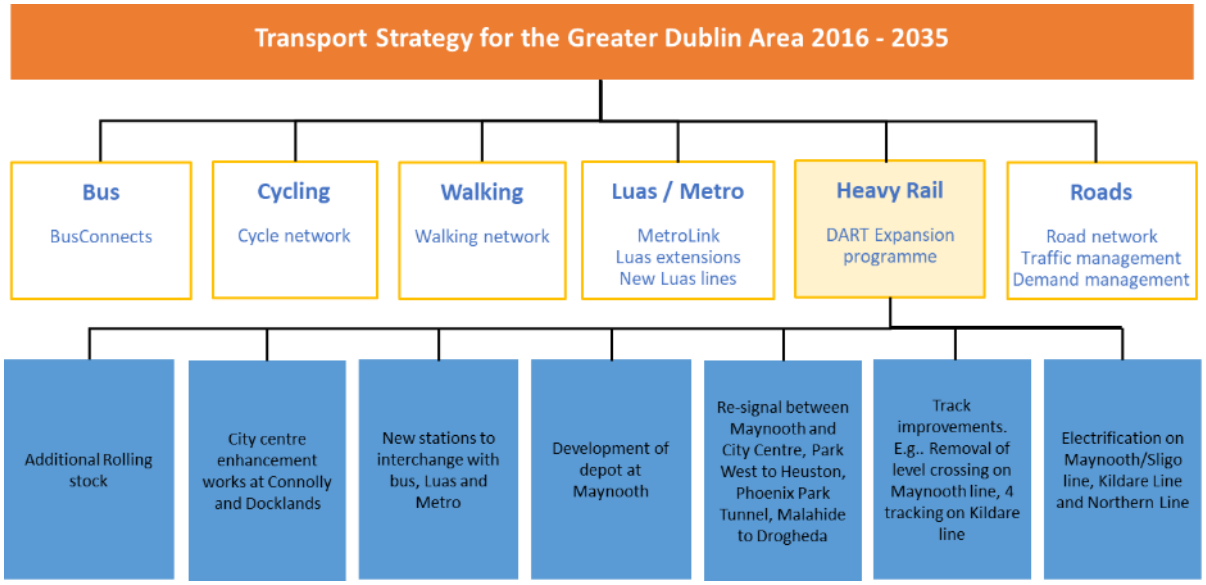

Figure 2-9 NTA Multi modal Transport Strategy for GDA

In developing the Strategy, the NTA have considered alternative options for the provision of transport services along the six radial corridors into Dublin and found heavy rail to be the most appropriate solution to meet the transport needs of the high-density population centres across several of the corridors identified. Consequently, the Strategy intends to:

"Implement the DART Expansion Programme, which will provide DART services as far north as Drogheda; to Hazelhatch on the Kildare Line (including a tunnel connection from the Kildare Line to link with the Northern / South-Eastern Line); to Maynooth in the west and to the M3 Parkway
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; and
Ensure an appropriate level of train fleet, of an appropriate standard, to operate on the rail network"

The Strategy also outlines its objectives for Transport Services and Integration, including bus and rail services, In relation to the rail service, the Strategy proposes the following:

"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"

The objectives of the Transport Strategy for the GDA align with and support the DART+.

The GDA Transport strategy includes objectives in respect of specific modes of transport. A selection of pertinent objectives is included below:

- 5.7 Walking: Provide a safer, more comfortable and more convenient walking environment for those with mobility, visual and hearing impairments, and for those using buggies and prams;
- 5.7 Walking: Revise road junction layouts, where appropriate, to provide dedicated pedestrian crossings, reduce pedestrian crossing distances, provide more direct pedestrian routes, and reduce the speed of turning traffic
- 5.7 Walking: Ensure that permeability and accessibility of public transport stops and stations for local communities is maintained and enhanced;
- 5.8.2 Regional and Local Roads: Enhance orbital movement, outside of the M50 C-Ring, between the N3, the N4 and N7 national roads, by the widening of existing roads and the development of new road links;
- 5.8.2 Regional and Local Roads: Develop appropriate road links to service development areas;
- 5.8.2 Regional and Local Roads: Enhance pedestrian and cycle safety through the provision of safer road junctions, improved pedestrian crossing facilities and the incorporation of appropriate cycle measures including signalised crossings where necessary.
- 5.8.3 Principals of Road Development: There will be no significant increase in road capacity for private vehicles on radial roads inside the M50 motorway;
- 5.8.3 Principals of Road Development: That the road scheme, other than a motorway or an express road proposal, will be designed to provide safe and appropriate arrangements to facilitate walking, cycling and public transport provision.

2.4.3 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 amount 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. To compliment the investment in the cycle network, the cycle network plans also provide for:

Sufficient on and off street public cycle parking at key urban destinations such as bus/rail stations, schools and large workplaces.
The expansion of the bike share scheme in Dublin City and the introduction of similar schemes across the Greater Dublin Area.
The implementation of a comprehensive cycle route signage programme in conjunction with the development of the cycle network.

The proposed network of primary, secondary and greenway routes that will help support cycling in the vicinity of the studied area is shown on the Figure 2-10.

The plan includes the development of the Royal Canal Greenway. The Sligo line is immediately parallel to the Royal Canal from City Centre to Maynooth. The canal towpath is paved from North Strand Road as far as Ashtown, with a good quality gravel surface from there to Blanchardstown. This path is in use by cyclists as a defacto cycleway at present. A number of design studies are underway to develop a high-quality cycle track along the canal westward to Maynooth, as the Royal Canal Urban Greenway which is on Public Consultation process at the moment.

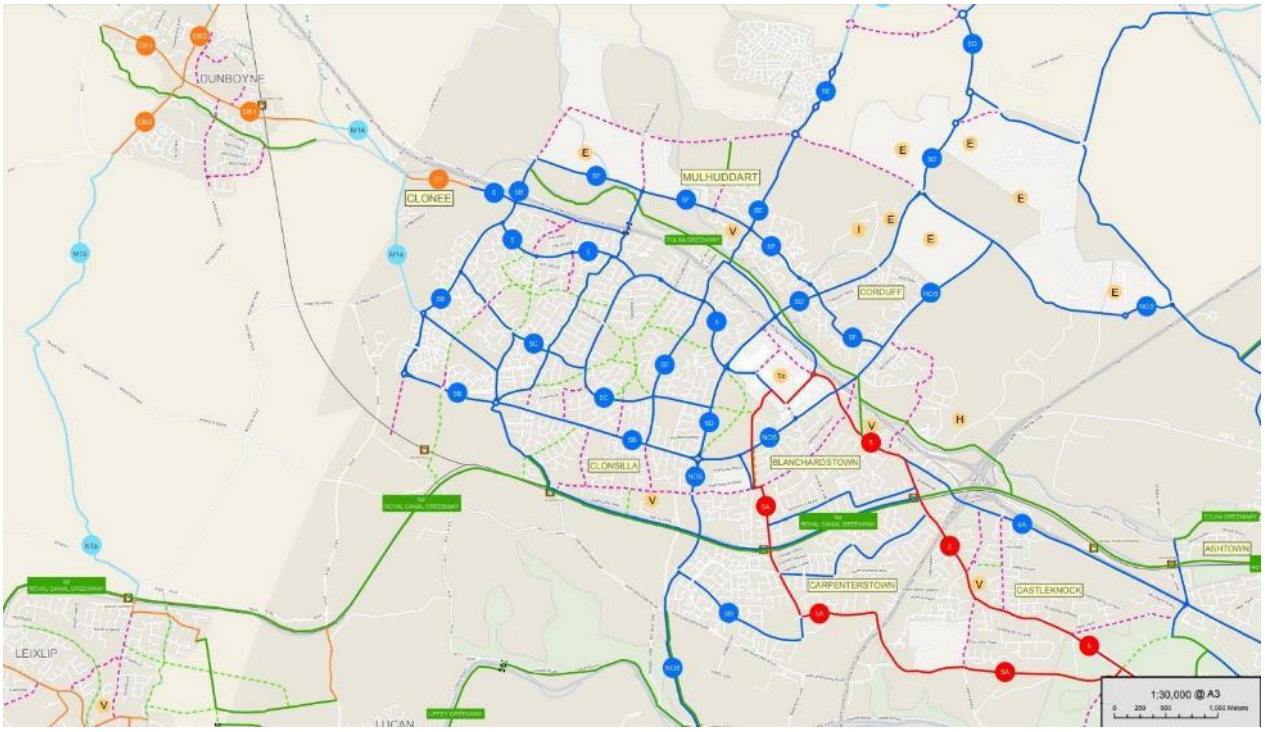

Figure 2-10 Greater Dublin Area Cycle Network Plan

2.4.4 Integrated Implementation Plan 2019-2024

The NTA's Integrated Implementation Plan 2019-2024 (currently in draft) supports the delivery of the Transport Strategy for the Greater Dublin Area 2016-2035 and is aligned with the objectives of the NDP. The Plan sets out the central infrastructure investment programme and overall funding provision over the six-year period. It identifies the key investment areas with respect to bus, light rail, heavy rail and integration and sustainable transport investment.

The 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. Table 2-5 shows the expenditure profile for heavy rail projects which includes the DART+ Programme and other heavy rail projects such as City Centre Re-signalling, the National Train Control Centre and fleet and other network developments.

Table 2-5 Expenditure Profile for Heavy Rail Projects

	2019	2020	2021	2022	2023	2024	Total
Heavy Rail investment (€m)	**67.7**	**108.0**	**167.0**	**166.0**	**225.8**	**315.0**	**1,049.5**

2.5 Local Policy

2.5.1 Dublin City Development Plan 2016–2022

The Dublin City Development Plan 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 Dublin CDP remit includes the areas between the Docklands and Ashtown Level Crossing.

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

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.

North Lotts and Grand Canal Dock SDZ 2014

Dublin City Council successfully prepared and adopted a SDZ Scheme for the Docklands area of North Lotts and Grand Canal Dock in 2014. The Docklands Station is located with the SDZ. The main objectives within the North Lotts and Grand Dock SDZ that support the DART+ programme include:

MV1: To continue to promote the modal shift from private car use towards increased use of more sustainable forms of transport such as cycling, walking and public transport and to implement the initiatives contained in the Government's 'Smarter Travel, A Sustainable Transport Future 2009-2020'

MV2: To support and facilitate the development of an integrated public transport network with efficient interchange between transport nodes, to serve the existing and future needs of all ages in association with

relevant transport providers, agencies and stakeholders and to facilitate the integration of walking and cycling with public transport.

Ashtown-Pelletstown LAP (January 2014)

The Ashtown - Pelletstown Local Area Plan (LAP) relates to the lands positioned south of the River Tolka and North of the Royal Canal within the administrative boundary of Dublin City Council. The lands of the LAP are immediately north of the existing Ashtown level crossing and train station.

The vision for Ashtown-Pelletstown LAP area is "The creation of a sustainable living and working environment with a strong urban identity, anchored by mixed-use supporting hubs and benefitting from both good permeability and quality public transport options. The area shall be characterised by a vibrant social mix, reflected in a variety of housing options and community facilities/amenities, well integrated with the wider city via improved infrastructure and green infrastructure".

The LAP Objectives that support to this study:

MA1: To improve accessibility throughout the plan area, facilitate the completion of hierarchical road infrastructure network, and encourage links to existing and proposed public transport nodes both within and beyond the LAP boundary.

MA3: To promote increased cycling and pedestrian activity through the development of a network of routes that connect to public transport routes, centres of employment, amenities and community and retail destinations.

MAO 7: To encourage and facilitate, in cooperation with Fingal County Council and Iarnród Éireann, the replacement of the existing manually operated rail level crossing at Ashtown Road, with suitably designed alternative. The eventual design shall have regard to both existing and proposed developments in the immediate vicinity of the plan area and provide for high quality pedestrian and cycle facilities linking with existing and proposed pedestrian cycle networks both within and surrounding the LAP area.

2.5.2 Fingal Development Plan 2017-2023

The Fingal Development Plan (FDP) 2017-2023 policy remit extends from the Ashtown level crossing west to Leixlip. The delivery of DART+ is recognised as a strategic aim of the Plan.

Aim 15 Seek the development of a high quality public transport system throughout the County and linking to adjoining counties, including the development of the indicative route for New Metro North and Light Rail Corridor, improvements to railway infrastructure including the DART Expansion Programme, Quality Bus Corridors (QBCs) and Bus Rapid Transit (BRT) systems, together with enhanced facilities for walking and cycling

Improving transport within Fingal is recognised as key to the future economic, social and physical development of Fingal. The Fingal Development Plan supports the project through the following objectives:

MT30: Support Iarnod Eireann and the NTA in implementing the DART+ Programme, including the extension of the DART line to Balbriggan, the design and planning for the expansion of DART services to Maynooth and the redesign of the DART Underground.

MT31: Design and implement measures, having regard to potential environmental impacts, to mitigate the increased congestion on the local road network caused by more frequent closures of the existing level crossings on the Maynooth Line. Ensure that well in advance of any such measures being taken, extensive

direct consultation is undertaken with local communities and residents who would be directly impacted by such measures.

MT28: Facilitate, encourage and promote high quality interchange facilities at public transport nodes throughout the county. The land use zoning objectives for the Ashtown, Coolmine, Porterstown Clonsilla and Barberstown level crossings are set down on Sheet 13, Blanchardstown South which contains the zoning objectives and specific objectives of the Fingal DP. Some of the aims of the Plan relating to transport are as follows:

Incorporating sustainable development, climate change mitigation and adaptation, social inclusion, high quality design and resilience are fundamental principles that underpin the Development Plan. Relevant aims also include:

To promote an appropriate balance of development across the County, by developing a hierarchy of high quality, vibrant urban centres and clearly delineated areas of growth, and favouring expansion in areas nearest to existing or planned public transport nodes.

To promote and facilitate movement to, from, and within the County of Fingal, by integrating land use with a high quality, sustainable transport system that prioritises walking, cycling and public transport.

To provide an appropriate level of safe road infrastructure and traffic management, in particular to support commercial and industrial activity and new development.

To work with all relevant stakeholders to seek a reduction in greenhouse gas emissions from transport.

2.5.2.1 Hansfield Strategic Development Zones (SDZ) April 2006

Fingal County Council published the Hansfield Strategic Development Zone Report in 2006[2]. The Hansfield SDZ comprises approximately 80.74 hectares of land in south West Blanchardstown close to the county boundary with County Meath.

The SDZ was approved by An Bord Pleanála in April 2006 and a number of residential units are occupied. The site is currently active with residential units under construction in the SDZ (Zones 1, 2, 4 & 6).

The Transport Strategy for the SDZ included the opening of the old Navan Line. The first phase of the proposed railway linking Navan to Dublin opened in September 2010. Over 25 trains each way per day now run between the new M3 Parkway Station, Dunboyne and Dublin city centre. Part of the strategic infrastructure within the SDZ was to provide a new train station within the SDZ lands, and Hansfield train station was opened in 2013.

In addition, pedestrian/cyclist connection to Clonsilla Train Station will be provided as part of the SDZ strategy. Figure 2-11 below, illustrates the extent of the SDZ lands.

[2] http://www.fingal.ie/planning-and-buildings/development-plans-and-consultations/studies-andreports/hansfield-strategic-development-zone/

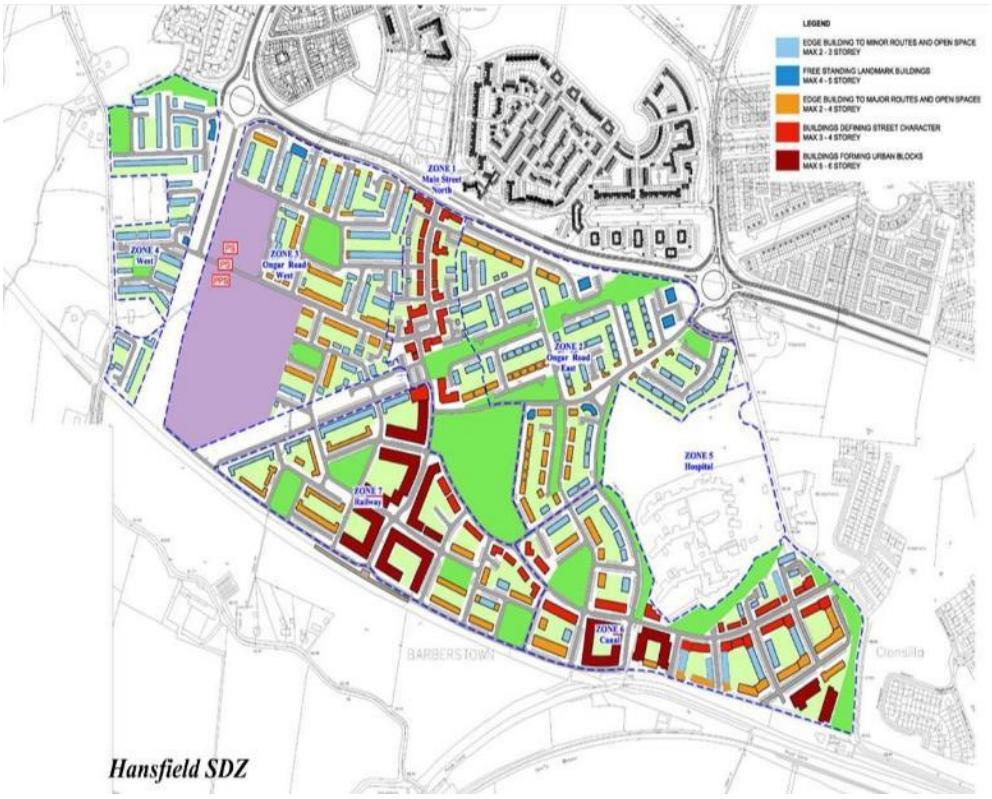

Figure 2-11 Hansfield Strategic Development Zone Lands

2.5.2.2 Barnhill LAP

Fingal County Council published Barnhill LAP in October 2018[3]. The Plan comprises 45.64 hectares of greenfield, illustrated in Figure 2-12. The designated area is located approximately 3km from Blanchardstown Town Centre, situated directly south of the Dunboyne to Clonsilla rail Line, west of the Royal Canal and the Dublin - Maynooth Railway Line, and east of the R149.

The Vision for Barnhill is to create a place to live that is appealing, distinctive and sustainable, maximising the opportunities provided by the surrounding natural environment for biodiversity and improved amenities. It is envisaged that Barnhill will develop as a sustainable community comprised of new homes, community, leisure and educational facilities based around an identifiable and accessible new local centre which will form the heart of the area.

Key aims of the LAP Movement and Transport Strategy are:

Improve accessibility and maximise public transport use, taking account of the land's location adjoining Hansfield train station.
Encourage use of sustainable transport options. Walking and cycling shall be encouraged, particularly for shorter trips.
Prioritise planned infrastructure that supports public transport, and ensures the land use strategy is informed by, and integrated with transportation objectives.
Seek the interconnection of walking and cycling routes with key public transport and amenity destinations (both existing and planned).
Encourage sustainable densities of population, such that public transport is supported and sustained, and walking and cycle routes are kept active.

[3] https://consult.fingal.ie/en/consultation/barnhill-local-area-plan

In order to provide for a coherent sustainable movement and transport strategy, and to maximise development capacity within the LAP lands, it is required to deliver the necessary extension of the Ongar-Barnhill road with provision of a new bridge over the Dunboyne (Pace) – Clonsilla rail line and provision of a new junction with the existing road network. This will connect the Ongar road to the existing Clonee-Lucan road (R149).

Figure 2-12 Barnhill LAP

2.5.2.3 Kellystown Issues Paper Draft Local Area Plan

Fingal County Council are, at the time of writing this report, currently in the process of preparing a Local Area Plan for Kellystown. The issues paper[4] was published to provide an overview of the Kellystown lands, and it's planning and policy context, to help inform consultation discussion and shape the new Local Area Plan.

The Kellystown lands, outlined in Figure 2-13 below, are situated directly south of the Royal Canal and the Dublin-Maynooth Railway Line, and between Diswellstown Road to the east and Clonsilla Road (R121) to the west.

The Kellystown LAP lands extend to circa. 56.4 Ha (0.4Ha occupied by roads) and will provide a statutory framework for the proper planning and sustainable development of the area which is subject to the following Land Use zoning Objectives:

Residential Area 'RA' – 'provide for new residential communities subject to the provision of the necessary social and physical infrastructure' The RA land use zoning extends to c. 30.2Ha; and

Open Space 'OS' where the land use zoning objective seeks to 'Preserve and provide for open space and recreational amenities'. The OS land use zoning extends to 25.8HA.

[4] https://consult.fingal.ie/en/system/files/materials/12704/Kellystown%20Issues%20Paper190619_V4.pdf

Figure 2-13 Kellystown LAP Lands (Figure extracted from the Kellystown Issues Paper)

The following Local Objectives from the Fingal Development Plan 2017-2023 are applicable to the LAP lands:

Local Objective 130 relating to Clonsilla level crossing: Prepare a feasibility study on the location of a road bridge, crossing the Royal Canal and the Dublin/Maynooth railway, connecting north to the Ongar road. This location shall be determined in advance of, or as part of the adoption of the Local Area Plan for lands at Kellystown.

Local Objective 137: Preserve the existing pedestrian and vehicular right of way at the level crossing at Porterstown.

Local Objective 144: Protect the rural character and setting of the Luttrellstown Road and enhance its use for pedestrians and cyclists.

2.5.3 Kildare County Development Plan 2017-2023

The Kildare County Development Plan (KCDP) sets out an overall strategy for the proper planning and sustainable development of the functional area of County Kildare, over the period 2017-2023 and beyond. The KCDP includes areas from Leixlip extending to Maynooth.

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

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

PTO 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.
PTO 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.

2.5.3.1 Kilcock Local Area Plan 2015-2021

The Kilcock Local Area Plan development boundary are located west of the proposed Depot location. The main policy and objectives stated in the LAP which are applicable to the DART+ Programme include:

MT1: To support the sustainability principles set out in the National Spatial Strategy, The Regional Planning Guidelines for the Greater Dublin Area, Government's 'Smarter Travel, A Sustainable Transport Future 2009-2020' and the National Transport Authority's 'A Platform for Change', the Integrated Implementation Plan for Transport in the GDA and the Authorities Draft Transportation Strategy for the Greater Dublin Area (2011-2030) and to ensure that land use and zoning are fully integrated with the provision and development of a comprehensive, sustainable and efficient transportation network that accommodates the movement needs of Kilcock and the region.
MTO2: To maximise the use of public transport infrastructure, walking and cycling and minimise car dependence.

2.5.3.2 Leixlip Local Area Plan 2020-2023

The existing Blakestown level crossing is located within the boundary of the Leixlip Local Area Plan which has the following objective applicable to the DART+ Programme:

MT2.2: To support and facilitate the delivery of electrification and upgrading of the Dublin - Sligo rail line from Connolly Station to Maynooth, including improvements to Cope Bridge

The Leixlip LAP supports the proposed DART+ programme through objective **MT2.2 "**To support and facilitate the delivery of electrification and upgrading of the Dublin – Sligo rail line from Connolly Station to Maynooth, including improvements to Cope Bridge." and supports the removal of level crossings and re-signalling.

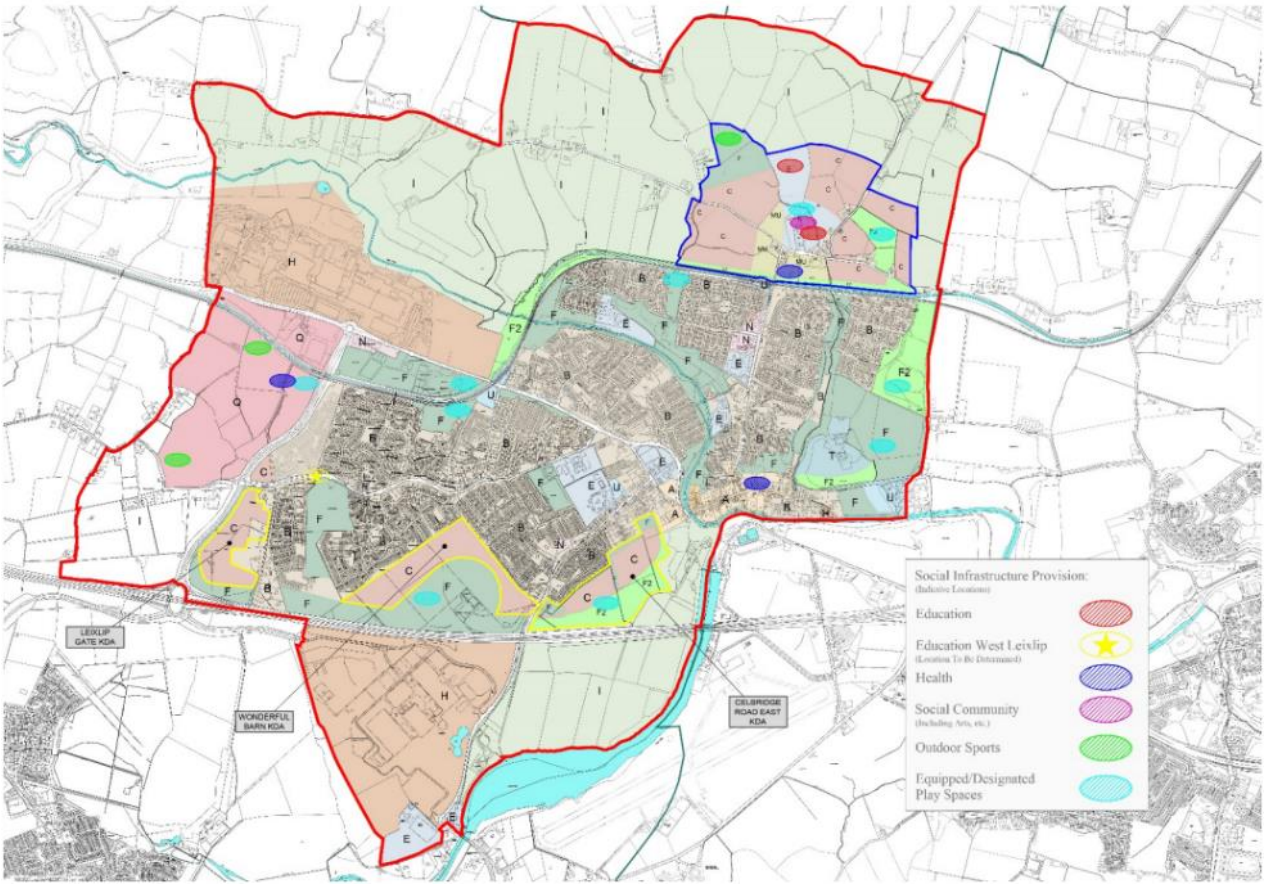

Figure 2-14 Leixlip LAP Lands (Figure extracted from the LAP 2017-2023)

Section 8.2 of the LAP (Public Transport) states "The DART Expansion Programme is a key project in the delivery of an integrated rail transport network for the Dublin region and includes the electrification of the Dublin-Sligo rail line from Connolly Station to Maynooth, together with the removal of level crossings and re-signalling" It recognises that the realisation of this project will improve the number and frequency of train services in addition to improved journey times.

2.5.4 Meath County Development Plan 2013- 2019

The relevant policies contained in the Meath County Development Plan 2013- 2019 include the followings: TRAN POL 6: To promote, facilitate and advance the development of Phase II of the Navan railway line project and rail services in co-operation with other relevant agencies.

TRAN POL 7: To support the improvement of existing rail transport infrastructure including the Dublin/Sligo route with increased suburban services to Enfield and Kilcock, the existing Dublin – Drogheda rail service which serves the urban settlements of Laytown and Gormonston and to seek to have the proposed electrification of this rail line extended to Drogheda.

2.5.4.1 Draft Meath County Development Plan 2020-2026

At the time of writing the draft Meath County Development Plan is currently at Stage two of the plan preparation process. The draft plan supports the project through policy:

MOV POL 9 "To support the DART expansion Programme including new infrastructure and electrification of existing lines, including provision of electrified services to Drogheda, Maynooth and M3 Parkway on the Maynooth/Sligo Line and on the Dublin-Belfast/Northern Rail Line

MOV OBJ 2 *"*To improve, in conjunction with the NTA and Irish Rail, facilities at existing stations"

The draft plan also recognises the higher-level planning and transportation policy remit (e.g. Regional Spatial and Economic Strategy 2019-2031) and references support for these policies (RPO 8.8) that relate to the delivery of this project which states: *"The RSES 2019-2031 supports delivery of the rail projects set out in Table 8.2, subject to the outcome of appropriate environmental assessment and the planning process.'*

These projects include:

- Implement the extension of the Dunboyne/M3 Parkway line to Navan during the Mid Term Review of the GDA Transport Strategy;
- DART expansion Programme - new infrastructure and electrification of existing lines, including provision of electrified services to Drogheda, Maynooth and M3 Parkway on the Maynooth/Sligo Line."

It goes on to state that the "Plan supports the prioritisation of these projects and will continue to support TII in the roll out of rail improvements and upgrades throughout the County."

MCDP recognises that the NTA's Transport Strategy for the Greater Dublin Area (GDA) provides a framework for the planning and delivery of transport infrastructure and services over the period 2016 - 2035.

2.5.4.2 Dunboyne Clonee Pace LAP 2009-2015

The existing PACE M3 Parkway Train station is located within the development boundary of the Dunboyne Clonee Pace LAP. Relevant policies include:

MOV POL 4 To facilitate and protect the operation of the railway in conjunction with Iarnród Éireann/CIE. To protect the Pace–Navan extension of the railway corridor from inappropriate development where all planning applications lodged within the route reservation corridor or which may impact on the future railway will be referred to Iarnród Éireann/CIE for comment.

MOV POL 6 To facilitate the development of Park & Rides as set out in the Railway Order NA0001 at Dunboyne Station & Pace Interchange.

3 TRANSPORTATION ANALYSIS

3.1 Introduction

The Traffic and Transport Assessment (TTA) outlined in this chapter provides a comprehensive review of the existing transportation networks within the Study Area and the potential impacts of the proposed DART + Maynooth Line.

This study is informed by previous reports produced to inform the proposed scheme including the following:

- DART Expansion Programme Options Assessment – Addendum Report; August 2018; by Systra / Jacobs for IE and the NTA;
- DART Expansion Programme Options Assessment; October 2018; by Systra / Jacobs for IE and the NTA;
- Maynooth Line Transportation Study Draft Final Report, July 2019; by CSEA / Systra for the NTA;
- NTA DART Expansion Progamme Future Patronage Modelling, June 2020; by Systra / Jacobs for the NTA.

The above reports documented DART+ Network modelling, demand modelling, and traffic assessment in respect of local areas affected by the proposed scheme.

The design team has carried out a review of, and has accepted, the conclusions of the above reports and the current study has been advanced on the basis of the conclusions and project data included in those reports. It is intended to update this document on completion of current modelling activities.

3.2 Methodology

3.2.1 Outline Approach

The approach to traffic assessment can be summarised in the following steps.

- Step 1 – Characterise baseline conditions at critical traffic locations including railway level crossings; train stations, the depot, electrical substation, site compounds, site accesses and site access routes. Following a visit to each site the base line conditions were reviewed as follows:
  - Existing train service and identification of impacts of same;
  - National, regional and local planning policy for the study area;
  - Traffic survey data;
  - Public transport facilities for each area;
  - Existing pedestrian and cycle facilities and plans for the study area;
  - Accessibility conditions in the vicinity of each site.
- Step 2 – Identification of options for assessment. This may include end to end considerations as appropriate for each site type;
- Step 3 – Options assessment – using the NTA ERM demand modelling to benchmark the local area models;
- Step 4 – Localised or end to end options assessment as appropriate to each component type and location;
- Step 5 – Multi-criteria analysis Stage 1 to identify the option or options to advance for more detailed consideration;
- Step 6 – Multi-criteria Assessment Stage 2 to identify the preferred options for each critical location as appropriate;

3.2.2 Local Area Models

A number of local area models have been identified to facilitate examination of the traffic impact of the project where significant change is contemplated at a local level. These models serve examination of the impact of the proposed works and the construction activities associated with them.

The local area model for the Ashtown area east of the M50 is shown in Figure 3.1 below. The local area model for the Blanchardstown area west of the M50 is shown in Figure 3.2 below.

The above area models were used to permit characterization of the impacts of the addition or removal of road links within the road networks. More localise models are used to assess the impact of specific measures on junctions or link roads as the design advances.

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3.2.3 Traffic Surveys

The local area models were informed by traffic surveys at locations selected to facilitate verification of the local area traffic models and to assist with benchmarking against the output of the NTA Eastern Regional Traffic Model. They were in the form of:

- Automatic Traffic Counts (ATC); and
- Junction Turning Counts (JTC).

The graphic in Figure 3-3 illustrates the locations where ATCs were carried out. . The graphic in Figure 3-4 illustrates the locations where JTCs were carried out.

The graphic in Figure 3-4 illustrates the locations where JTCs were carried out.

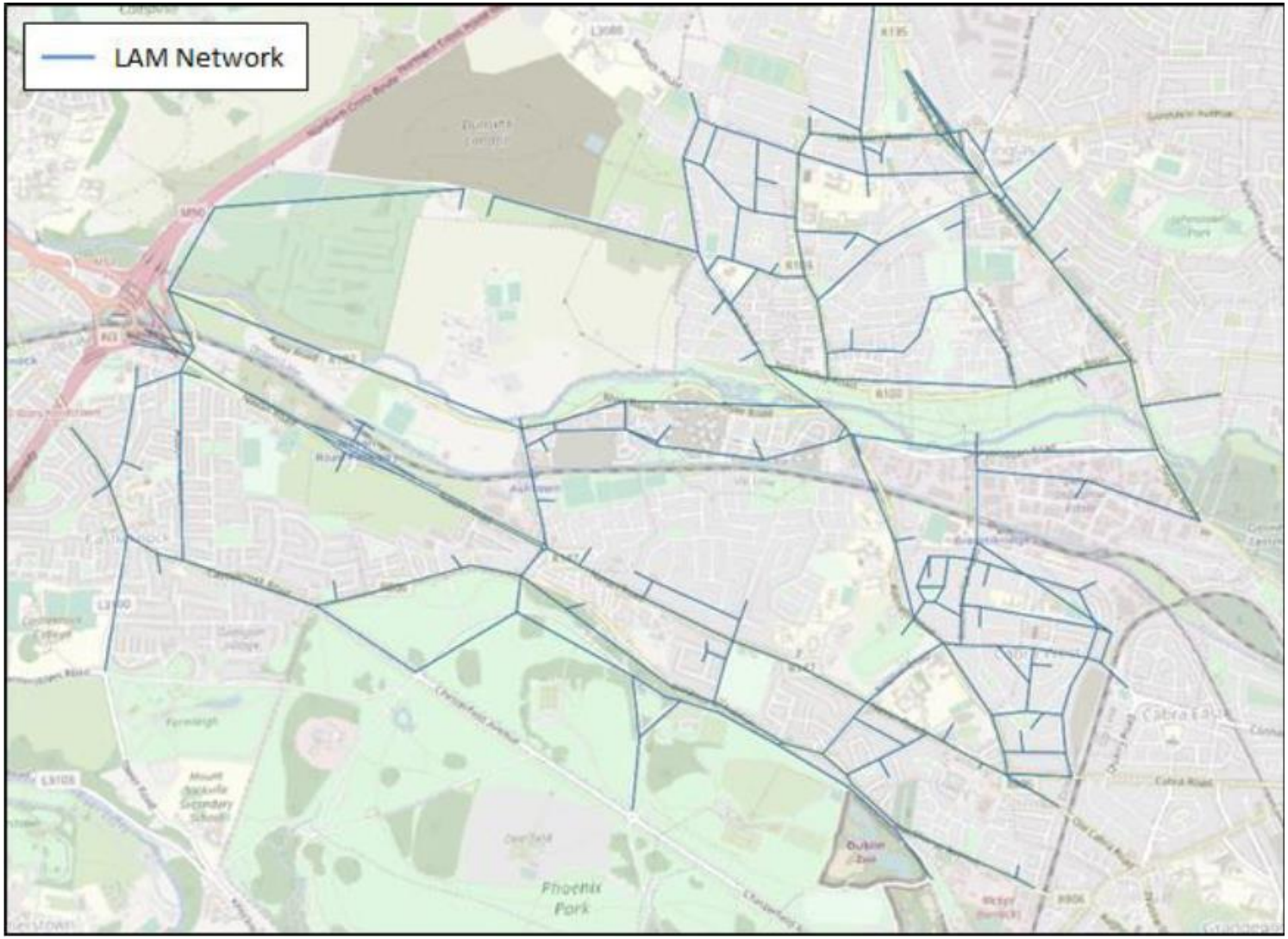

Figure 3-1 Ashtown Local Area Model – CSEA/Systra

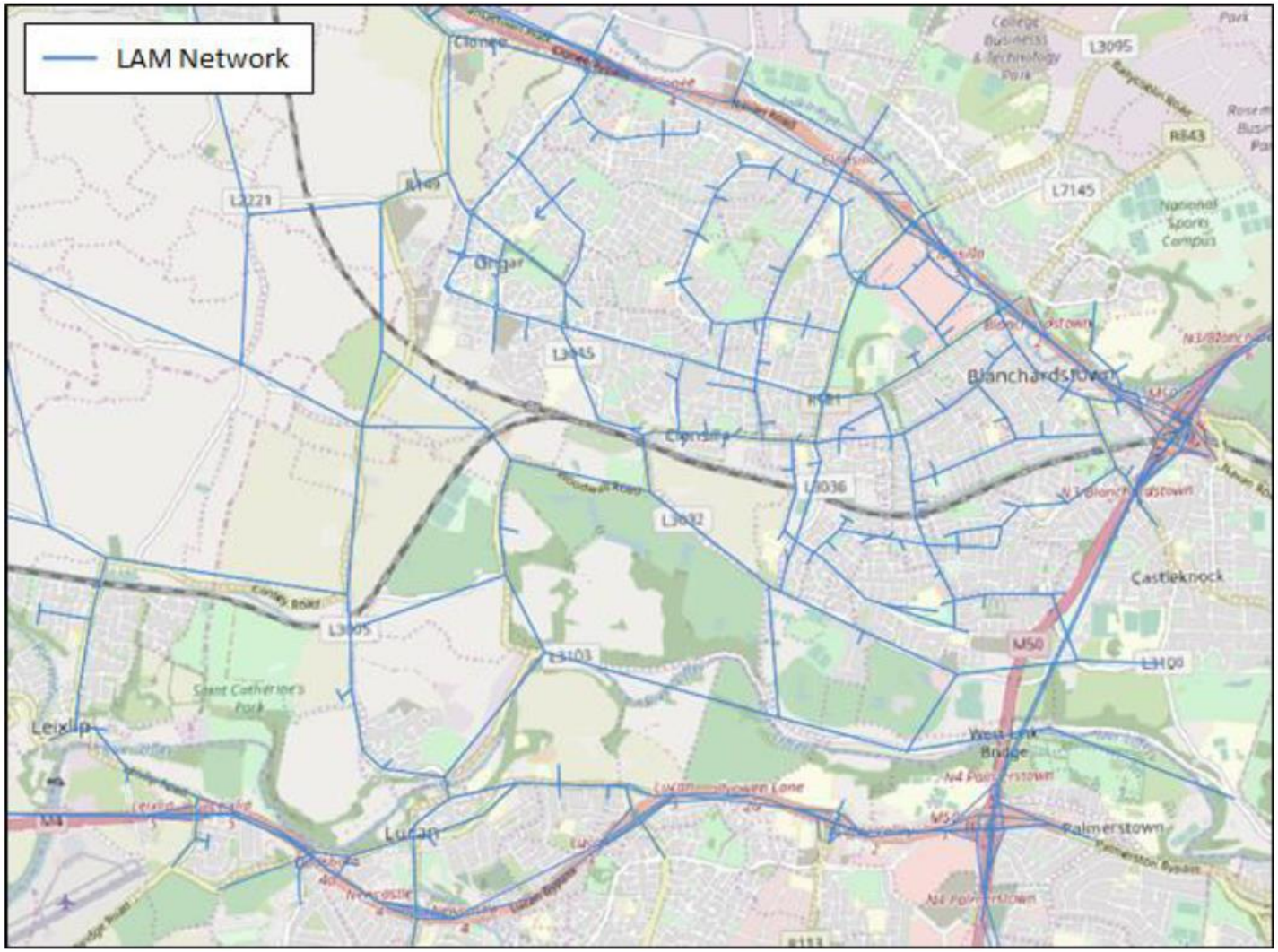

Figure 3-2 Blanchardstown Local Area Model– CSEA/Systra

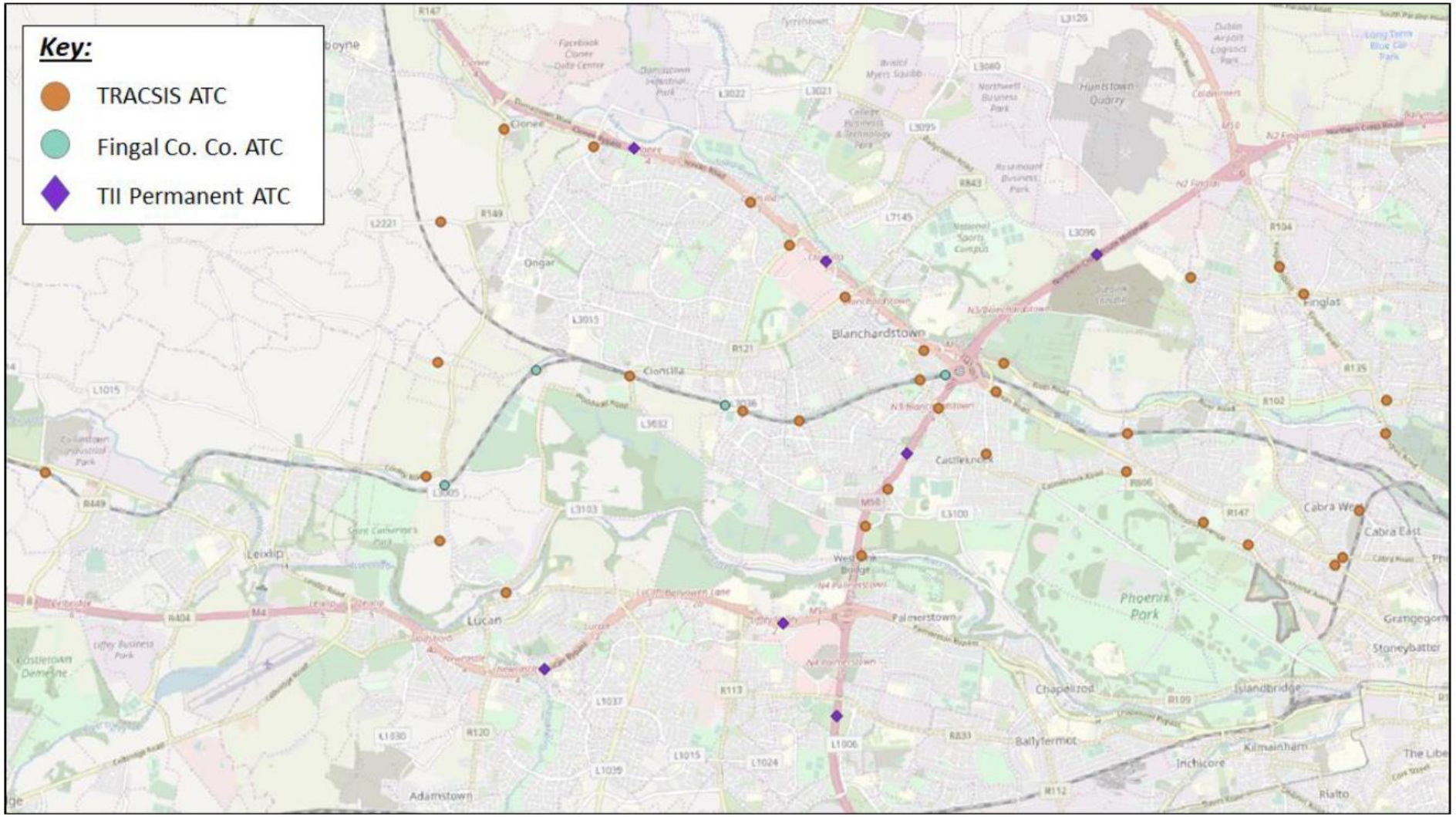

Figure 3-3 Automatic Traffic Counts for Local Area Models– CSEA/Systra

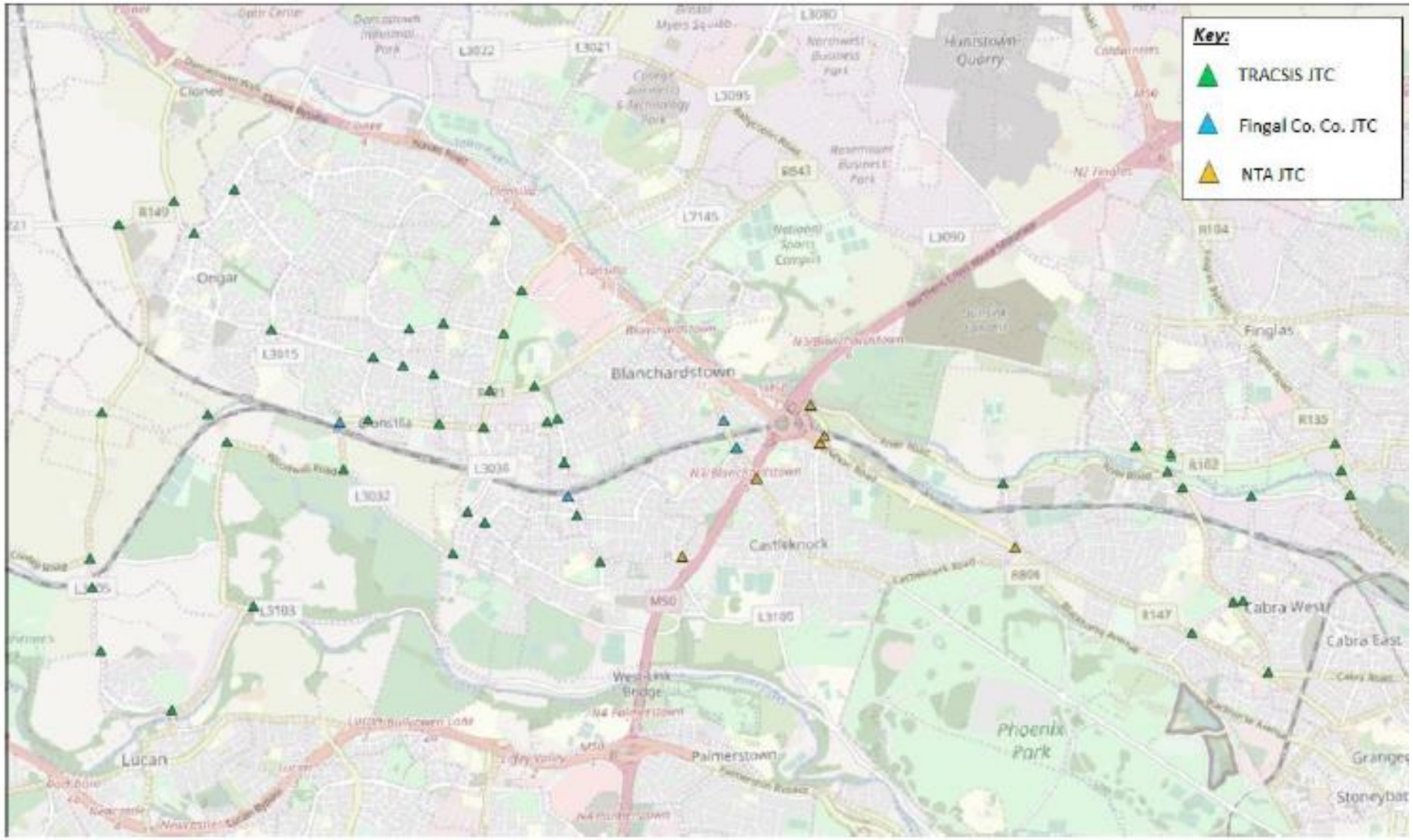

Figure 3-4 Junction Traffic Counts for Local Area Models – CSEA/Systra

3.2.4 Guidance

This Traffic and Transport Assessment Study has been undertaken in accordance with current best practice guidance and planning policies. The following documents have been referenced during the preparation of this report;

- Transport Infrastructure Ireland Traffic and Transport Assessment Guidelines, PE-PDV-02045, (May 2014);
- Design Manual for Urban Road and Streets (DMURS);
- NTA Permeability Best Practice Guide;
- TII Design Standards for junctions as relevant in conjunction with DMURS;
- Wexford Town and Environs Development Plan; and
- NTA National Cycle Manual.

3.3 Baseline Conditions

3.3.1 Site Visits

Focal points in respect of traffic impact associated with the project include those listed in Table 3-1 below.

Table 3-1 Focal Points for Traffic Impact Assessment

Grouping	Location		
Stations	Docklands Station, Connolly Station, Drumcondra Station, Ashtown Station Castleknock Station	Coolmine Station, Clonsilla Station, Confey Station, Louisa Bridge Station Maynooth Station	Hansfield Station, Dunboyne Station, M3 Parkway Station
Level Crossings	XG004 Ashtown, XG006 Coolmine, XG008 Porterstown	XG010 Clonsilla, XG012 Barberstown, XG014 Blakestown	
Junctions	Connolly, Newcomen		
Indicative Electrical Substations	Cross Gunns Bridge, Reillys Bridge, Castleknock, Clonsilla Junction	Confey East of Cope Bridge, Blakestown Crossing, Maynooth Station	
Site Compounds	Docklands, Newcomen, Glasnevin MP2mls1200yds, Liffey Junction 1mls 745yds	Reilly's Bridge 2mls 135yds, Ashtown Station, Coolmine Station, Clonsilla Station	Barberstown, Confey Station, Maynooth Station
Indicative Site Accesses and Routes	Docklands, Newcomen, Glasnevin Junction, Cabra Road,	Castleknock Station, Coolmine Crossing, Porterstown Crossing, Clonsilla,	Confey 10mls 470yds, Louisa Bridge 11mls 298yds, Leixlip 11mls 607yds, Blakestown Crossing,

Grouping	Location		
	Reilly's Bridge, Ashtown Station	Barberstown Crossing, Lucan Curve 8mls 1302yds	Maynooth Station R148 – Depot Access
Stabling	Depot Site – Millfarm, Maynooth		

Each of the locations was visited to examine the existing conditions, constraints and any likely obstacles to use of the sites for the expected purpose.

3.3.2 Traffic Counts

The traffic survey data collected in January 2019 include the following:

- Automatic Traffic Counts (ATC) at 35 location;
- Pedestrian and Cyclist counts at 2 locations; and
- Junction Turning Counts (JTC) at 48 locations;
- Supplementary counts by Fingal County Council;
- Journey time information NTA database.

The Automatic Traffic counts collected the following information over a 3 week period from Monday 28th January to Sunday 14th February

- The daily and weekly profile of traffic within the study area
- Busiest time periods and locations of highest traffic demand on the network
- Any issues on the network during the survey period e.g. accidents, road closures etc.; and
- Typical speed of traffic on the network

The ATC data was collected at all locations crossing the Maynooth Rail line within the study area. The results indicate that the Porterstown Viaduct is the most heavily trafficked crossing point at AM peak (08:00-09:00) with approx. 1,573 vehicles in both directions. Of the level crossings, Coolmine experiences the largest traffic volumes with 518 vehicles in the AM peak hour, followed by Ashtown with 454 vehicles. Blakestown experiences relatively low traffic volumes with only 12 vehicles recorded in the AM peak hour.

Similarly, in the PM peak the Porterstown Viaduct carries the highest traffic with 1,647 vehicles recorded between 17:00 and 18:00. The other bridge crossings at the R149 and Castleknock Road also carry significant volumes with 840 and 1,265 vehicles respectively. Again, Coolmine is the most heavily utilised level crossing with 447 vehicles recorded in the PM peak hour. Porterstown, Barberstown and Blakestown all experience relatively low volumes of traffic with two-way flows of 59, 71 and 13 respectively.

Figure 3.6 and Figure 3.6 overleaf illustrates the AM and PM peak figures for the crossing points of the railway within the study area.

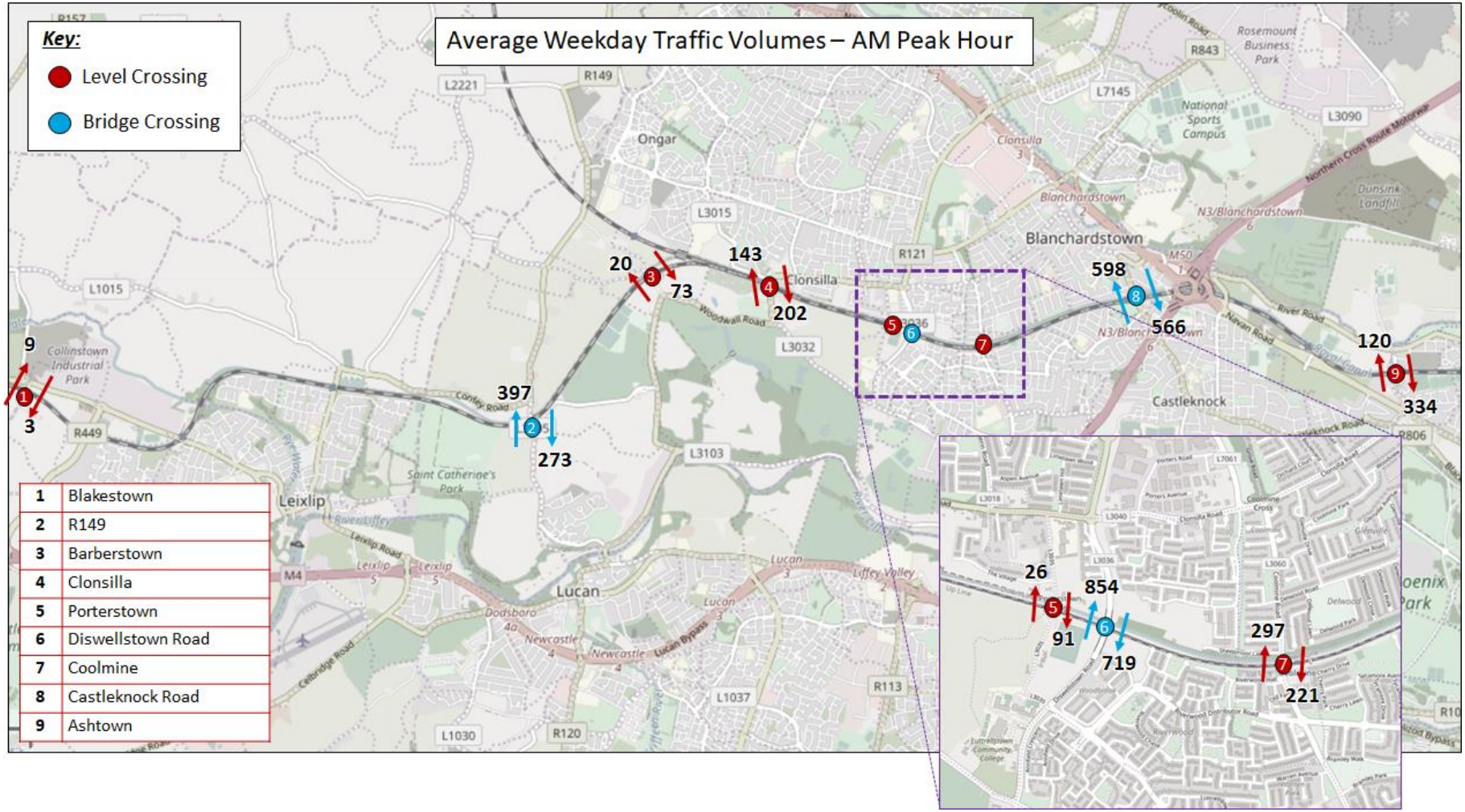

Figure 3-5 AM Peak ACT Counts – CSEA Systra Oct 2019

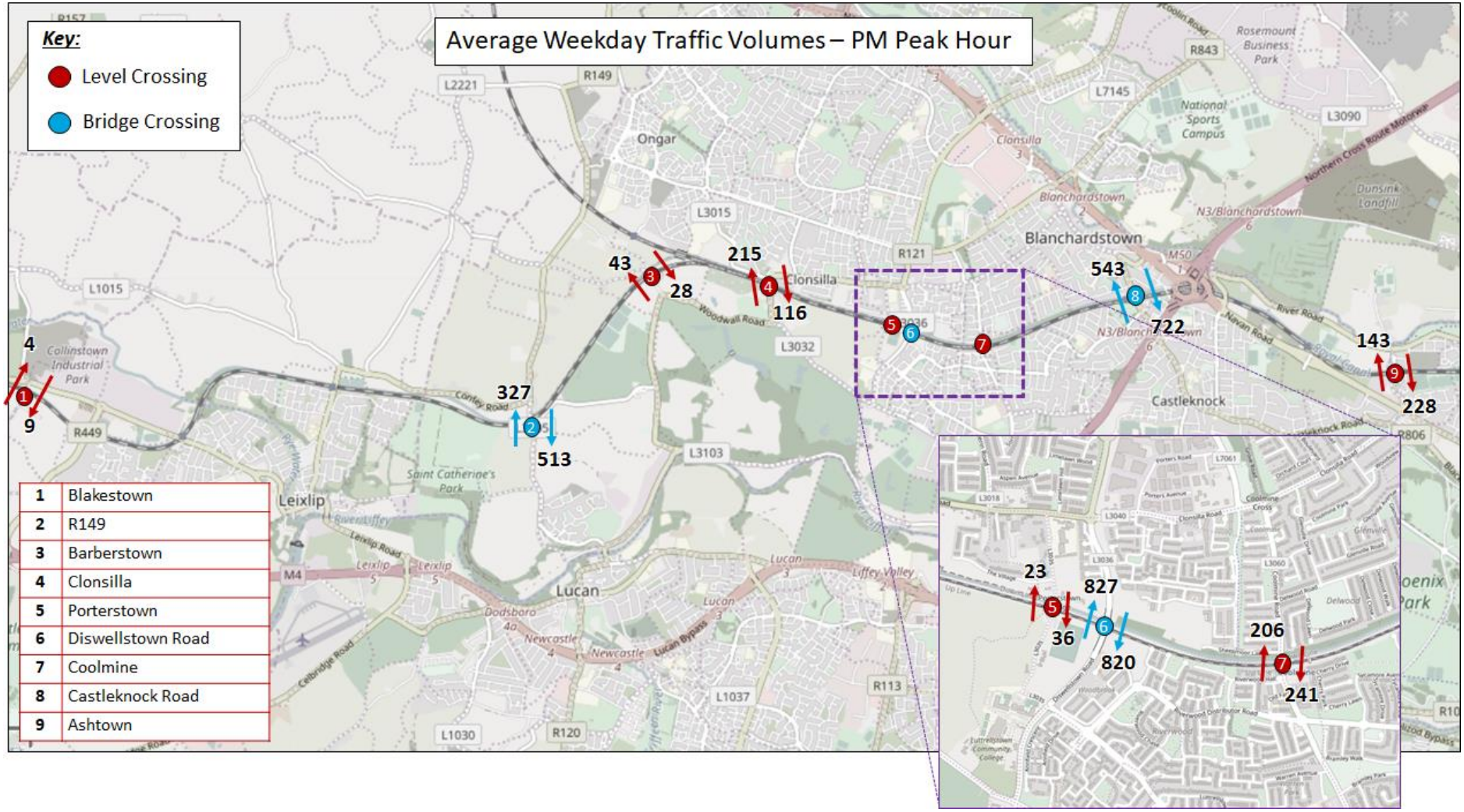

Figure 3-6 PM Peak ACT Counts – CSEA Systra Oct 2019

3.3.3 Pedestrian and Cycle Counts

Pedestrian and cyclist counts were undertaken at Ashtown and Blakestown level crossings on Tuesday 5th February 2019 between 07:00 to 10:00 in the AM, and 16:00 to 19:00 in the PM. This data was supplemented with counts undertaken by Fingal County Council at Coolmine, Porterstown, Clonsilla and Barberstown.

The figures for each level crossing are presented in Table 3-2.

Table 3-2 AM & PM Pedestrian and Cycle Counts – CSEA Systra Oct 2019

Crossing	Time Period	Pedestrians		Cyclists	
		N/B	S/B	N/B	S/B
Ashtown	AM	150	672	65	44
	PM	574	217	53	56
Coolmine	AM	395	103	34	35
	PM	255	81	33	27
Porterstown	AM	5	123	1	37
	PM	149	24	41	13
Clonsilla	AM	23	15	1	2
	PM	441	15	12	5
Barberstown	AM	0	0	2	1
	PM	0	0	3	0
Blakestown	AM	0	0	1	0
	PM	0	2	0	2

Each of the suburban level crossings experience significant levels of both pedestrian and cycle traffic. Rural level crossings exhibit very low levels of usage.

3.3.4 Baseline Journey Times

Baseline journey times were received from the NTA satellite navigation database for the Blanchardstown and Ashtown cordoned areas as illustrated in Figure 3-7 and Figure 3-8. They address both the AM (08:00-09:00) and PM (17:00-18:00) peak hours

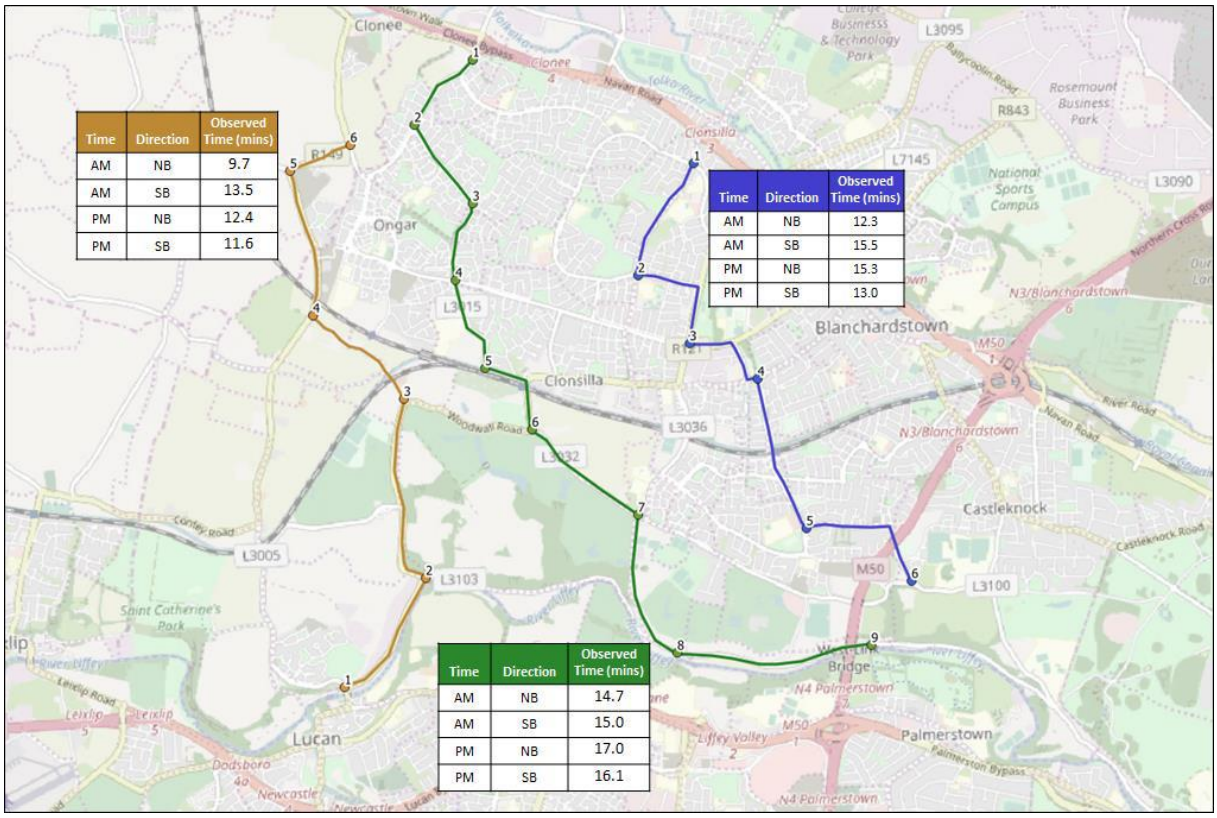

Figure 3-7 AM & PM Blanchardstown Baseline Journey Times – CSEA Systra Oct 2019

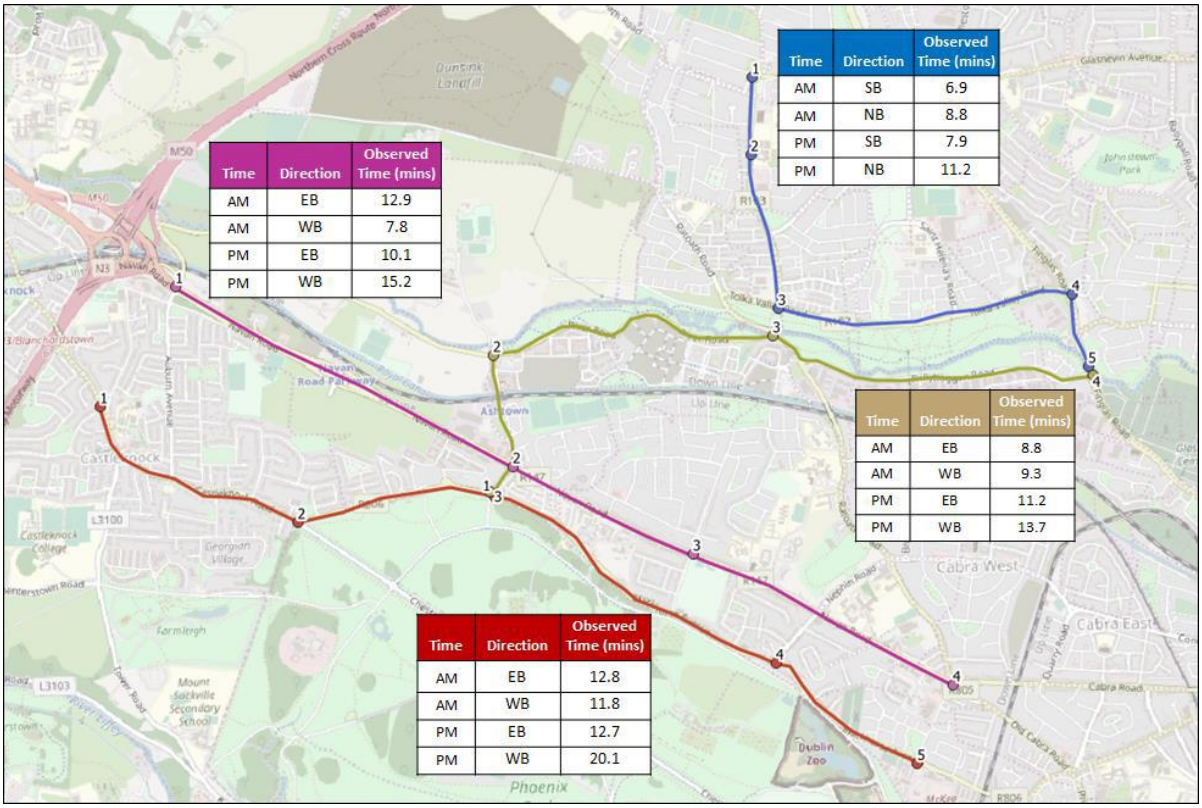

Figure 3-8 AM & PM Ashtown Baseline Journey Times – CSEA Systra Oct 2019

3.3.5 Existing Level Crossing Closure Durations

Level crossings are a major constraint to surrounding road networks causing congestion and increased journey times for all modes of traffic including pedestrians and cyclists. The main aim of the DART + Maynooth Line Project, and the overarching DART+ Programme, is to increase passenger capacity and train frequencies. Increased train frequencies will result in additional level crossings closures and subsequent increase in congestion and delays in the surrounding road network. Table 3-3 below presents the statistics of the current number of level crossing closures for each level crossing on the Maynooth Line and the associated closure time for the AM and PM peak hours. As shown below, the level crossings are currently closed for 20 -40 minutes in the peak AM and PM hour.

DART + Maynooth Line Project intends to nearly double the frequency of trains, subject to passenger demand. This would result in the virtual closure of the level crossings. This report assesses options which have been developed to fulfil the aim of DART + Maynooth Line while relieving traffic congestion in the surrounding road network.

Table 3-3 AM Railway Stats for the Level Crossings – CSEA Systra Oct 2019

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Ashtown	13	6	00:36:42	00:06:07
Coolmine	12	9	00:41:35	00:04:37
Porterstown	12	7	00:32:46	00:04:41
Clonsilla	12	7	00:30:58	00:04:25
Barberstown	9	6	00:26:03	00:04:21
Blakestown	7	5	00:23:48	00:04:46

Table 3-4 PM Railway Stats for the Level Crossings – CSEA Systra Oct 2019

Level Crossing	No. Trains Passing	No. Closures	Total Closure Time	Average Time per Closure
Ashtown	11	6	00:36:32	00:06:05
Coolmine	11	7	00:34:14	00:04:53
Porterstown	10	6	00:19:57	00:03:20
Clonsilla	10	4	00:26:30	00:06:38
Barberstown	7	6	00:20:37	00:03:26
Blakestown	7	6	00:21:54	00:03:39

3.3.6 Bus Routes

A review was undertaken of existing bus services within the study area to identify if any routes would be disrupted due to the closure of the six level crossings along the Maynooth line.

Currently, only route 239 operated by Go Ahead Ireland travels via the existing level crossings. The route, illustrated in Figure 3-9 below, operates from Blanchardstown Shopping Centre to Liffey Valley Shopping Centre via the Clonsilla level crossing. The service operates approximately once per hour throughout the day in each direction, with one service in each of the AM and PM peaks.

The planned BusConnects network is illustrated in Chapter 2 of this report. BusConnects is expected to replace route 239 with route 252.

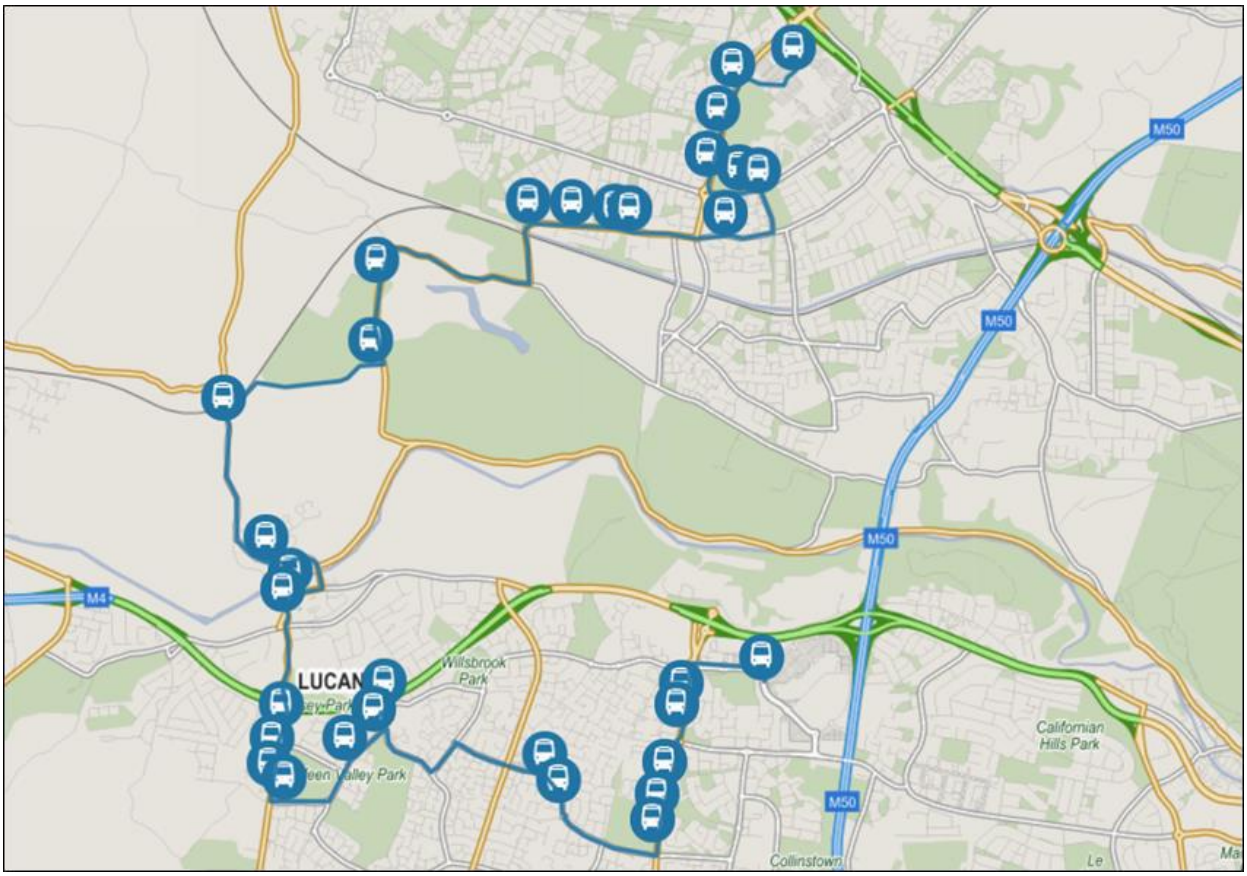

Figure 3-9 Go Ahead Ireland Route 239 (Transport for Ireland Journey Planner Map)

3.3.7 Existing Pedestrian and Cycle Facilities and Plans for the Study Area

A review of the existing provisions for pedestrians and cyclists at level crossings has exhibited some deficiencies.

3.3.8 Accessibility Conditions in the Vicinity of Each Site

A review of the accessibility conditions at level crossings has exhibited some deficiencies.

3.4 Predicted Impacts

Section 3.2.1 sets out the steps to be followed in addressing the traffic impact of the proposed scheme and determining the appropriate configuration of replacement routes to be implemented within the emerging preferred end to end option consistent with the project objectives.

Individual level crossing closures represent the principal mechanism whereby significant long lasting traffic impact can be manifest as a consequence of the project. As a consequence it has been decided to consider the impact of level crossing closures on an end to end basis examining the cordon wide effects of combinations of closures with and without the implementation of replacement infrastructure.

A number of combinations of closures have been examined as shown in Table 3-5 below:

Table 3-5 End to End Crossing Replacement Options – CSEA Systra Oct 2019

Option	Level Crossing	Replacement Infrastructure				
		Barberstown	Clonsilla	Porterstown	Coolmine	Ashtown
Do Minimum	All Closed	✗	✗	✗	✗	✗
Option 1	All Closed	✓	✗	✗	✗	N/A*
Option 2	All Closed	✗	✓	✗	✗	N/A
Option 3	All Closed	✗	✗	✗	✓	N/A
Option 4	All Closed	✓	✓	✗	✗	N/A
Option 5	All Closed	✓	✗	✗	✓	N/A
Option 6	All Closed	✗	✓	✗	✓	N/A
Ashtown Replacement	All Closed	N/A	N/A	N/A	N/A	✓

Blanchardstown LAM

Ashtown LAM

In respect of each of the end to end options above, scenarios were coded within the benchmarked Local Area Models to determine the consequences of implementation of the change for the design year. Selected impacts were examined for each of the options as follows:

- The number of journeys displaced onto different routes consequent of the change;
- The delay along diversion routes consequent of the change;
- The change in journey times consequent of the change.

The journey time changes were measured against a benchmark – 'close all crossings' option without replacement and the 'Do-Nothing' option – leave the crossings as they currently are.

The outcome of the study is presented in Table 3-6 below.

Table 3-6 End to End Crossing Replacement Options – CSEA Systra Oct 2019

Option	Level Crossing	Replacement Vehicular Infrastructure			Flows Displaced (pcus)		Change in Delay[1] (vs Benchmark)		Change in Journey Times[2] (vs Benchmark)		Change in Journey Times[3] (vs Do Nothing)	
		Barberstown	Clonsilla	Coolmine	AM	PM	AM	PM	AM	PM	AM	PM
Do Minimum	All Closed	✗	✗	✗	2,241	2,179	38%	22%	19%	20%	25%	15%
Option 1	All Closed	✓	✗	✗	1,703	1,772	22%	11%	13%	15%	18%	11%
Option 2	All Closed	✗	✓	✗	1,561	1,475	18%	15%	23%	14%	15%	6%
Option 3	All Closed	✗	✗	✓	1,218	1,110	7%	5%	8%	6%	3%	4%
Option 4	All Closed	✓	✓	✗	1,023	1,068	12%	10%	27%	9%	18%	4%
Option 5	All Closed	✓	✗	✓	680	704	1%	1%	3%	3%	-1%	-2%
Option 6	All Closed	✗	✓	✓	538	406	7%	5%	12%	5%	2%	2%
Option 7	Ashtown Closed	Compared to replacement road infrastructure provided at Ashtown			867	705	18%	12%	38%	29%	14%	13%

The impacts in Table 3-5 are used in the multi-criteria analysis process to facilitate a full CAF based assessment of the options in respect of the level of accommodation of vehicular, pedestrian, cycle and vulnerable user to be provided for in the Emerging Preferred Option for the level crossings. The local area models and localised junction models will also be used to assess the impact of construction traffic at a local level and to consider the effects of temporary traffic diversions. The outcome of these local assessments will be presented at PC2.

3.5 Train Service Specification (TSS)

The design team has developed a railsys model for DART + Programme network for the base year reflecting the current railway infrastructure and train service specification and for the Design year incorporating enhanced infrastructure and an associated Train Service Specification.

The work carried out by IDOM was to build on the previous work carried out by Jacobs Systra bringing it to an enhanced level. The October 2018 study by Jacobs Systra included a proposed working timetable for the project which is used in the IDOM study as a reference or baseline timetable.

At this stage of the study the Baseline Train Service Specification (TSS) has been reviewed for its feasibility as a representation of a maximum peak hour train traffic.

The study examined the feasibility of the train services specification with "Balanced City Centre" Train services with priority for the northern line traffic at the Connolly station and with infrastructure enhancements as follows:

- A "do minimum" provision at Connolly Station with slight adjustments and with discontinued use of the Newcomen chord;
- Provision for electrification of the whole DART + network and adequate signalling reconstruction (with regard to the City Centre Resignalling Project (CCRP));
- Provision for construction of the enhanced Docklands Station with several platforms and access from three lines;
- Provision for a 4-track arrangement of the whole Heuston to Hazelhatch section, with two electrified, suburban, "slow" tracks on the northern side of the line.

For the modelling exercise adequate reserves were applied in accordance with the UIC (International Union of Railways (Union Internationale des Chemins de fer)) rules to achieve a workable train timetable with an adequate level of robustness.

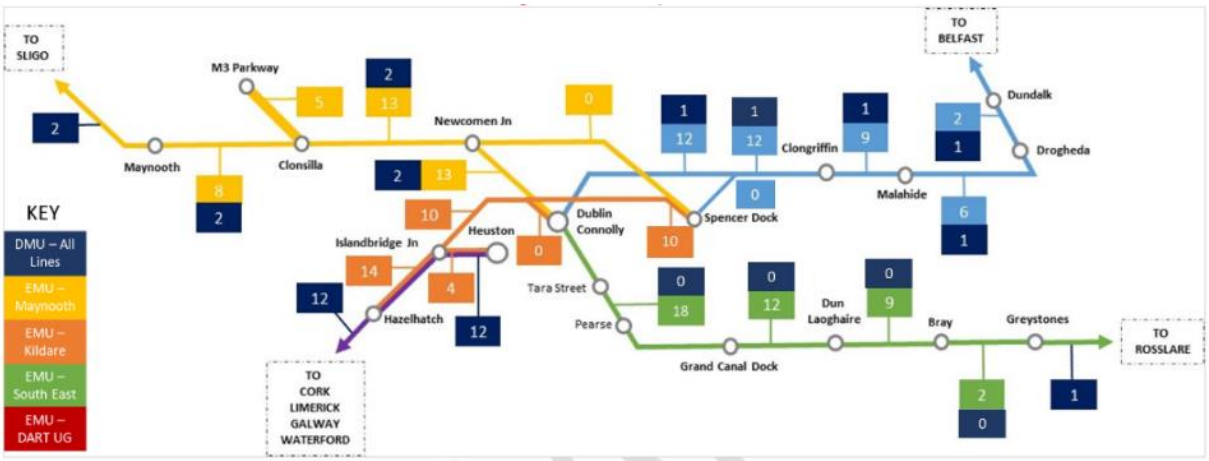

Figure 3-10 Reference Design Year Working Timetable

From the study the design team developed a project working timetable. The timetable used for this stage of the study is represented in graphical form in Figure 3.10.

3.6 The NTA Eastern Regional Traffic Model

The Eastern Regional Model (ERM) is one of five models that comprise the Authority's 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 and the DART+ Maynooth & City Centre Capacity Enhancement Project. 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 project.

4 PREVIOUS STUDIES

The following sections provide an outline of some of the previous assessments and studies undertaken which set out the basis for the scope of the DART+ Maynooth Line Project.

4.1 Depot Siting Studies

This section aims to set out and summarise the previously completed Depot location assessments undertaken which identified that Maynooth West is the most suitable location for the depot on the DART+ network. The Depot Location studies carried out to determine the location of the new Electrical Multiple Units (EMU) depot are:

EMU Depot Location Feasibility Study Report, (See the full report in Annex 4.1A)
Depot Location Assessment. (See the full report in Annex 4.1B)

4.1.1 Depot Location Assessment

This Depot Location Assessment is an extensive study to establish a recommendation for the most suitable location for the EMU Depot. The study considered the plots of land and facilities that could be suitable to contain the depot. The analysis comprised the first stage of preliminary pre-appraisal for the location (13 alternatives), based largely on the capacity of the site to contain a depot with all the necessary facilities, and a second stage (4 environ alternatives) of a Multi-Criteria analysis (MCA) of the chosen options, considering criteria such as accesses, operational factors, availability of the land, neighbouring environment and the impact on the DART+ programme.

The main conclusion from this document is the selection of Maynooth West as the emerging preferred location for the new DART+ Maintenance Depot.

The location assessment contains two stages:

- The first stage of preliminary appraisal for the 13 alternative locations was based on the capacity of the area to hold the depot
- The second stage of MCA for the chosen options considered criteria such as access, operation, availability of the land, neighbouring environment, and the impact on the DART+.

The considered locations in the first stage were:

- Fairview Depot & immediate environs;
- Connolly Station & immediate environs;
- Heuston Station & immediate environs;
- Pearse Station & immediate environs;
- North Wall Railway Yard & immediate environs;
- East Wall Railway Yard & immediate environs;
- Inchicore Railway Works & immediate environs;
- Drogheda Station/Depot & immediate environs;
- Maynooth Station & immediate environs;
- M3 Parkway Station & immediate environs;
- Hazelhatch Station & immediate environs;
- Greystones Station & immediate environs;
- Bray Station & immediate environs.

The second stage of the analysis comprised the assessment of the following options:

Option 1 Drogheda Environs

This option is approximately 50km north of Connolly and is split into Drogheda South and Drogheda North.

Figure 4-1 Option 1. EMU Depot Location Assessment 2019 (Copyright Ordnance Survey Ireland – 0039720)

Option 2 Maynooth Environs

This option is approximately 25km west of Connolly and is split into Maynooth East and Maynooth West.

Figure 4-2 Option 2. EMU Depot Location Assessment 2019 (Copyright Ordnance Survey Ireland – 0039720)

Option 3 M3 Parkway Environs

This option is approximately 18km west of Connolly and is split into M3 Parkway South and M3 Parkway North.

Figure 4-3 Option 3. EMU Depot Location Assessment 2019 (Copyright Ordnance Survey Ireland – 0039720)

Option 4 Hazelhatch Environs

This option is approximately 16km west of Heuston Station and is split into Hazelhatch East and Hazelhatch West.

Figure 4-4 Option 4. EMU Depot Location Assessment 2019 (Copyright Ordnance Survey Ireland – 0039720).

The following is a summary of the multi-criteria analysis carried out.

Table 4-1 Aggregated Summary of Site Appraisal

2019 Location Assessment	Option 1		Option 2		Option 3		Option 4	
	Drogheda South	Drogheda North	Maynooth East	Maynooth West	M3 Parkway South	M3 Parkway North	Hazelhatch East	Hazelhatch West
Minimised empty running								
Maximise track access								
Complexity of access and egress								
Availability of suitable lands								
Adjacent environment								
Road vehicle access								
Transport and Land-Use Compliance								
Short term impact on DART+								

The results of the study show that the Preliminary Emerging Preferred Option is Maynooth West.

4.1.2 EMU Depot Location Feasibility Study Report

The main objective of the report is to undertake a feasibility study to review the proposed locations for the new depot and recommend the best site. This study reviewed and analysed three proposed sites that were considered most suitable to contain the depot. The assessment considered the stakeholders involved, the preliminary layouts provided for the depot in the different locations, a risk assessment, and a cost estimation. The main conclusion is that the preferred location for the depot is Maynooth West, which is Option 2 Bailey Bridge at 16 ¾ M.P.

The options selected and assessed are the following:

Option 1 McLoughlin Canal Bridge at 21 ¼ M.P.: this option is placed west of Kilcock in a plot of land mostly occupied by agricultural fields. The site has an area of 46 acres.

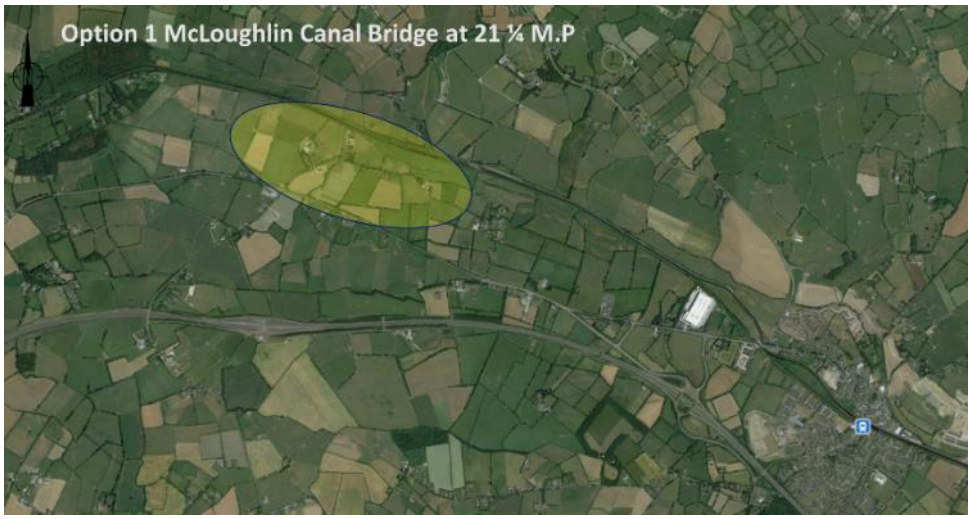

Figure 4-5 Option 1. EMU Depot, Western Line – Location Feasibility Study (Copyright Ordnance Survey Ireland – 0039720)

Option 2 Bailey Bridge at 16 ¾ M.P.: this option is placed west of Maynooth in a plot of land mostly occupied by agricultural fields. The site has an area of 83.1 acres.

Figure 4-6 Option 2. EMU Depot, Western Line – Location Feasibility Study (Copyright Ordnance Survey Ireland – 0039720)

Option 3 Collins Bridge at 9 ¼ M.P.: this option is placed west of Clonsilla in a park plot of land. The site has an area of 47.5 acres.

Figure 4-7 Option 3. EMU Depot, Western Line – Location Feasibility Study (Copyright Ordnance Survey Ireland – 0039720)

4.2 CSEA / Systra Transportation Study

In 2018 CSEA / Systra completed Transportation Study, on behalf of the NTA and IÉ, in respect of the removal of the Sligo line level crossings from the road network and the consequent traffic impacts on the relevant cordoned study areas. The report for the study was updated in 2019 to take account of more recent traffic surveys. Much of the content of the study is described in Chapter 3 and the traffic outcomes have been used in the MCA process to determine to Emerging Preferred Option at each level crossing.

4.3 Connolly Station Enhancement Options Study – Options Selection Report. March 2019

Connolly station was assessed by Jacobs in several documents that are summarised below:

Connolly Station Enhancement Option Study. Options Selection Report. This report outlined a shortlisted number of options extracted from a list of over twenty feasible options and identified Option 6B as the Emerging Preferred Option, rejecting Option 3 “Do-minimum” because it cannot achieve the target trains per hour per direction.

“Further Do Minimum” (Do-minimum) options were developed and these have been advanced as part of the study for this project.

The first Option 3 “Do Minimum” developed in the Option Selection Report document did not require structural works to the historical arches and kept concourse and platform canopies unaffected. However, it included a revision to the alignment, length and width of the northern end of all platforms.

The proposed solution for improvement of the Newcomen chord required the demolition of the new cycle bridge next to the North Strand Road. Further options/studies would be necessary to avoid, if possible, the demolition of this recently built structure.

The “Further Do Minimum” Options do not consider the revision of the alignment and length of the northern end of all platforms and the partial demolition of the Maintenance Depot to the east, envisaged in earlier options.

Instead, the study focuses only on the increase of train services and does not take into consideration the resulting increase in passengers using the platforms, underpass or gate lines. Therefore, it will be necessary to assess the length and width of the platforms to check their ability to cope with the increase of the number of passengers, both in operation and evacuation.

4.4 Spencer Dock Station Options Study – Summary Report

A number of options were examined as part of the AECOM study to examine the potential to provide for the following in the Docklands area:

- To provide terminating capacity for Midlands Great Western Railway (MGWR), Great Southern & Western Railway (GSWR) and Northern Line.
- To identify the preferred location for a Station to provide the best service for the passengers, locating the station at the most demanded location and maximising the potential interchange with the LUAS.
- To increase the number of services without a substantial increase in land occupation for the rail infrastructure.
- To improve punctuality and reliability with an increased number of trains.
- To provide adequate integration with other transport facilities in the vicinity, taking into account the Master Plans approved for this area.
- To analyse the consequences that the different options have regarding the interface with the potential DART Underground Station.

Station options were developed at a number of locations as illustrated in Figure 4.8. The engineering assessment concentrated particularly on those issues that differentiated the locations, so were most relevant to the selection of a preferred option.

Figure 4-8 Docklands Station Options Study 2019

5 OPTIONS SELECTION PROCESS

5.1 Introduction

The primary purpose of this document is to present the mechanism by which the design team has chosen the preferred end to end option for the project. In respect of the DART + Maynooth Line the engineering design is centred on enhancing the existing railway network to meet the needs of the Project Train Service Specification consistent with the DART + Programme objectives.

In addition to end to end options assessment for the project, many elements of the scheme require option assessment at a local level prior to incorporation into the global assessment. These components include the following:

- Infrastructure to facilitate the removal of individual level crossings;
- Individual Station Enhancements;
- The proposed Depot:
- Permanent way design;
- SET; and
- Alterations to existing structures (Overhead line clearances required at existing structures)

5.2 Options Assessment / Multi-criterial analysis (MCA)

The options assessment in respect of each of the above is presented in this report. A multi-criteria analysis (MCA) mechanism has been developed on the basis of "Department of Transport Tourism and Sport (DTTAS), *Common* Appraisal *Framework (CAF) for Transport Project and Programmes March 2016* for options assessment. It includes the following six appraisal criteria as follows:

Economy	Economy relates to impacts of a transport investment on economic growth and competitiveness are assessed under the economic impact and economic efficiency criteria.
Safety	Safety is concerned with the impact of the investment on the number of transport related accidents.
Integration	Integration considers the extent to which the project being evaluated promotes integration of transport networks and is compatible with Government policies, including national spatial and planning policy.
Environment	Environment embraces a range of impacts, such as emissions to air, noise, and ecological and architectural impacts.
Accessibility and Social Inclusion	Accessibility and social inclusion embraces the notion that some priority should be given to benefits that accrue to those suffering from social deprivation, geographic isolation and mobility and sensory deprivation.
Physical Activity	This relates to the health benefits derived from using different transport modes

Multi-Criteria Analysis – MCA can be used to describe any structured approach to determine overall preferences among alternative options, where the options should accomplish multiple objectives. The term covers a wide range of techniques that share the aim of combining a range of positive (benefits) and negative (costs) effects in a single framework to allow for easier comparison of alternative options in decision-making (CAF, 2016).

A multi-criteria analysis (MCA) was undertaken to consolidate the quantifiable and non-quantifiable impacts associated with each option devised under each aspect of the proposed project.

The information needed to carry out the multicriteria analysis is set out below with the proposals in respect of the project:

Information Needed	Project Approach
The options that have to be analysed	Component Options are presented for each
The evaluation criteria that will be used to analyse the options	The above criteria are broken into sub-criteria each of these are used to carry out a comparative assessment of the options
The importance of these criteria (that is, the weights); and	For individual scheme components either a fully qualatitive mechanism without weighting has been used or a weighted mechanism has been adopted dependent on the perceived appropriateness for each component.
The evaluation of the options on the different criteria. These evaluations can be given a numerical or ordinal (comparative) scale.	The evaluations are on the basis of colour coding as describes in Table 5.1 below.

In this options assessment process a two stage multi-criteria analysis is used; MCA1 to prune out infeasible options and options which are obviously inferior to others; MCA2 to facilitate a more detailed assessment of the higher ranked options from MCA1.

5.2.1 Stage 1 MCA

In the Stage 1 assessment, the MCA is called MCA1 and it is developed to facilitate a ranking of each option against a set of defined criteria. It comprises either a qualitative and/ or quantitative assessment of the options developed. It is a comparative assessment of all options against each other. The MCA1 is undertaken on all options developed. It screens and assesses all options based on high level design or baseline data collection in order to screen and assesses all options. All options are assessed against the defined criteria, and the significance of the impacts, in order to screen out options which are considered either not feasible or for which clear division emerges between them and superior options in respect of the defined criteria, leading to a short-listing of options. NOTE: For some aspects of the proposed project a Stage 1 assessment was deemed to be sufficient and resulted in arriving at an Emerging Preferred Option (EPO).

5.2.2 Stage 2 MCA

In some cases, a more detailed MCA is deemed to be required. This is called a Stage 2 MCA. The Stage 2 MCA examined the shortlisted options from MCA1 in greater detail to determine an Emerging Preferred Option.

The same general selection process is followed for both Stage 1 and Stage 2 MCAs. However, in the Stage 2 a more detailed examination of the options is undertaken. This is informed through additional design development / further studies and subsequently more detailed analysis / assessment under the CAF criteria and sub-criteria under examination.

5.2.3 Criteria and Sub-Criteria

The criteria and sub-criteria are the measures of performance by which the options will be judged. It is appropriate that the approach should reflect the Project Objectives. A common set of Criteria and Sub-Criteria has been identified for the project. These are presented in Table 5-1 below. Each of the principal components of the scheme as listed above have had specific comparators identified under each sub criterion, comparators which are appropriate to each specific component type. They are described in Section 6 on an individual basis.

Table 5-1 CAF Criteria for MCA process

CAF Criteria	Sub - Criteria
1. Economy	Construction and Land Cost
	Long Term Maintenance costs
	Traffic Functionality /economic benefit
2. Integration	Transport Integration
	Land Use Integration
	Geographical Integration
	Other Government Policy
3. Environment	Noise and Vibration
	Air Quality and Climate
	Landscape and Visual (including light)
	Biodiversity (flora and fauna)
	Cultural, Archaeological and Architectural Heritage
	Water Resources
	Agriculture and Non-Agricultural
	Geology and Soils (including waste)
	Radiation and Stray Current
4. Accessibility & Social inclusion	Impact on Vulnerable Groups
	Stations Accessibility
	Social Inclusion
5. Safety	Rail Safety
	Vehicular Traffic Safety
	Pedestrian, Cyclist and Vulnerable Road user Safety
6. Physical Activity	Connectivity to adjoining cycling facilities
	Permeability and local connectivity opportunity

5.3 Assessment Methodology (MCA)

The assessment undertaken is of a comparative nature (options compared against each other). This is based on the Common Appraisal Framework (CAF) criteria and based on professional judgement in respect of the items to be qualitatively evaluated, and comprehensively assessed against the key relevant criteria in accordance with good industry practice.

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

A comparative assessment was undertaken for each option developed, where in general, for each positively scored option there must be an opposing negatively scored option. Table 5-2 provides an overview of the

comparative colour coded scale for assessing the criteria and sub-criteria. For illustrative purposes, this five-point scale is colour coded with advantageous options graded to 'dark green' and disadvantaged routes graded to 'dark brown'.

Table 5-2 The comparative colour coded scale for assessing the criteria and sub-criteria

Colour	Description
	Significant comparative advantage over all other options
	Some comparative advantage over all other options
	Comparable to all other options
	Some comparative disadvantage over all other options
	Significant comparative disadvantage over all other options

For each individual assessment the parameter and associated criteria and sub criteria were considered and options were compared against each other based on the five-point comparative scale, ranging from having 'significant *advantages over other options*' to having '*significant comparative disadvantages over other options*.' Options that are comparable were assigned '*comparable across all other options'*. Options were compared under each criteria, before those criteria are aggregated to give a summary score for each parameter. These scores were then compared to establish the relative ranking of the options.

NOTE: A degree of professional judgement was used by the specialist undertaking the assessment. For example, Environmental criterion assessments take into consideration the comparative likely potential impact and the significance value of the environmental factor to be impacted which is reflected in the aggregated summary ranking of that criteria.

5.3.1 Potential Impacts

The types of potential impacts under consideration relate to the likely construction and operation activities (including maintenance) of new and/ or modifications to road infrastructure and heavy rail infrastructure and ancillary works required at stations etc. in an urban, sub-urban and rural setting.

They are the direct and indirect effects associated with the construction phase including considerations relating to ease of construction/buildability and the likely temporary or permanent effects on all criterion. For example, direct effects on land use (Agronomy) could include temporary land-take, severance or reduction of viability, which prevents or reduces its value for intended use. Such uses include residential, commercial, recreational, agricultural etc. Similarly, soils may be impacted or degraded during construction. These impacts should be considered under each criteria and sub-criteria as appropriate. Indirect effects during construction activities may include indirect impacts on air, noise, landscape and visual associated with the construction of new and/or modifications to existing urban landscape including new roads, bridges, junctions, lighting which is likely to impact directly and indirectly on a number of the criteria under consideration.

The changes in land use are considered under the planning policy consideration under Integration parameter. The changes in traffic and associated impacts on the 'economy' are addressed under the Economy criterion and are not duplicated as part of the Environment assessment. The parameters, criteria, sub-criteria and their respective assessments for each aspect of the DART + Maynooth Line project is set out in Section 6.

6 STATIONS

6.1 Connolly

Connolly station today consists of four terminal platforms, (numbered 1 - 4), primarily for Northern Line services, including the Enterprise service to Belfast. Platform 4 can also be used for Sligo services, via Ossory Road Junction and Maynooth. Three through platforms (numbered 5-7) connect the Loop Line to the Northern line and the Phoenix Park Tunnel and Maynooth lines via Ossory Road Junction and Phibsborough. The station complex also includes a number of stabling roads (train parking) and maintenance facilities, primarily used to service the Enterprise train sets.

The key issue with the current layout is that the terminal platforms are on the east side of the station, while the loop line through platforms are on the west of the station. The station capacity is constrained by the number of trains and by track crossing conflicts. DART+ is seeking to modify the northern throat of Connolly Station rail lines with additional crossovers and track modifications to facilitate an increase in the station capacity. These modifications will facilitate additional operational flexibility at Connolly Station. As well as the track reconfiguration it is proposed to upgrade the platforms and the station itself to provide greater capacity for the predicted increase in passenger demand.

The aim in Connolly station is to achieve the maximum level of service of 23 trains per hour per direction. This requirement is being confirmed by the outcomes of the Railsys Model and the operational scheme of the whole DART Network.

Once the preferred operational scenario is determined, the number of trains at each platform of Connolly Station will be obtained. This information will be input into the ERM to obtain the Passenger Demand in the station. Based on these numbers, the station will be analysed and enhanced to adjust to the envisaged number of passengers.

When the project demands in respect of the station are resolved, the necessary solutions will be finalised. The Station Capacity Report will analyse the length and width of the platforms. It will also examine the sufficiency of the means of egress to check their ability to cope with the increase of the number of passengers, both in operation and evacuation. At present the emerging preferred solution is the “Further Do Minimum” option according to Drawing No. 32110100-01-ETR-DG-010 Rev 02 and document “Staged Approach for Infrastructure – Technical Note (32100100-GEN-RP-004/4)”. The emerging preferred is a Do Minimum proposal in respect of alterations to track alignments with all track modifications carried out within the existing railway viaduct boundary. It includes for minor alterations to platforms and egress provisions. Details of the emerging preferred station alterations are illustrated in Figure 6-1.

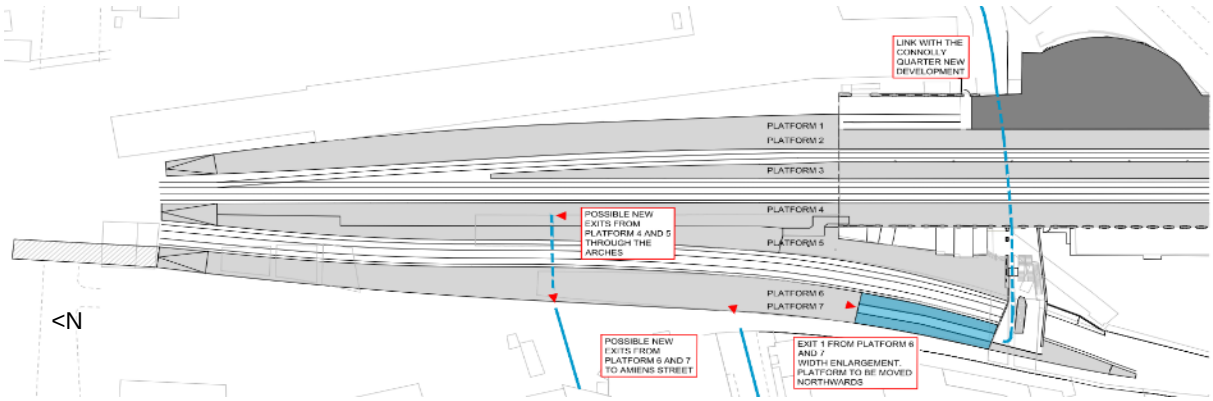

Figure 6-1 Emerging Preferred Station Alterations

6.2 Spencer Dock Station

The existing Docklands Station is located southeast of Connolly Station and operates as an overflow terminus station to Connolly Station in the morning and evening peak times.

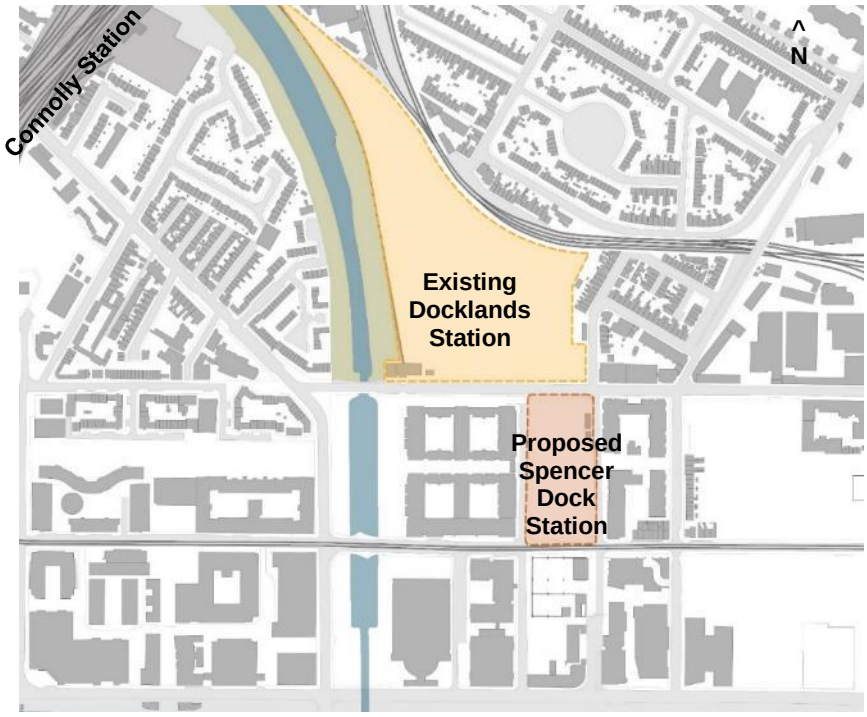

Figure 6-2 Proposed Spencer Dock Station Location

DART+ is seeking to make more beneficial use of Docklands Station, so that both stations work together in a more efficient manner to cater for the planned increased frequency of services that will benefit all GDA routes. Specific objectives in the Docklands area include the following:

- To identify the optimal location and layout of Docklands Station with to the aim of achieving the minimum train capacity requirement, which would best serve the needs of the Docklands area and maximise interchange potential with the Luas; and
- To carry out a comprehensive study for the Docklands Station and how it is accessed, including all connecting rail alignments from the DART radial routes bounded by and including Newcomen, North Strand and East Wall Junctions and freight traffic from East Wall Yard. This study will take cognisance of the station's interface with a potential future DART Underground Station and alignment.

Subject to further assessment, DART+ is seeking to construct a new station fronting Mayor Street Upper at Spencer Dock and adjacent the existing Luas Stop. This will increase the overall rail capacity in the City Centre, to better serve the Docklands area and will maximise the interchange potential with the Luas.

The study concluded that the proposal to construct a new station at Spencer Dock performs strongly, given its proximity to high density employment zones on the south and western side of the study area and its location within both the North Lotts and Grand Canal Dock Strategic Development Zone and SDRA 6. The assessment was validated from the network analysis work carried out which demonstrated that there is a significance difference in the employment figures across the study area, particularly within the 5min walking zone.

Figure 6-3 Spencer Dock Station on Mayor Street

An MCA is ongoing in respect of sub-options for the proposed station. The results of the assessment will be presented at PC2. Figure 6-3 illustrates the proposed station on plan on Mayor Street.

7 SIGNALLING, ELECTRICAL, TELECOMMUNICATIONS

As part of the SET (Signalling, Electricity and Telecoms) delivery strategy, we are making high-level optioneering reports for Signalling, Electricity and Telecoms, including mainline and depot. An MCA is being carried out to determine the preferred option.

In the upcoming sections the options are presented with summary assessment table included below.

7.1 Electricity (DART system-wide)

7.1.1 Alternatives for OHLE

7.1.1.1 OHLE Mechanical Compensation Equipment

The OHLE is exposed to variation in temperature – both from the day/night cycle and in the course of seasonal changes. This makes it necessary to constantly and reliably tension compensate for the resulting expansion and contraction of the contact wire and messenger wire in order to guarantee efficient train services.

The OHLE for the DART will be an auto – tensioned system. 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 a constant tension regardless the variation of temperature.

This mechanical tension can be achieved by two main solutions, springs or counterweights/balance weights solutions. On this alternative assessment report both solutions will be assessed.

7.1.1.1.1 Option 1 – Spring Solutions

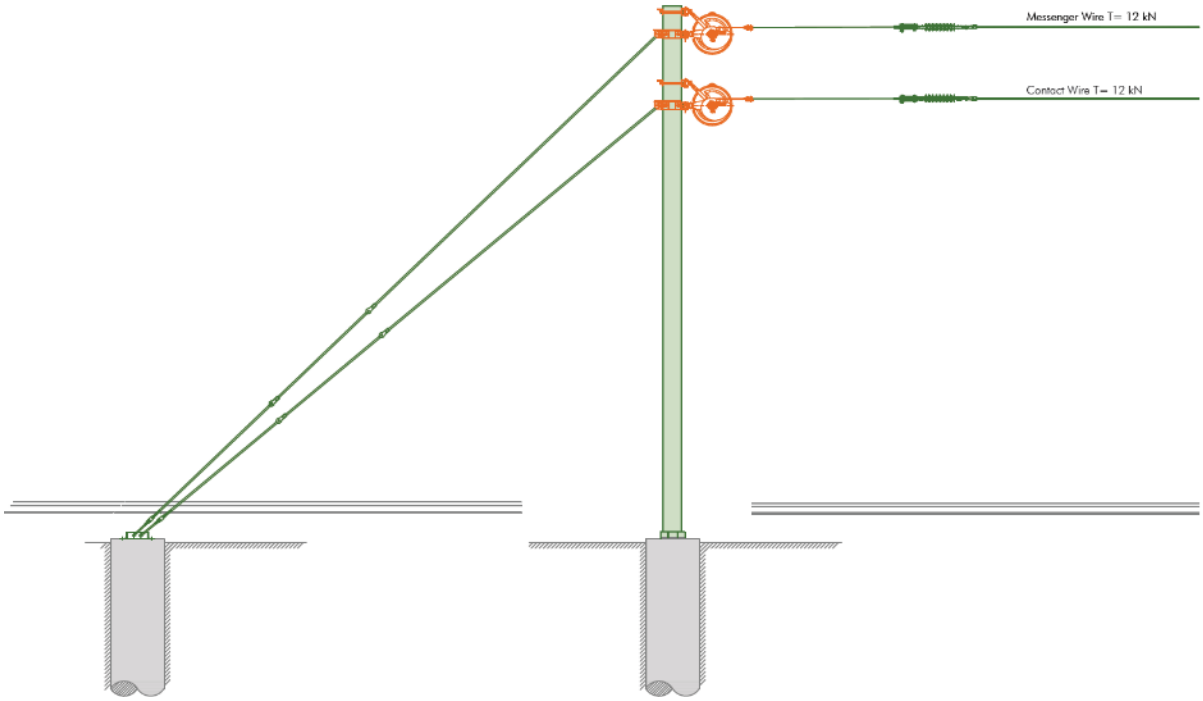

Figure 7-1 Option 1 OHLE Spring Tension System

7.1.1.1.2 Option 2 – Counterweight solutions

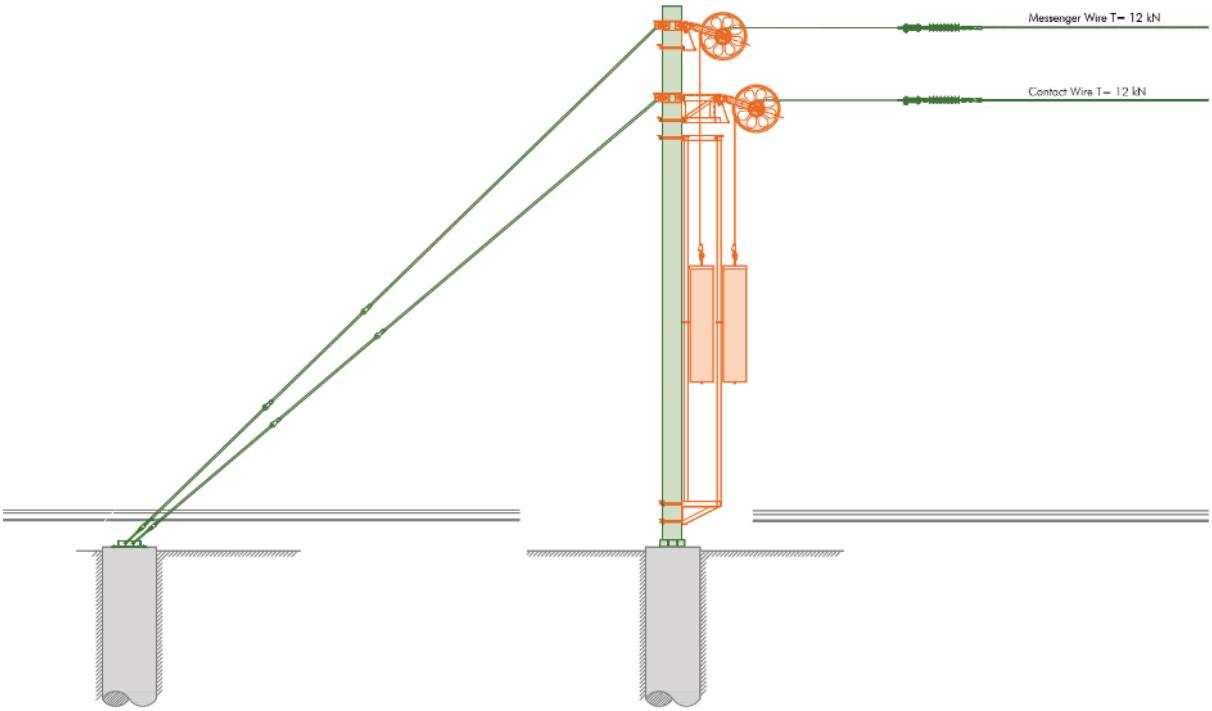

Figure 7-2 Option 2 OHLE Counterweighted Tension System

The following table summarises the averaged results of the MCA assessment per parameter to compare it.

Table 7-1 MCA Summary

	Option 1 – Spring Solution	Option 2 – Counterweight Solution
Economy	Significant comparative advantage over other options	Significant disadvantage over other options
Integration	Comparable to other options	Comparable to other options
Environment	Some comparative advantage over other options	Some comparative disadvantage over other options
Accessibility & Social inclusion	Comparable to other options	Comparable to other options
Safety	Some comparative advantage over other options	Some comparative disadvantage over other options
Physical Activity	Comparable to other options	Comparable to other options

The recommendation is to further progress Option 1.

7.1.1.2 OHLE Structures

The OHLE structures are responsible for supporting the OHLE and auxiliary equipment. There is a wide range of solutions of OHLE type of structures and after a benchmarking exercise of the current practices two main types will be studied in this alternative assessment: HEB steel beams and Circular Structures.

7.1.1.2.1 Option 1 – HEB steel beams

Figure 7-3 OHLE Structure Option 1: HEB Steel Beams

7.1.1.2.2 Option 2 – Circular Profiles / Poles

Figure 7-4 OHLE Structure Option 2: Circular Profiles

The following table summarises the averaged results of the MCA assessment per parameter to compare it.

Table 7-2 MCA Summary

	Option 1 – HEB steel beams	Option 2 – Circular Profiles / Poles
Economy	Some comparative advantage over other options	Some comparative disadvantage over other options
Integration	Some comparative advantage over other options	Some comparative disadvantage over other options

	Option 1 – HEB steel beams	Option 2 – Circular Profiles / Poles
Environment	Comparable to other options	Comparable to other options
Accessibility & Social inclusion	Comparable to other options	Comparable to other options
Safety	Comparable to other options	Comparable to other options
Physical Activity	Comparable to other options	Comparable to other options

The recommendation is to further progress Option 1.

7.1.1.3 OHLE Foundations

OHLE foundations will be a critical and key element for the electrifications works to be undertaken under the DART + programme. The type of foundation to be design will determine the construction method that will have a direct impact into the buildability of the system.

Based on this premise, three best spoke solutions will be assessed in order to determine the best one for the DART that guarantees reliability and reduces disruptions during construction. The three types are:

Figure 7-5 Alternative OHLE Foundation Configurations

7.1.1.3.1 Option 1 – Steel Pile Driven Foundations

Figure 7-6 Option 1: Steel Pile Driven Foundations

7.1.1.3.2 Option 2 – Concrete Bored Pile Foundations

Figure 7-7 Option 2: Concrete Bored Pile Foundations

7.1.1.3.3 Option 3 – Concrete PAD foundations

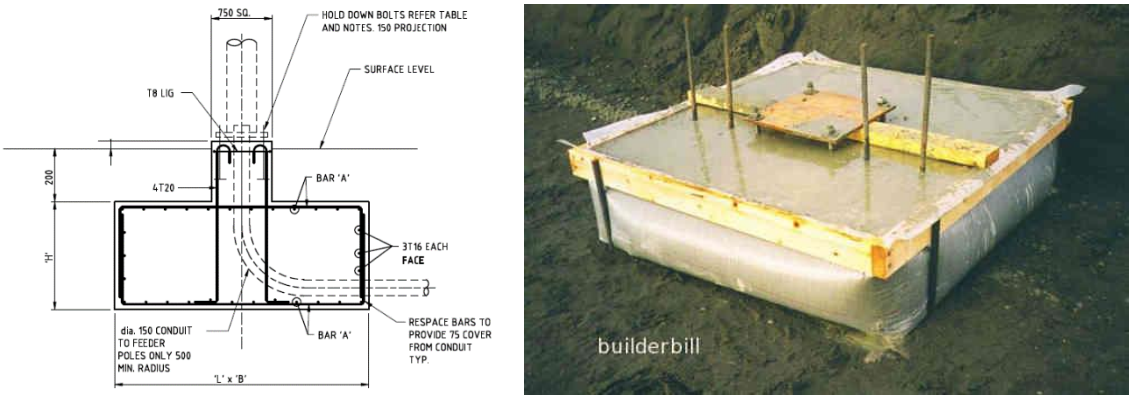

Figure 7-8 Option 3: Concrete PAD foundations

The following table summarises the averaged results of the MCA assessment per parameter to compare it.

Table 7-3 MCA Summary

	Option 1 – Steel Pile Driven Foundations	Option 2 – Concrete Bored Pile Foundations	Option 3 – Concrete PAD foundations
Economy	Some comparative disadvantage over other options	Significant comparative advantage over other options	Some comparative advantage over other options
Integration	Some comparative advantage over other options	Significant comparative advantage over other options	Some comparative disadvantage over other options
Environment	Comparable to other options	Comparable to other options	Comparable to other options
Accessibility & Social inclusion	Comparable to other options	Comparable to other options	Comparable to other options
Safety	Comparable to other options	Comparable to other options	Comparable to other options

	Option 1 – Steel Pile Driven Foundations	Option 2 – Concrete Bored Pile Foundations	Option 3 – Concrete PAD foundations
Physical Activity	Comparable to other options	Comparable to other options	Comparable to other options

The recommendation is to further progress Option 2

7.1.1.4 OHLE Protections Against Direct Contacts

The DART network and its structures were designed for a non – electrified line, therefore when introducing the OHLE the existing structures might not comply with the requirements set out in EN 50122-1 in regards protection against direct contacts. This might imply increasing parapets heights or extending / modifying the fencing to comply with this requirement.

7.1.1.4.1 Option 1 – Increasing the Height of the Parapets

Figure 7-9 OHLE Protection Option 1: Increase Parapet Heights

7.1.1.4.2 Option 2 – Installing Safety Screens over the OHLE

Figure 7-10 OHLE Protection Option 2: Safety Screens

The following table summarises the averaged results of the MCA assessment per parameter to compare it.

Table 7-21 MCA Summary

	Option 1 – Increasing the Height of the Parapets	Option 2 – Installing Safety Screens over the OHLE
Economy	Significant comparative advantage over other options	Significant comparative disadvantage over other options
Integration	Some comparative advantage over other options	Some comparative disadvantage over other options
Environment	Some comparative advantage over other options	Some comparative disadvantage over other options
Accessibility & Social inclusion	Comparable to other options	Comparable to other options
Safety	Comparable to other options	Comparable to other options
Physical Activity	Comparable to other options	Comparable to other options

The recommendation is to further progress Option 1. It must be noted that this is currently work in progress and subject to interdisciplinary checks (IDCs) and feedback from key stakeholders and third parties which may influence the final recommendation.

7.1.2 Alternatives for Depot OHLE

7.1.2.1 OHLE in the Depot Area

For depot areas and sidings with more than two tracks, it is not generally possible to use single pole cantilevers as there is insufficient space between tracks. For this reason, two main possible arrangements are feasible, headspans and portals.

7.1.2.1.1 Option 1 – Headspans

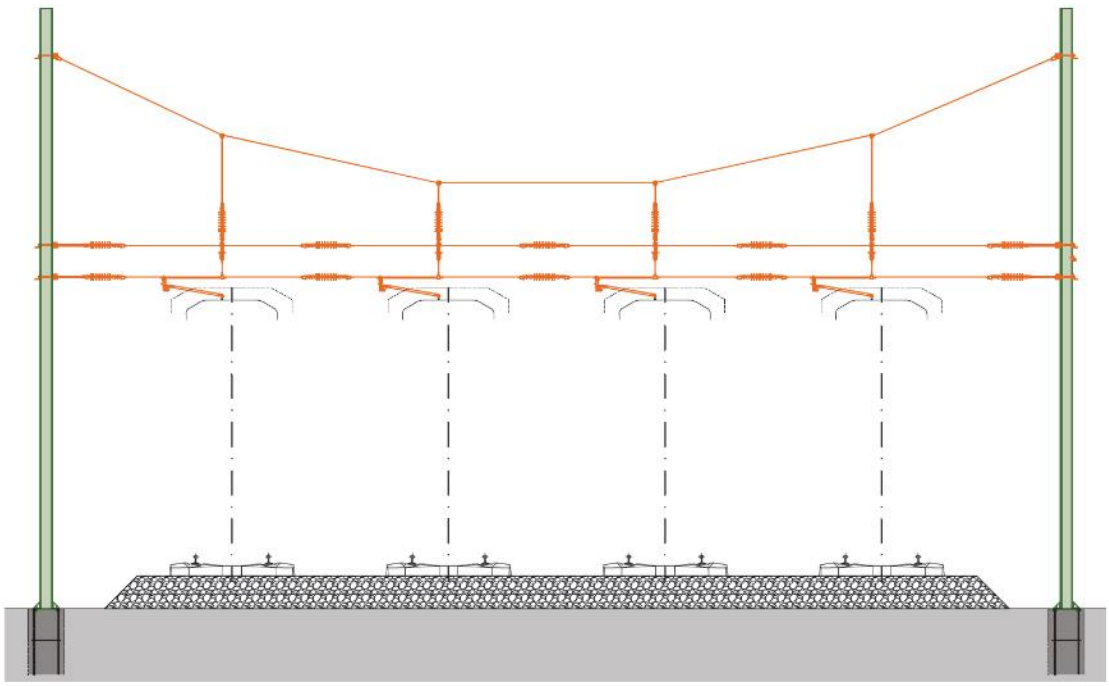

Figure 7-11 Option 1 – Headspans

7.1.2.1.2 Option 2 – Portals

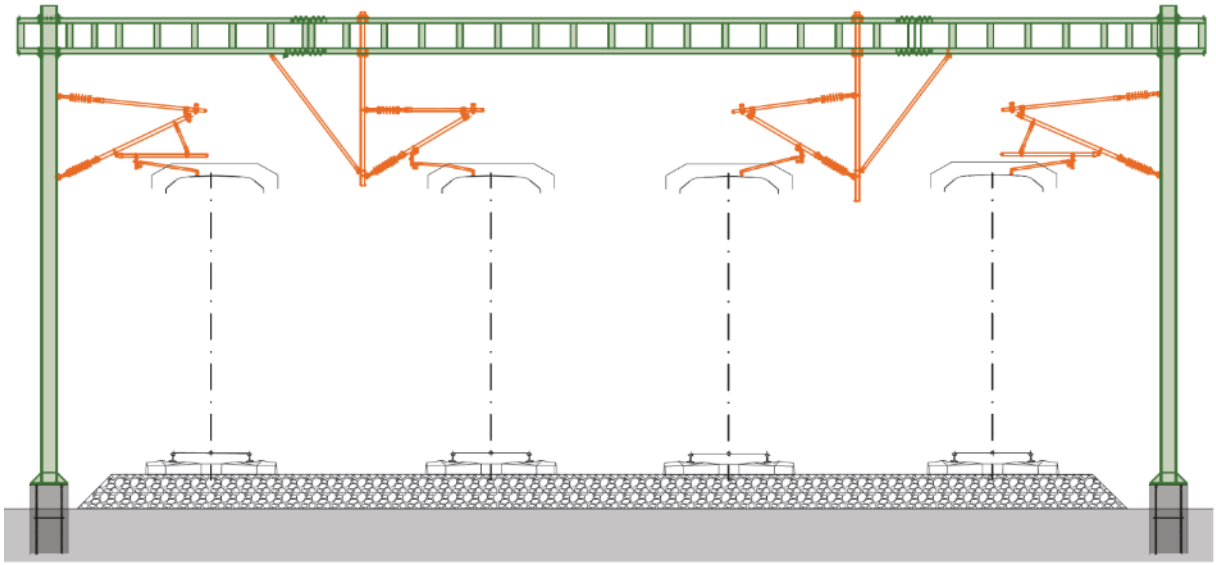

Figure 7-12 Option 2 - Portals

The following table summarises the averaged results of the MCA assessment per parameter to compare it.

Table 7-4 Depot OHLE MCA Summary

	Option 1 – Headspans	Option 2 – Portals
Economy	Some comparative disadvantage over other options	Some comparative advantage over other options
Integration	Comparable to other options	Comparable to other options
Environment	Some comparative disadvantage over other options	Some comparative advantage over other options
Accessibility & Social inclusion	Comparable to other options	Comparable to other options
Safety	Comparable to other options	Comparable to other options
Physical Activity	Comparable to other options	Comparable to other options

The recommendation to progress further is option 1.

7.1.2.2 OHLE inside the Workshop

Depending on the expected maintenance activities to be performed in the workshop to the rolling stock units, different OHLE inside the workshop can be provided (subject to the final depot proposal and therefor the proposed operation.

7.1.2.2.1 *Option 1 – Fixed OHLE in the Workshop*

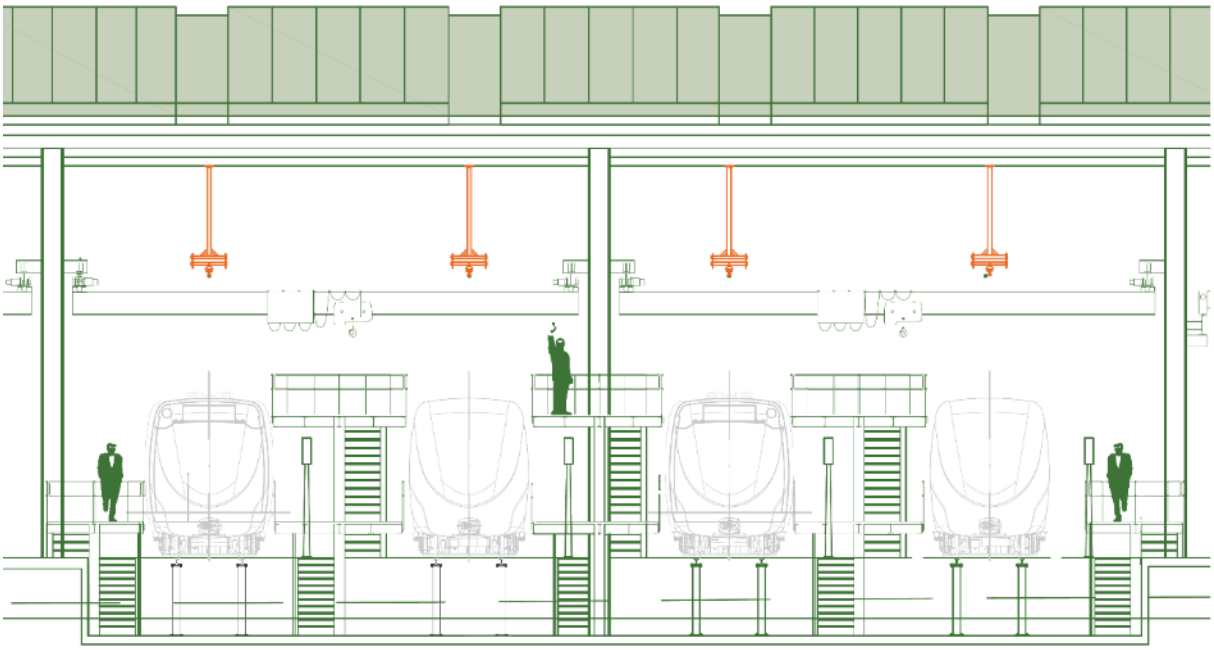

Figure 7-13 Option 1 – Fixed OHLE in workshop

7.1.2.2.2 *Option 2 – Moveable OHLE in the Workshop*

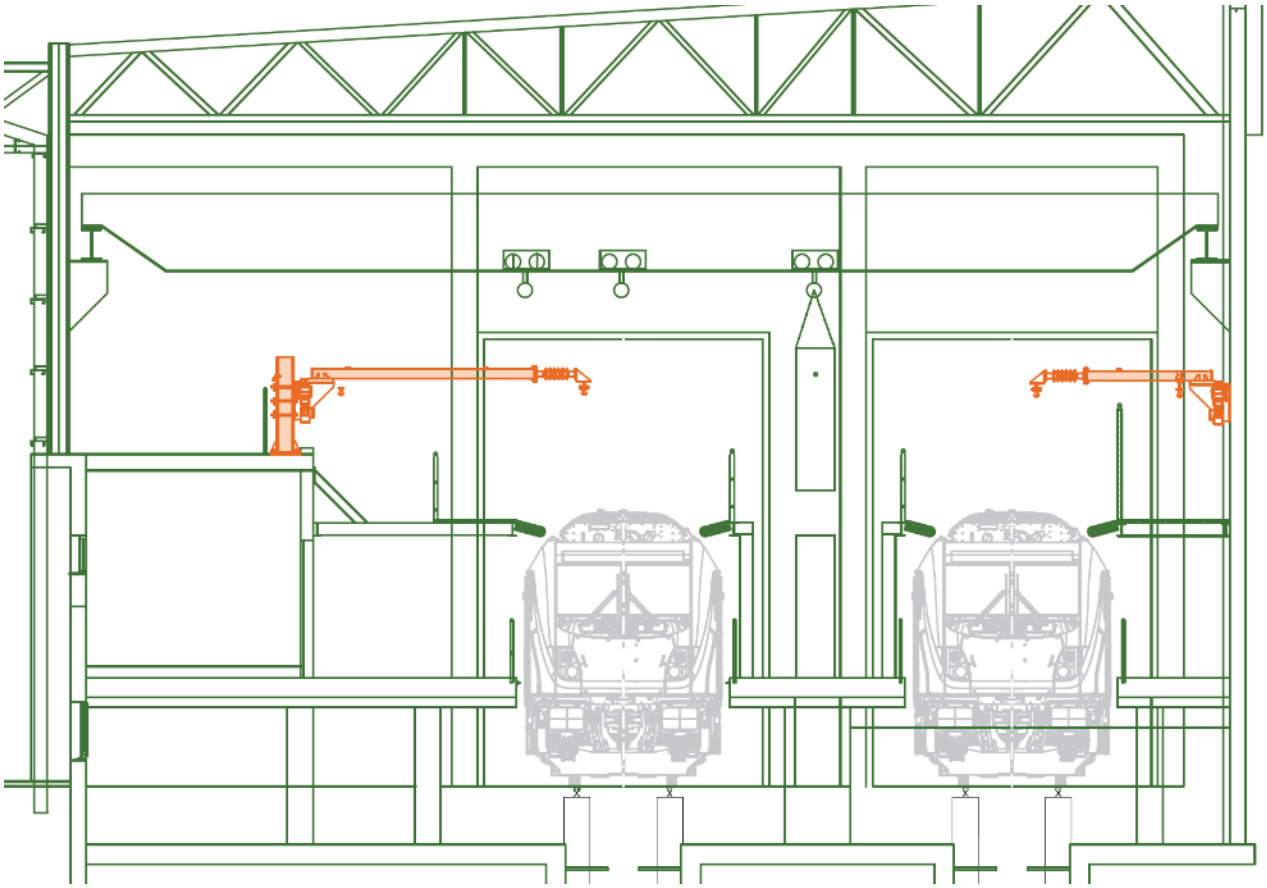

Figure 7-14 Option 2 – Moveable OHLE in workshop

The following table summarises the averaged results of the MCA assessment per parameter to compare it.

Table 7-5 Workshop OHLE MCA Summary

	Option 1 – Fixed OHLE in the Workshop	Option 2 – Moveable OHLE in the Workshop
Economy	Significant comparative advantage over other options	Significant comparative disadvantage over other options
Integration	Some comparative advantage over other options	Some comparative disadvantage over other options
Environment	Some comparative advantage over other options	Some comparative disadvantage over other options
Accessibility & Social inclusion	Comparable to other options	Comparable to other options
Safety	Some comparative disadvantage over other options	Some comparative advantage over other options
Physical Activity	Comparable to other options	Comparable to other options

The recommendation to progress further is option 1. It must be noted that this is currently work in progress and subject to IDCs and feedback from key stakeholders and third parties which may influence the final recommendation.

7.2 Power Study (DART System-wide)

The MDC has started a first traction simulation for the Maynooth Line that will be part of the overall Power Study.

To make the traction simulations, data is needed for the Rolling Stock (RS). The MDC has completed the available RS data with some assumptions

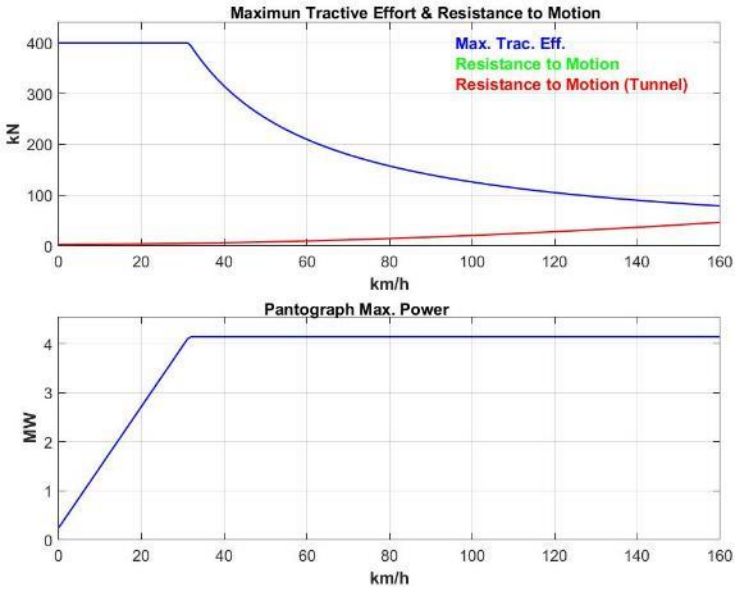

Figure 7-15 Power Study Graph

The results of this information are being collected to produce a first estimation of the needed powerat each station in normal and degraded modes. This will be the start of the engagement with ESB.

The traction study will be fully developed before PC2.

7.3 Substations Potential Locations (Maynooth Line)

As described in the previous section, the MDC has started a first high-level traction simulation to determine the number of substations in the Maynooth Line.

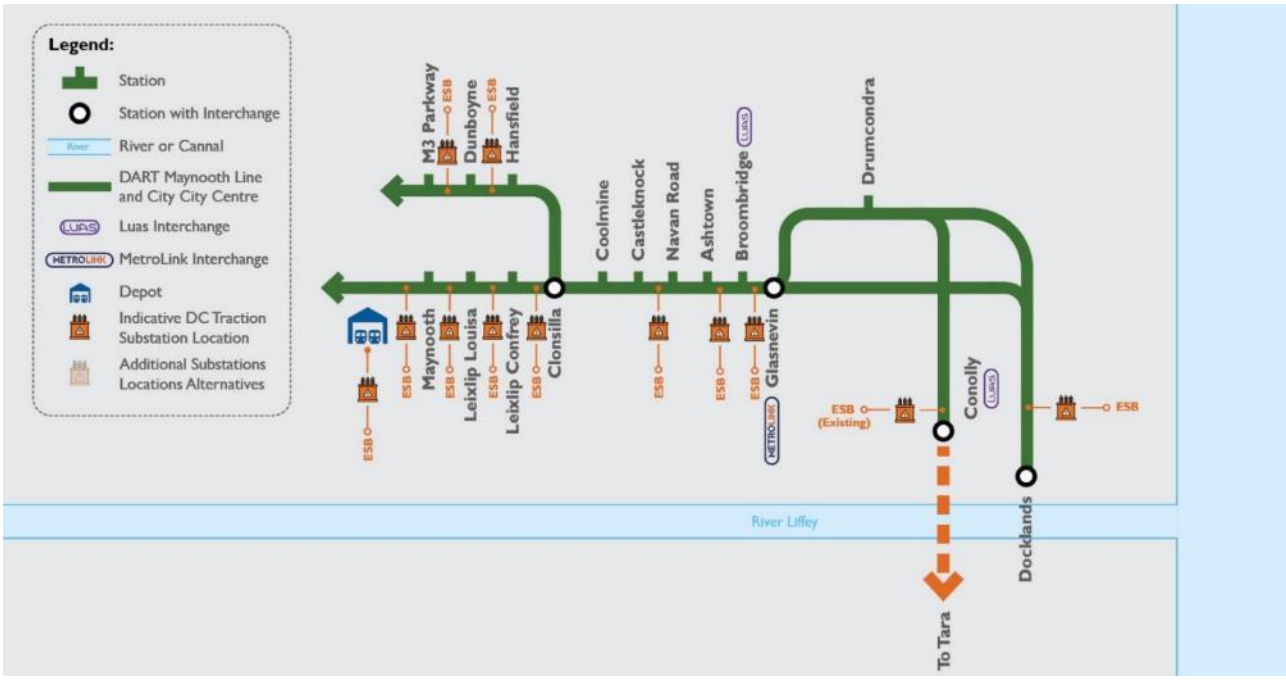

Figure 7-16 Proposed Traction Substation Locations

At present, as shown in the figure above, it is envisaged that the Maynooth Line will require 10 new traction substations plus another at the Depot.

Once the number and potential location of the substations are determined, further studies will be needed to decide the exact location of them, assuring that they accomplish with all the requirements for such areas (road access, supply connection and space availability). These locations will be shown in PC2 and engagement with landowners will start as soon as the potential plots are analysed.

8 PERMANENT WAY

The DART + Maynooth Line Project is characterised by the objective to enhance capacity along the existing railway corridors. As part of this study it was necessary to examine the existing infrastructure for pre-existing deficiencies and for opportunities for enhancement. In this regard the following were examined:

- The scope for removal of existing speed restrictions consequent on existing horizontal and vertical alignment of the track;
- The provision of a double track configuration west from Maynooth to the proposed depot and for connection to the depot;
- The need for track modification necessary to optimise the project train service specification;
- The scope for track alignment modification to ensure the availability of the clearances at structures necessary to meet OHLE needs;
- Opportunities for adjustment of track alignment to address localised pre-existing flooding issues.

8.1 Speed Restriction Removal

One of the objectives in the Permanent Way design is to remove, if possible, pre-existing speed restrictions on the railway. The following sections have been identified as having speed restrictions due to the existing track alignment:

- Drumcondra curve alignment, between Croke Park and Drumcondra Station on GSWR line;
- Liffey Junction, between Broombridge Station and Glasnevin Junction;
- Ashtown curve alignment, between Ashtown Station and Navan Road Station;
- 8 ¾ 9 ¼ curves alignment, between Clonsilla Station and Leixlip Confey Station;
- Leixlip curves alignment, within and nearby Leixlip Louisa Bridge Station.

The options for the identified sections are currently under early stage assessment. Some may require major significant civil works on the mainline, at existing overbridges or land acquisition due to horizontal or vertical realignments. The Emerging Preferred Option, after MCA1 and potentially MC2, will be presented at PC2.

8.2 Double Track from Maynooth and Connection to the Depot

The rail line (referring to the mainline), which is currently a single line west of Maynooth, will be upgraded to twin track between Maynooth and the new Depot west connection. This new track (to double the track) will be located parallel to the existing track, south of the Royal Canal with modification to OBG23 underreview to achieve this.

Along the length of mainline track adjacent to the depot area, the twin tracks will continue to run parallel with the second/new track to be located between the existing track and the Depot Plot.

A proposed new bridge is to be constructed (Depot access from R148 road, in the north), which will cross the mainline railway, the Royal Canal and potentially part of the depot.

The configuration for proposed track construction in the vicinity of the depot will be subject to multi-criteria analysis. A single stage process is likely to be sufficient as it is anticipated that only one of the technical solutions considered will be shown to be achievable.

In the section between Maynooth and the new Depot, the solution for the twin track of the mainline will be developed in further stages, once the operational and Jackson's Bridge – OBG23 solutions are decided. The

MCA is expected to be predominantly in relation to the options around Jackson's Bridge – OBG23 and not the double tracking itself, as it's foreseen that only one technical solution is achievable, dependent on the Jackson's Bridge – OBG23 proposal..

The alignment options for depot turnout in the vicinity of Jacksons Bridge OBG23 are currently under review. The situation at Jacksons Bridge is complicated by the curtailed clearances available at the bridge, the protected status of the structure, pre-existing flooding conditions and the presence of the culverted Lyreen River adjacent to the bridge.

8.3 Track Alterations for TSS Needs

In addition to examining to the scope for removal of speed restrictions, the design team is seeking to optimise the track layout in respect of the Train service timetable. This includes review of the effectiveness of sections of track within the network, considerations of sidings and track consideration in respect of stabling for trains. This work is ongoing and will be presented at PC2.

8.4 OHLE Clearances at Structures

In chapter "10.1 OHLE Clearance Challenging Overbridges", a list of overbridges that present an issue for the implementation of the catenary is shown. Please note that this section is fed by the document MAY-MDC-ELE-ROUT-RP-E-0002 (OHLE early clearance assessment report) and its findings as an output of the IDC (interdisciplinary check).

The existing track alignment has been assessed to confirm the availability of clearances for 1500kV and 2500kV OHLE. A number of structures have been confirmed to be deficient in respect of clearance and a number of alternative provisions are being examined to address the shortfall. The provisions include examination of the scope for alteration of the track alignment to provide additional clearance. The outcome of this study will be presented as part of PC2. Parapets on the bridges are also subject to review. These will need to be increased in height in many instances to meet current standards.

These works require possessions throughout weekend periods, since they cannot be achieved during a single night possession. First one track must be lowered, the following weekend the remaining trackwork can be lowered.

9 LEVEL CROSSINGS

9.1 Introduction

The main aim of the DART + Maynooth Line Project, and the overarching DART+ Programme, is to increase train frequencies and passenger capacity along the Maynooth Line. Level crossings are a major constraint to railway operation and surrounding road networks, causing congestion and increased journey times for all modes of transport including pedestrians and cyclists.

This aim cannot be achieved with active level crossings along the rail line.

Level crossings present a major constraint to railway operation and surrounding road networks, causing congestion and increased journey times for all modes of transport including pedestrians and cyclists As discussed in Section 3.3.5, an increase in the frequency of trains will result in the level crossing being effectively closed the majority of the time.

A number of different options were developed for each level crossing to assess alternatives to the existing level crossings. These options were developed to sufficient detail to permit a robust Stage 1 multi- criteria analysis, MCA 1. Shortlisted options from MCA 1 were then assessed in more detail in Stage 2 multi-criteria analysis. The MCA Methodology is discussed further in Section 0.3 of this report.

The design standards used to develop the level crossing options adopted the principles of the Design Manual for Urban Roads and Streets (DMURS) while also incorporating elements of the Design Manual for Roads and Bridges (DMRB). The standards adopted for each element of the design generally follow the requirements of the following:

Road Geometry	Design Manual for Urban Roads and Streets (DMURS) prepared by the Department of Transport, Tourism and Sport and the Department of Housing, Planning and Local Government Design Manual for Roads and Bridges (DMRB) prepared by the Transport Infrastructure Ireland (TII) (formerly the National Roads Authority (NRA))
Bridge and Underpass Geometry	Design Manual for Roads and Bridges (DMRB) prepared by the Transport Infrastructure Ireland (TII) (formerly the National Roads Authority (NRA))
Cycle Facilities Geometry	National Cycle Manual prepared The National Transport Authority (NTA)
Traffic signs, Traffic Road Markings and Traffic Signals Layout	Traffic Signs Manual 2019 prepared by the Department of Transport, Tourism and Sport
Drainage	Greater Dublin Regional Code of Practice for Drainage Design Manual for Roads and Bridges (DMRB) prepared by the Transport Infrastructure Ireland (TII) (formerly the National Roads Authority (NRA))

To facilitate the assessment a baseline characterization of the existing setting at each level crossing was carried out. This baseline characterization is presented in this Chapter. In addition, Do Nothing and Do Minimum scenarios were developed for each level crossing to facilitate the assessment. The scenarios are also presented below. Consideration of the traffic consequences of removing the level crossings with alternative provisions of replacement access are presented in **Chapter 3**. The detail of the MCA process applied to the level crossings is also described in this chapter.

9.2 Level Crossing Options Selection Process

For each level crossing closure, an extensive set of options was initially developed taking account of previous studies. Additional options were also developed to account for national and regional planning objectives and updates to design standards in recent years. For all level crossings an option for pedestrian and cycle access alone in the vicinity of the crossing is included to ensure the need for replacement of vehicular access on removal of the level crossing was adequately accounted for in the assessment process. Further consideration on the provision of vehicular access is presented in **Chapter 3**.

The options were then assessed/ screened based on their overall feasibility; the most likely or potentially viable options were shortlisted for further assessment and consideration in MCA2.

9.2.1 Do Minimum, Do Nothing Scenarios

The Do-Nothing scenario for level crossings considers leaving the current level crossings in place. The current operation and opening times associated with each level crossing is presented in Chapter 3. This option is contrary to the project objectives and is consequently not a realistic prospect but it has been included for comparative purposes.

The Do-Minimum scenario for level crossings considers the closure of the crossings with no alternative access provided. This option is wholly consistent with the project objectives but as discussed in Chapter 3 is not appropriate in all instances. For this scenario all traffic would be diverted to alternative routes around the crossing location.

These baseline options along with the Do-Something scenario described below are in accordance with the *Guidelines on a Common Appraisal Framework for Transport Projects and Programmes*.

9.2.2 Do Something Scenario - Option Development

The Do-Something scenario considers the closure of the existing crossings, with segregated access across the rail line for some, or all traffic. The options provided within this scenario range from providing a non motorised user (NMU) facility, with diversions in place for vehicular traffic, to fully diverted road bridges with extensive NMU facilities (including cycleways, etc.)

The development of alternative options was typically constrained, such constraints varying between locations but the following were manifest at many of the level crossing locations:

- Extensive existing development,
- Planning considerations
- Constrained existing road network and interfaces
- The Royal Canal, below railway level in many instances;
- The proximity of heritage or protected properties and structures
- Railway infrastructure and stations

9.2.3 Baseline Characterisation of Level Crossing Locations

This section sets out to describe the baseline (existing receiving environment) at each of the level crossing locations so that the reader can have a picture of the likely impacts when reading the Stage 1 and Stage 2 MCA text and spreadsheets.

9.2.3.1 Ashtown Level Crossing

The first level crossing (working east to west) is located at XG004 Ashtown, about 1km inside the M50 C-Ring motorway north of the Phoenix Park. XG004 is currently a manually operated level crossing. The crossing is located approximately 300m north of the Navan Road. The Tolka River runs west-east approximately 300m to the north of the level crossing. The road crosses the railway immediately adjacent to the Royal Canal, over which there is a bridge, which is a protected structure. There is a double lock on the Royal Canal at Ashtown immediately upstream of the Canal Bridge. The Canal drops approximately 4.5m through the double lock. Figure 9-1 shows the existing level crossing.

Ashtown Level Crossing XG004 is split over two local authority areas with the eastern side of Ashtown Road located in Dublin City Council's functional area and the western part in Fingal County Council's functional area.

Figure 9-1 Ashtown Level Crossing

The Royal Canal proposed Natural Heritage Area (pNHA) runs parallel and to the north of the railway line. The area to the immediate north of the level crossing is developed and includes residential and retail land and properties with further development proposed on the lands to the northeast of the level crossing.

Figure 9-2 View eastwards of Royal Canal and development in Pelletstown

Ashtown Railway Station is located immediately east of the crossing and there is an established residential estate further south (Martin Savage Park, Ashbrook and Kempton). There is a horse-riding school to the west of Ashtown Road and light industrial development further west on the opposite side of Mill Lane. Mill Lane follows the old line of Ashtown Road, which was severed when the Royal Canal was constructed. To the east lies Martin Savage Park home to St Oliver Plunket's GAA club. These playing pitches are also used in significant numbers for foraging by Light bellied Brent Geese which are a Qualifying Interest of the Special Protection Areas (SPAs) in Dublin Bay.

There are a number of protected structures including Ashtown House and gate lodge, the old Mill building, the 10th Lock and the Royal Canal itself.

Figure 9-3 View of Old Mill to the southwest of the existing Level Crossing

An existing utilities desktop study identified the following utilities in the vicinity of the level crossing. These are also presented in Figure 9-4 below.

- Electricity – ESB underground MV / LV ducts;
- Electricity – ESB overhead MV cables;
- Electricity – ESB overhead LV cables;
- Gas – GNI underground MP pipes;
- Gas – GNI underground LP pipes;
- Telecom – Virgin underground ducts;
- Telecom – Eircom underground ducts;
- Water – IW watermain;
- Water – IW gravity foul/combined sewer;
- Water – Local Authority storm water sewer;

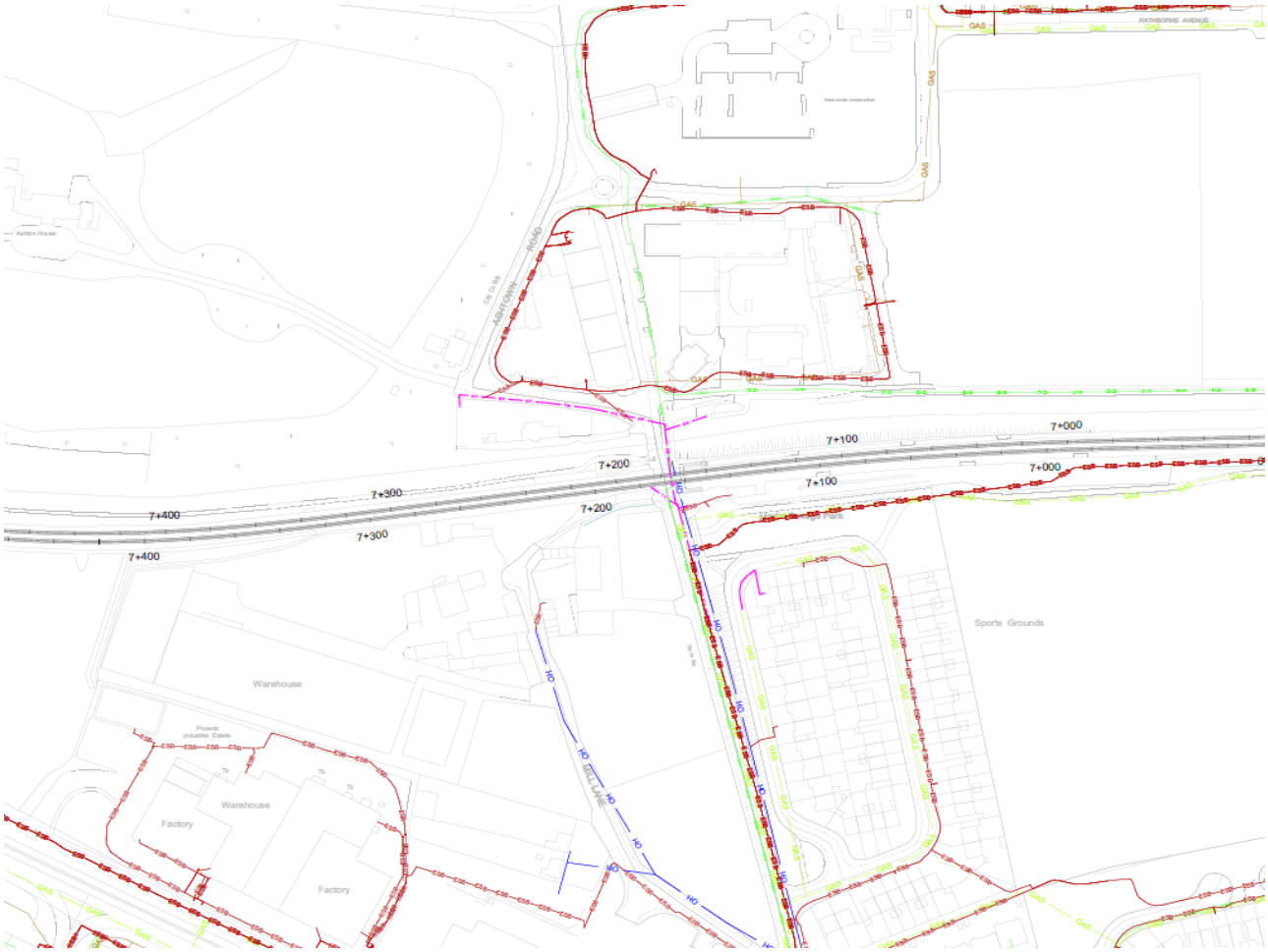

Figure 9-4 Ashtown Existing Utilities Records

Please refer to Volume 2 drawing MAY-MDC-UTL-ROUT_DR-C-0101_0167-P03-SH12 for additional detailed existing utilities information at Ashtown Level Crossing.

9.2.3.2 Coolmine Level Crossing

Coolmine level crossing is located to the west of Ashtown, adjacent to Coolmine Railway Station. Coolmine is currently a CCTV controlled level crossing. The crossing is located on Coolmine Road, which connects Clonsilla Road to Carpenterstown Road. The crossing is located immediately adjacent to the Royal Canal, which is spanned by Kirkpatrick Bridge. The canal level is approximately 9 metres below the railway level at the crossing. All lands in the vicinity of the level crossing are zoned for residential use or for open space and recreational amenities. Figure 9-5 shows the situation at the existing level crossing.

Figure 9-5 Coolmine Level Crossing

The area surrounding the level crossing is predominantly residential in nature. There are mature housing estates to both the north and south of the railway / canal corridor. Coolmine Station is located to the immediate southeast of the level crossing and there is a railway car park immediately to its south. Carpenterstown Road is an important access route to the lands south of the railway and carries of the order of 8,000 vehicles a day.

Kirkpatrick Bridge, which carries Coolmine Road over the canal, is a protected structure.

Figure 9-6 Mature housing southwest and apartments southeast of Coolmine Level Crossing

Figure 9-7 Car park to the south of Coolmine Level Crossing Location

An existing utilities desktop study identified the following utilities in the vicinity of the level crossing. These are also presented in Figure 9-9 below.

- Electricity – ESB underground MV / LV ducts;
- Electricity – ESB overhead LV cables;
- Gas – GNI underground MP pipes;
- Gas – GNI underground LP pipes;
- Telecom – Virgin underground duct;
- Telecom – Eircom underground duct;
- Water – IW water main;
- Water – IW gravity foul/combined sewer;

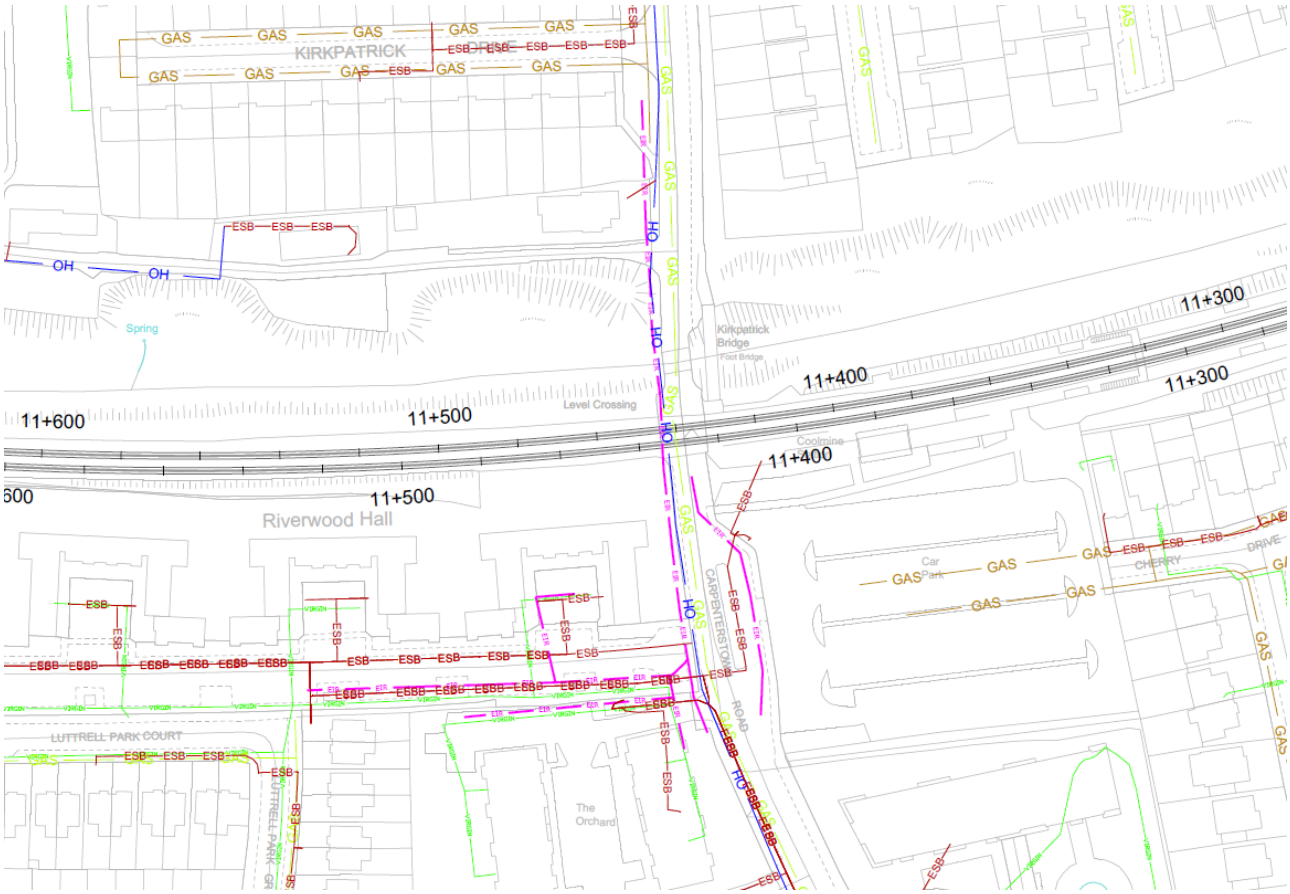

Figure 9-8 Coolmine Existing Utilities Records

Please refer to Volume 2 drawing MAY-MDC-UTL-ROUT-DR-C-0101_0167-P03-SH18 for additional detailed existing utilities information at Coolmine Level Crossing.

9.2.3.3 Porterstown Level Crossing

The third level crossing under consideration is located at XG008 Porterstown, on the old Porterstown Road. The level crossing is currently a CCTV controlled level crossing. Porterstown Road connects Clonsilla Road to the north to Luttrellstown Road to the south. The crossing is located immediately adjacent to the Royal Canal, which is spanned by a protected bridge structure. Existing land uses in the vicinity include residential (low density), amenity / institutional and agricultural. Figure 9-9 below shows the existing level crossing.

Figure 9-9 Porterstown Level Crossing

The need for a full road traffic connection on Porterstown Road has been largely supplanted by the recent construction of the Porterstown Viaduct 200 metres to the east. This serves the recent Carpenterstown Developments to the south of the railway but there is no connection through to Luttrellstown Road. Were such a link to be provided in a convenient location, the need for a through route for vehicles on the Old Porterstown Road would become largely redundant. Fingal County Council has secured planning permission for such a link, for which tenders are currently being sought. This link is will bypass the Old Porterstown Road and any residual use of the road will be for local traffic only.

Figure 9-10 Porterstown Level Crossing

The area surrounding the level crossing is predominantly green, with some low-density residential development to the north of the crossing. There are two sports facilities on the eastern side of Porterstown Road – one on either side of the canal / railway corridor and there are also two schools along the road. The existing canal bridge carrying Old Porterstown Road is a protected structure.

The existing level crossing at XG008 Porterstown is via an extremely narrow canal bridge that allows only one direction of travel at a time. This bridge, known as Kennan Bridge, is a Protected Structure (RPS 698). The canal is in a relatively deep cutting at this point. The former crossing-keeper's house is alongside the railway on the southern side and is a Protected Structure (RPS 699). A ringfort (RMP DU017-005) is situated in Porterstown townland 600m to the south of the development area.

Figure 9-11 Kennan Bridge

An existing utilities desktop study identified the following utilities in the vicinity of the level crossing. These are also presented in Figure 9-16 below.

- Electricity – ESB underground HV ducts;
- Electricity – ESB underground MV / LV ducts;
- Electricity – ESB overhead MV cables;
- Electricity – ESB overhead LV cables;
- Gas – GNI underground HP pipes;
- Gas – GNI underground MP pipes;
- Telecom – Virgin underground ducts;
- Telecom – Eircom underground ducts;
- Water – IW water main;
- Water – IW gravity foul/combined sewer;

Figure 9-12 Porterstown Existing Utilities Records

Please refer to Volume 2 drawing MAY-MDC-UTL-ROUT-DR-C-0101_0167-P03-SH19 for additional detailed existing utilities information at Clonsilla Level Crossing.

9.2.3.4 Clonsilla Level Crossing

The next level crossing to the west is located at XG010 Clonsilla, adjacent to Clonsilla Railway Station. XG010 is currently a manually operated level crossing. The crossing is located on Clonsilla Road adjacent to the Canal where Clonsilla Road veers south towards Luttrellstown Road and Clonsilla Station. The crossing is located immediately adjacent to the Royal Canal, which is spanned by a protected structure. Figure 9-13 below shows the existing level crossing and station at Clonsilla.

Figure 9-13 Clonsilla Level Crossing

All lands in the vicinity of the level crossing are zoned for residential use or for open space and recreational amenities and fall within Fingal County Council's administrative area. There is currently a mix of land uses in the study area, between residential, commercial, and industrial uses. A high proportion of the lands within the vicinity of the level crossing are undeveloped lands zoned as open spaces, green belts, and high amenity areas.

Figure 9-14 View of northern approach to the existing Level Crossing

The majority of the lands to the north of the level crossing are zoned to provide for residential development and to protect and improve residential amenity. Parts of this land are zoned to protect and enhance the special physical and social character of major suburban centres. Most of these lands to the north are already developed. To the south of the level crossing, the lands are zoned as open spaces and high amenity areas. The area to the west of the level crossing is zoned to provide for new residential communities in accordance with approved local area plans.

The Royal Canal proposed Natural Heritage Area (pNHA) runs parallel and to the north of the railway line. The existing level crossing at XG010 Clonsilla is adjacent to the canal bridge and to the Clonsilla railway station. The canal bridge, known as Callaghan Bridge, is a Protected Structure (RPS 706), as are two features at the station, the signal box and a footbridge (RPS 707).

An existing utilities desktop study identified the following utilities in the vicinity of the level crossing. These are also presented in Figure 9-15 below.

- Electricity – ESB underground MV / LV ducts;
- Electricity – ESB overhead MV cables;
- Electricity – ESB overhead LV cables;
- Gas – GNI underground HP pipes;
- Gas – GNI underground MP pipes;
- Telecom – Virgin underground ducts;
- Telecom – Eircom underground ducts;
- Water – IW water main;
- Water – IW gravity foul/combined sewer;
- Water – Local Authority storm water sewer;

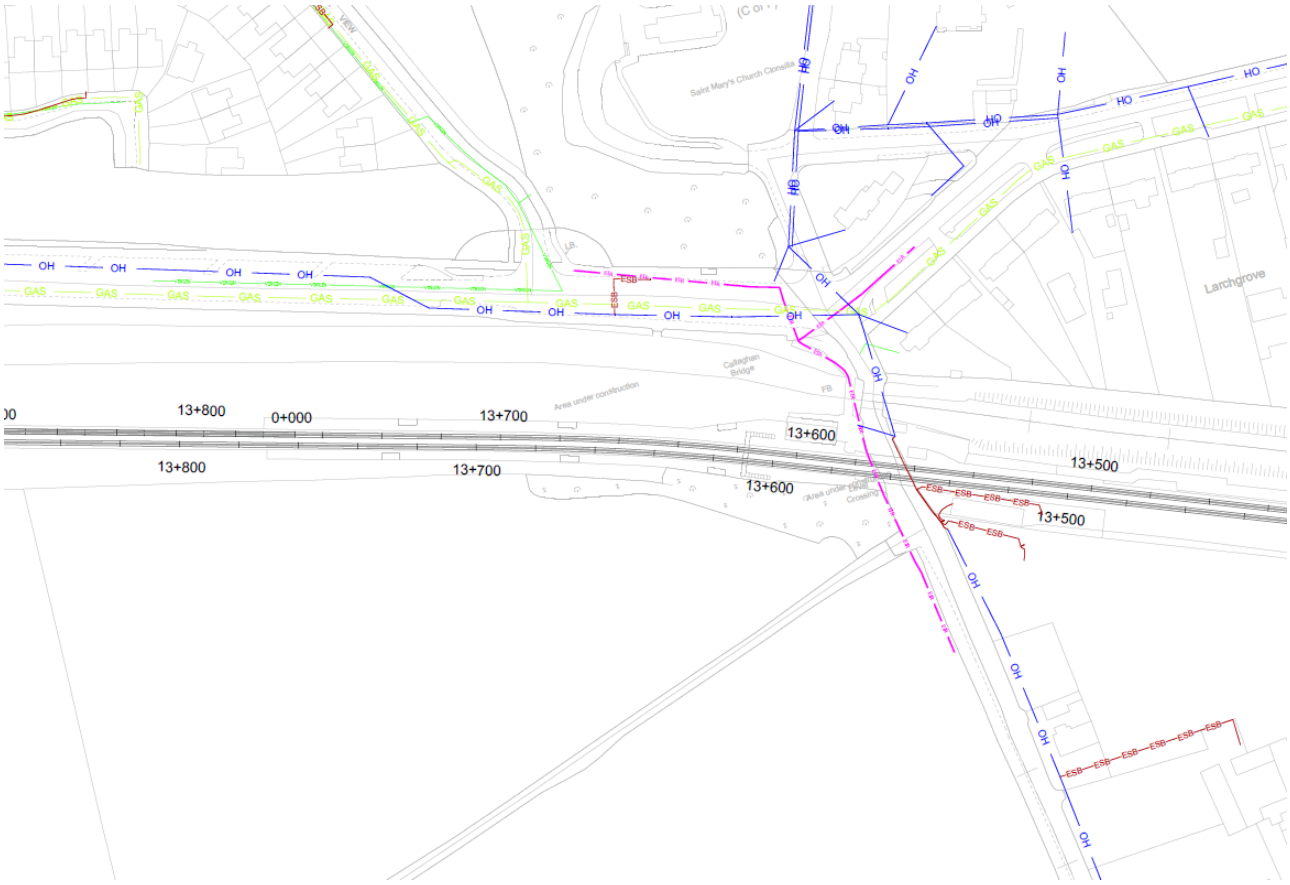

Figure 9-15 Porterstown Existing Utilities Records

Please refer to Volume 2 drawing MAY-MDC-UTL-ROUT-DR-C-0101_0167-P03-SH21 for additional detailed existing utilities information at Porterstown Level Crossing.

9.2.3.5 Barberstown Level Crossing

The XG012 Barberstown Level Crossing is located to the west of Clonsilla, XG012 Barberstown level crossing is located at Mileage 7mls 1320yds on the Dublin Sligo Railway Line. The railway at this location is twin track. Barberstown level crossing is approximately 1.2 kilometres from Clonsilla Station. The Dublin to Maynooth railway line crosses Milestown Road, which is a local road linking the R121 Kellystown Road and R149 Barnhill Road. The crossing is located immediately adjacent to the Royal Canal, which is spanned by Pakenham Bridge – a protected structure. All lands in the vicinity of the level crossing are currently rural in character with areas to the south of the crossing identified as local amenity area and lands to the north identified for housing and other development.

Figure 9-16 Barberstown Level Crossing

This crossing, currently under CCTV control, is situated in a rural setting and is lightly trafficked. The area is zoned for residential development within the Fingal Development Plan. Although lightly trafficked, closure of the crossing to vehicular traffic would result in a detour of approximately 8km.

Figure 9-17 Western approach to Barberstown level crossing

As highlighted in Figure 9-18 below the lands immediately to the west are zoned for substantial development as set out in the Barnhill Local Area Plan, February 2019 as are lands to the east closer to the Porterstown level crossing as set out in the Kellystown Draft Local Area Plan issues Paper of June 2019. This level crossing is expected to come under increased pressure due to the additional traffic movements created and Fingal County Council have received planning approval for the Ongar to Barnhill Distributor Road which any road bridge would need to tie in with to the west of the rail and canal.

Figure 9-18 Western approach to Barberstown level crossing

An existing utilities desktop study identified the following utilities in the vicinity of the level crossing. These are also presented in Figure 9-19 below.

- Electricity – ESB underground MV / LV ducts;
- Electricity – ESB overhead MV cables;
- Electricity – ESB overhead LV cables;
- Gas – GNI underground HP pipes;
- Telecom – Virgin underground pipes;
- Telecom – Aurora underground ducts;
- Telecom – Vodafone underground ducts;
- Water – IW water main;

Figure 9-19 Barberstown Existing Utilities Records

Please refer to Volume 2 drawing MAY-MDC-UTL-ROUT-DR-C-0101_0167-P03-SH22 for additional detailed existing utilities information at Barberstown Level Crossing.

9.2.3.6 Blakestown Level Crossing

The proposed development at XG014 Blakestown is located in the townland Blakestown in Co. Kildare. The existing Local Road L81206 that crosses the canal and railway at Blakestown is a minor road while the canal bridge - Deey Bridge, is a Protected Structure lying directly north of the level crossing over the Royal Canal. The L81206 is narrow local road of approximately 3m in width, has no hard shoulders and has limited verges. To the south of the level crossing the L81206 connects to the local road network and R449 while 90m north of the level crossing the road ties into the R148 Regional Road. The R148 was recently realigned southwards near this junction to accommodate the expansion of the Intel Ireland campus. The R449 Regional Road which connects the R148 to the M4 Motorway lies approximately 700m east of the level crossing and provides an alternative route for local traffic accessing the R148.

Figure 9-20 Blakestown Level Crossing

South of the existing level crossing the land both east and west of the road is in agricultural use. To the north east of the level crossing the land in by occupied by the Intel Ireland Leixlip Campus. Directly north west of the crossing there are number of houses and a bed and breakfast, north of here and the R148 there are farmlands and to the west of this lies Carton Demesne.

Figure 9-21 Deey Bridge

An existing utilities desktop study identified the following utilities in the vicinity of the level crossing. These are also presented in Figure 9-22 below.

- Electricity – ESB underground MV / LV ducts;
- Electricity – ESB overhead MV cables;
- Electricity – ESB overhead LV cables;
- Gas – GNI underground MP pipes;
- Telecom – Virgin underground ducts;
- Telecom – Eircom underground ducts;
- Water – IW water main;
- Water – IW gravity foul/combined sewer;

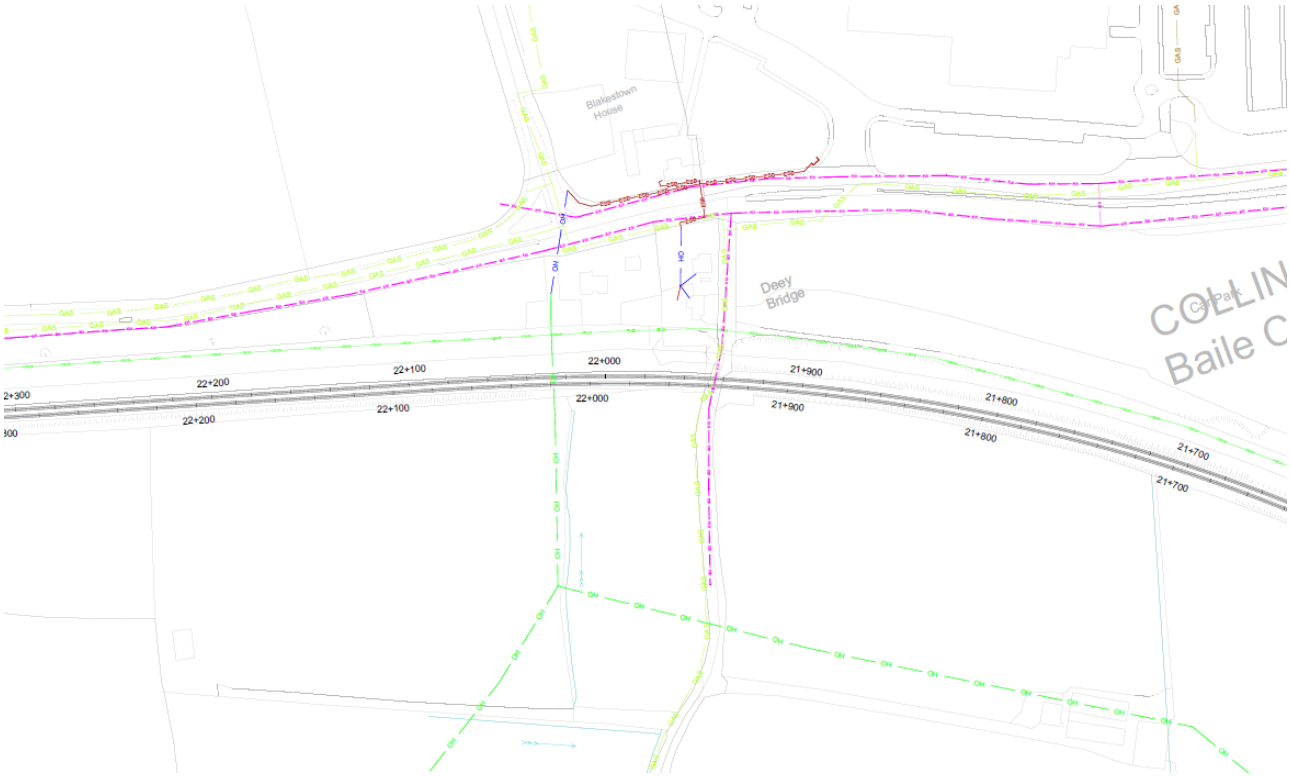

Figure 9-22 Blakestown Existing Utilities Records

Please refer to Volume 2 drawing MAY-MDC-UTL-ROUT-DR-C-0101_0167-P03-SH32 for additional detailed existing utilities information at Blakestown Level Crossing.

9.3 Level Crossing Options MCA Methodology

As described in Section 5 above the level crossing options assessment was developed with reference to CAF criteria and with specificity to the project objectives relating to the DART+. The Stage 1 Criteria and sub-criteria are set out in Table 9-1 below.

9.3.1 Stage 1 MCA Criteria and Sub-Criterion Level Crossing

The Stage 1 Criteria and sub-criteria are set out in Table 9-1 below.

Table 9-1 MCA Parameters, Criteria and Sub-criterion for Level Crossings

Paramater	Criteria	Sub-Criteria (Qualitative and/or and Quantitative)
1. Economy	Construction and Land Cost	Assessment of cost of construction of option, land costs, acquisition costs and temporary works
	Long Term Maintenance costs	Steel options vs concrete options for structures and maintaining level crossings versus removing them
	Traffic Functionality /economic benefit	Benefits to vehicular traffic through reduction in journey time lengths and delays through removal of level crossings. Consideration of potentially longer routes for traffic.
2. Integration	Transport Integration	Impact on scope for and ease of interchange between modes. Impact on the operation of other transport services both during

Paramater	Criteria	Sub-Criteria (Qualitative and/or and Quantitative)
		construction and in operation. New interchange nodes and facilities; Reduced walking and wait times associated with interchanges. Modal shift figures during construction and operations. Changes to journey times to transport nodes.
	Land Use Integration	Impact on land use strategies and regional and local plans. Assessment of support for land use factors local land use and planning. Inclusion of project in relevant local and regional planning documents.
	Geographical Integration	Impact on improvement of external links. Desire to link various geographical – mostly neutral due to localised nature of the level crossings. Overall electrification scheme would be highly positive.
	Other Government Policy	Integration with Government Policy, Smarter Travel, Investment Programmes, rail safety, electrification etc
3. Environment	Noise and Vibration	Summary of likely Noise and vibration effects during construction and operation. Estimated number of people likely to be affected by transport related noise with the scheme within 50m.
	Air Quality and Climate	Local air quality effects. Number of receptors within 50m.
	Landscape and Visual (including light)	Key landscape characteristics affected; Effects on listed/ key views; Impact on landscape character.
	Biodiversity (flora and fauna)	Potential compliance/conflict with biodiversity objectives; Indirect impacts on protected species, designated sites; Overall effect on nature conservation resource.
	Cultural, Archaeological and Architectural Heritage	Overall effect on cultural, archaeological and architecture heritage resource. Likely effects on RPS, National Monuments, SMRs, Conservation areas, etc. Number of designated sites/structures (by level of designation) directly impacted by scheme (land-take)
	Water Resources	Overall potential significant effects on water resource attributes likely to be affected during construction and operation.
	Agriculture and Non-Agricultural	Overall impact on land take & property. Number of properties to be impacted/acquired. Likely temporary or permanent severance effects, etc.
	Geology and Soils (including waste)	Soils and Geology and likely impact on geological resources based on preliminary/likely construction details. Soil resources to be developed/removed. Existing information relating to potential to encounter contaminated land. High-level assessment based on the likely structures/ works required and the potential for ground contamination due to historic landfills, pits and quarries.
	Radiation and Stray Current	Overall likely impact on existing sources of electromagnetic radiation.
4. Accessibility & Social inclusion	Impact on Vulnerable Groups	Impacts on low income groups, non-car owners, people with a disability. Quantification of increased service levels to these groups. Quantification of infrastructure and rolling stock improvements aimed at these groups; distribution of consumers surplus
	Stations Accessibility	Quantification of increased service levels to the vulnerable groups.

Paramater	Criteria	Sub-Criteria (Qualitative and/or and Quantitative)
	Social Inclusion	Quantification of service levels impacts including severance to all groups (Severance of local communities through removal of level crossings without connection would fair worst under this heading).
5.Safety	Rail Safety	Safety for Rail users – removal of LC positive in this respect
	Vehicular Traffic Safety	Quality of Access for these road users, lengths of diversions, removal of interface with rail and other modes of transport
	Pedestrian, Cyclist and Vulnerable Road user Safety	Quality of Access for these road users. removal of interfaces
6.Physical Activity	Connectivity to adjoining cycling facilities	Analysis of the extent that the scheme connects with cycle tracks.
	Permeability and local connectivity opportunity	Journey Time and lengths of diversions for active modes and numbers affected. Analysis of the connectivity between level crossing and green areas/key attractions related to active mode

9.3.1.1 Economic

The Economic assessment parameter is split into a number of criteria and associated sub-criteria as described below.

- *Construction and Land Cost*
- *Long Term Maintenance costs*
- *Traffic Functionality /economic benefit*

The methodology applied to the assessment of each of these criteria is described below.

Construction **and Land Cost:** The Construction and Land Cost criteria has been assessed under the following sub-criteria:

- *Construction Cost:*
  This sub-criterion relates directly to the cost of construction of each option. A high-level cost estimate was prepared for each option with the lowest construction cost option preferable to the highest construction cost option.
- *Land Cost:*
  This sub-criterion relates to the cost of land that may need to be purchased for each of the options. For the purpose of the MCA Stage 1 assessment this is based on the amount of land to be acquired for each individual option. Options that require more property acquisitions, acquisition of lands with planning permissions for development or impact greater extents of zoned development lands will be more expensive. Options with lower and less expensive land take requirement will score higher than options that require a larger extent of land or more expensive land.
- *Temporary Works:*
  This sub-criterion relates to the cost of temporary works required for the construction of the option. Options which require significant temporary works during construction will score lower than other options that require less temporary support. This criterion includes for temporary support of proposed structures, existing structures, and temporary support of the live railway if applicable.

Long Term Maintenance: Long term Maintenance criteria has been assessed under the following sub-criteria:

- *Structure Type:*
  Steel Vs Concrete Structures. Concrete Structures are preferable to steel bridges in the context of electrified railways as they require less clearance above the catenary infrastructure.

- *Structure Type:*
  Overbridge vs underbridge. From the perspective of long-term maintenance underbridges, i.e. where the railway passes under the road, are preferable to overbridges. Overbridges require more regular inspections and maintenance due to the additional loading imparted on the bridge from the passing trains. Overbridges are also more likely to be hit by over height vehicles which requires the railway to be temporarily shut pending structural assessment. Vehicle strikes also increase maintenance costs required.
- *Bridge Inspections:*
  Overbridge vs Under bridge
  No. of bridges in an option
- *Maintenance of Options*

Traffic Functionality/Economic Benefit: Traffic Functionality/Economic Benefit criteria has been assessed under the following sub-criteria:

- *Vehicular Traffic:*
  This sub-criterion relates to the benefit to traffic flows within the vicinity of the level crossing. Maintaining vehicular traffic along the existing route via a over bridge or under bridge while removing the existing level crossing is deemed beneficial compared to closing the level crossing and diverting traffic along an undesirable route. In some instances, it may be more desirable to divert traffic or construct a new carriageway to connect trip generating locations.

9.3.1.2 Integration

The Integration assessment parameter is split into a number of criteria and associated sub-criteria as described below.

- *Transport integration*
- *Land use integration*
- *Geographical Integration*
- *Other government policy*

Transport Integration: Transport integration addresses integration of the proposed options with existing and future transportation infrastructure and services.

Transport Integration has been assessed under the following sub-criteria:

- *Integration between modes of transport:*
- *This sub-criterion relates to the ease of transfer between different transport modes and services.*
- *Integration with the cycle network:*
- *This sub-criterion relates to how the proposed options integrate with existing and future cycling infrastructure, in particular, the GDA Cycle Network Plan.*
- *Integration with pedestrian facilities:*
- *This sub-criterion relates to how the proposed options integrate with pedestrian facilities in the vicinity of the level crossings.*

Land use integration: Land use integration is considered at two levels, as outlined in the *Common Appraisal Framework (CAF) for Transport Projects and Programmes* (DTTAS, 2016).

1. *Integration with land use policies and objectives; and*
2. *Integration with regional and local land use plans.*

Methodology - Land use integration

DDTAS states that "the reason why these aspects require separate consideration is that while regional and local policies may promote integration of transport and land use at the local level, they may run counter to national goals by, for example, promoting long distance commuting." It goes on to state "Projects should be assessed as to whether they support such national land use and transport objectives."

The assessment criteria under which this options assessment is undertaken is informed by DTTAS and is set out below.

Table 9-2 Land use integration Criteria

Criteria	Sub-criteria/ Qualitative Statement	Quantitative Statement
Land use integration	Assessment of compatibility with land use strategies and regional and local plans Assessment of support for land use factors	Inclusion of project in relevant local and regional planning documents

All of the options are assessed based on the above criteria. Some of the land use factors that have been taken into account include the extent to which the proposed project:

- *Provides opportunities for high density development, particularly at public transport nodes.*
- *Promotes the development of mixed land use neighbourhoods.*
- *Supports infill development.*
- *Supports the location of housing within existing urban areas rather than greenfield locations.*
- *Provides opportunities for use of non-vehicular modes, such as walking and cycling.*

A review of the existing land use plans is undertaken examining the land use zoning, policies and objectives within 500m of each level crossing. The planning policy documents reviewed include:

- *Dublin City Development Plan 2016 – 2022;*
- *Fingal Development Plan 2017 – 2023;*
- *Kildare County Development Plan 2017 – 2023;*
- *Ashtown – Pelletstown Local Area Plan 2014;*
- *Kellystown Local Area Plan 2019;*
- *Leixlip Local Area Plan 2020 – 2023;*

9.3.1.3 Environment

The Environmental parameter is split into a number of criteria and associated sub-criterion as described in Table 9-2 above.

- *Noise and vibration*
- *Air quality and Climate*
- *Landscape and Visual*
- *Biodiversity (flora and fauna)*
- *Cultural, archaeological and architectural heritage*
- *Water resources*
- *Agricultural and non-agricultural*
- *Geology and soils (include waste)*
- *Radiation and stray current*

Methodology – Environment

A study area was defined for each environmental sub-criterion under examination. GIS was then used to collate, map and analyse information where available including relevant planning policy, land use information, and publicly available environmental data from sources such as the NPWS, EPA, GSI, etc.

The key environmental data/ constraints are illustrated in a separate volume for the project in Appendix 6.3A of this report (To be completed). The baseline data collection informs the baseline characteristics of the environment under examination. It also to identifies areas or sites with specific statutory protection related to the environmental criteria, which is recognised as important and/ or sensitive from a planning and environmental perspective e.g. EU designated Sites, protected views, etc.

Option(s) which have the least impact on the environment factor under examination are scored based on the comparative assessment methodology. For example, options which have the least impact on the environmental factor under examination are scored the highest on the scale 'significant advantage over other options' (or high preference).

The option(s) which have the most significant impact on the environmental receptor under study are scored on the lowest on the scale 'significant disadvantage over other options'.

Option(s) that have a comparable environmental impact are assigned a scoring of comparable to all other options. The assessment are completed by specialists qualified in the specialists area under study and a degree of professional judgement is applied when completing the options selection study taking into consideration likely potential environmental impacts and the significant value of the environmental factor to be impacted.

9.3.1.4 Accessibility and Social Inclusion

Accessibility & Social Inclusion is divided into impact on vulnerable groups and impact on deprived geographic areas. The objective of the scheme in these respects is to avoid any impact on vulnerable groups and at the same time meet the broader objectives of the project.

The Accessibility and Social Inclusion assessment parameter is split into a number of criteria and associated sub-criteria as described below.

Impact on Vulnerable Groups

Impact on Vulnerable Groups criterion addresses the impact of the options on vulnerable road users and safety for vulnerable rail users. This sub-criterion relates to how the proposed options provide better facilities for vulnerable road users with the inclusion of enhanced pedestrian facilities providing a higher degree of safety and accessibility.

Station Accessibility

Station accessibility criterion assess whether the proposed options enhances accessibility to stations through provision of pedestrian routes and drop off and pick up facilities.

- *Increased pedestrian routes and permeability:*
  This sub-criterion relates to whether a proposed option provides enhanced pedestrian access to a station for existing or proposed public transport and existing communities and employment hubs.
- *Increased vehicular access:*
  This sub-criterion related to whether a proposed option provides enhanced vehicular access through improve roadways, signage, pick up/drop off facilities and parking facilities.

Social Inclusion

Social Inclusion criterion relates to impact on groups within the community.

- *Better connectivity between communities and groups.*
  This sub-criterion relates to whether the proposed option improves connectivity between existing communities or whether an option severs existing communities or groups.
- *Better connectivity between commercial hubs*
  This criterion relates to whether the proposed option improves connectivity between existing commercial hubs.

9.3.1.5 Safety

In order to assess the safety parameter associated with each of the proposed options a number of criteria and sub-criteria have been developed:

Rail Safety

The Rail Safety criterion assess whether the proposed option increases rail safety. In this respect Rail Safety has been split into

- *Removal/Closure of the level crossing*
  Removal or Closure of the level crossing will score highly as this removes the potential for vehicle or pedestrian train strikes.
- *Provision of under-bridges, i.e. roads under the railway*
  Under-bridges will score lower than over-bridges due to potential for bridge strikes by vehicles and oversized vehicles or loads carried by vehicles.
- *Provision of over-bridges, i.e. roads over the railway*
  Over-bridges will score higher than under-bridges as there is no potential for vehicle strikes. Over-bridges do pose a risk to objects being thrown from the bridge at passing trains.

Vehicular Traffic Safety

Vehicular Traffic Safety criterion access whether the proposed option impacts Vehicular Safety. To assess this criterion a number of sub-criterions have been developed:

- *Vertical and Horizontal Alignment:*
  Options which provide vertical and horizontal alignments that are within the standard parameters of the DMRB or DMURS will score higher than options that would be deemed as a departure from the standard.
- *Sight lines:*
  Options that provide adequate sight lines for road users will score higher than options that provide sub-standard sight lines.
- *Adjoining Junctions and Entrances:*
  Many of Irelands road traffic accidents occur at junctions, therefore options that provide equal or less junctions will score higher than options that increase the number of junctions.
- *Improvement to existing road network.*
  This sub-criterion assesses whether the options increase road safety. Collision data for each location was reviewed to determine if there were any locations that had multiple collisions.

Pedestrian, Cyclist and Vulnerable Road User Safety

Pedestrian, Cyclist and Vulnerable Road User Safety access whether the proposed options increase safety. To assess this criterion a number of sub-criterion have been developed as outlined below.

- *Pedestrian Safety:*
  Options which provide increased pedestrian safety through the inclusion of adequate footpaths, formalised crossing points and desire lines will score higher than options that do not.
- *Cyclist Safety:*
  Options which provide high quality cycle facilities and connectivity to existing cycle facilities will score high marks compared to options that do not.
- *Vulnerable Road Users Safety:*
  Options which provide vulnerable road users with a safer environment through the inclusion of tactile paving and other safety elements will score higher than options that do not.

9.3.1.6 Physical Activity

In order to assess the Physical Activity parameter a number of criteria and sub criteria have been developed as outlined below.

Connectivity to adjoining cycling facilities

This criterion assesses whether proposed options provide adequate connectivity to adjoining cycling facilities. Options which provide formalised connectivity taking account of desire lines will mark higher than options which do not provide adequate connectivity.

Permeability and local connectivity opportunity

This criterion assesses options on a number of sub-criterion:

- *Journey Time and Diversion Lengths*
  Options will be assessed on whether Journey times are negatively affected or if diversion routes will create a negative transport mode shift, i.e. diversion route length is to long to walk or cycle so people may opt to drive instead.
- *Connectivity between level crossing locations and green areas/key attractions which promote physical activity*
  Option will be assessed on whether the proposed options provide better connectivity to trip generators which promote physical activity.

9.3.2 Ashtown MCA Stage 1

9.3.2.1 Description of Options

In addition to the Do minimum and Do Nothing scenarios described in Section 9.2.1, the Do – Something Options assessed as Stage 1 MCA are described in Table 9-3 below:

Table 9-3 Ashtown Level Crossing Do – Something Options

Option	Description
Option 1	Online Overbridge
Option 2	Underbridge on Mill Lane
Option 3	Overbridge on Mill Lane
Option 4 & 4a	Link from River Road to Phoenix Park Station Grade Separated Junction and the construction of an underbridge structure at existing Ashtown level crossing for pedestrian and cycle access

Option	Description
Option 4 & 4b	Link from River Road to Phoenix Park Station Grade Separated Junction and the construction of an overbridge structure at existing Ashtown level crossing for pedestrian and cycle access
Option 5	Underbridge east of existing crossing
Option 6	Road Overbridge 250m east of existing crossing connection to Ashtown
Option 7	Road Overbridge 250m east of existing crossing with new link to Navan Road
Option 8	Provision of a Pedestrian/Cycle Overbridge
Option 9	Lowering of the Railway vertical alignment

Figure 9-23 below presents the options considered in Stage 1 MCA on aerial photography. Drawing **MAY–ROD-HRW-LC01-DR-C-0010** provided in Volume 2 shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background. Option 9 – Lowering of the Railway Vertical Alignment is not included in the drawing set.

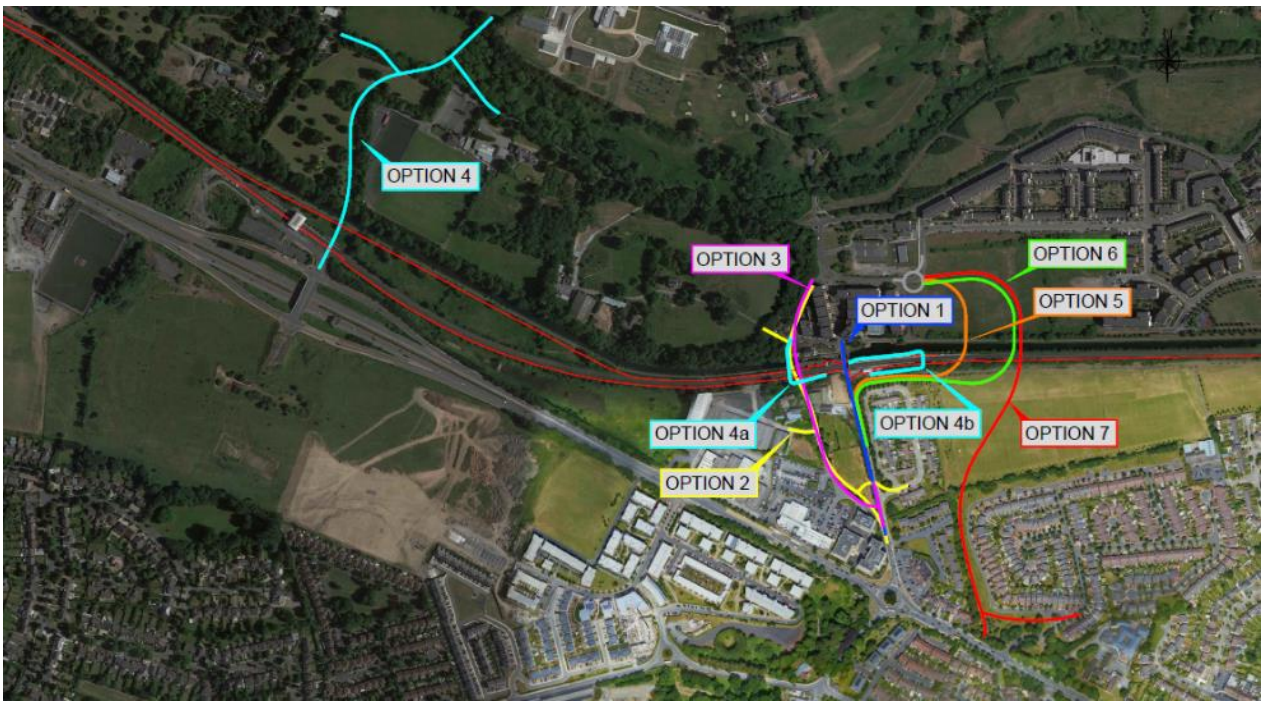

Figure 9-23 Ashtown Level Crossing Options (Copyright Ordnance Survey Ireland – 0039720)

Option 1 Online Overbridge

This online scheme would require the demolition of the existing protected bridge over the canal to provide a new bridged structure crossing the railway and canal. This would lift the existing carriageway by at least 5.5m above the railway line, accommodating a cross section of a 6.5m roadway with 1.8m footpaths on both sides and 2.5m two-way cycle track on the eastern side.

While the option of an online scheme might have been workable 15 to 20 years ago, it is considered infeasible since the construction of developments to the north of the level crossing. The topography is such that the northern approach (where the ground falls away towards the Tolka River) would be steep and would also require significant modifications to the recent development of the area, both over-ground and underground.

The length of the approach on the northern side would be approximately 120m and be at a gradient of 12% and 140m on the southern side at a gradient of 5%. The bridge over the rail line would be at a level of 51.9m above MSL (Mean Sea Level) with a deck level 7.3m above the rail level.

Figure 9-24 Ashtown Option 1 – Online Overbridge (Copyright Ordnance Survey Ireland – 0039720)

Option 2 – Underbridge on Mill Lane

This option would entail re-routing Ashtown Road along its old alignment (pre-Royal Canal) on Mill Lane and passing under both the railway and the Royal Canal. The option can accommodate a cross section of a 6.5m carriageway with 1.8m footpaths on both sides and 2.5m two-way cycle track on the eastern side. An at-grade turning head and drop-off are proposed to be provided in the green space to the south of Ashtown Station.

The length of the option is approximately 150m on the northern side and 300m south of the rail line. The option would drop to an approximate level of 37.5m above MSL under the rail which is a at a level of 45.6m above MSL at the crossing point. On the southern side a separate pedestrian and cyclist link and link to the riding school are proposed to maintain access for non-motorised use these would have cross section of 4.0m.

It is feasible to cross at this location, as it is upstream of the double lock on the canal and the canal is at the same approximate level as the adjacent railway. This option would require some property acquisition and modifications to existing accesses.

Figure 9-25 Ashtown Option 2 under rail and canal (Copyright Ordnance Survey Ireland – 0039720)

Option 3 – Overbridge on Mill Lane

This option would entail re-routing Ashtown Road along its old alignment (pre-Royal Canal) on Mill Lane and passing over both the railway and the Royal Canal. The option can accommodate a cross section of a 6.5m carriageway with 1.8m footpaths on both sides. An at-grade turning head and drop-off will be provided to the south of Ashtown Station.

The length of the option is approximately 150m on the northern side and 300m south of the rail line. The option would rise to an approximate deck level of 52.9m above MSL above the rail the rail which is a at a level of 45.6m above MSL at the crossing point. On the southern side a separate pedestrian and cyclist link and link to the riding school are proposed to maintain access for non-motorised use these would have cross section of 4.0m.

It is feasible to cross at this location, as it is upstream of the double lock on the canal and the canal is at the same approximate level as the adjacent railway. This option would require some property acquisition and modifications to existing accesses. It will extend further North to the river road and will extend into the lands of Ashtown House.

Figure 9-26 Ashtown Option 3 – Overbridge on Mill Lane (Copyright Ordnance Survey Ireland – 0039720)

Option 4+4a – Link from River Road to Phoenix Park Station Grade Separate Junction with Pedestrian / Cycle bridge in Ashtown

This option is located approximately 1km to the west of the existing level crossing at Ashtown at the grade separated junction on the Navan Road serving Phoenix Park Railway Station. At this location there is scope to construct a new road link over the canal and railway to link to River Road. This could either descend to tie into River Road or be designed to pass over it to cross the Tolka River and connect onwards to the Dunsink lands. In the latter case, a short spur would be provided to link to River Road, in both cases this would involve significant diversions and land acquisition. The option can accommodate a cross section of a 6.5m carriageway with 2m footpaths and 1.75m cycle tracks on both sides.

The road would be at a similar level to the existing Phoenix Park junction crossing the rail at a level of approximately 55.4m above MSL before descending to tie to the level of the River Road at a level of 34.7m above MSL. The road on the northern side would be at a gradient of approximately 6% over a length of approximately 300m.

This option also includes the construction of a new tunnel under the rail line and canal at Ashtown to provide pedestrian and cycle access. This option would drop to a level of approximately 40.1m above MSL to tie in with the existing road to the north of the rail line providing a pedestrian and cycling link north and south of the rail line with a 6m wide cross section in order to match the existing cross sections of the surrounding road network with a 3m footway..

Figure 9-27 Ashtown Option 4 over rail and canal at Phoenix Park Station (Copyright Ordnance Survey Ireland – 0039720)

Figure 9-28 Ashtown Option 4A complimentary pedestrian and cycle underpass at Ashtown
(Copyright Ordnance Survey Ireland – 0039720)

Option 4+4b - Link from River Road to Phoenix Park Station Grade Separated Junction

This option is considered in combination with Option 4 described above and also includes a pedestrian cycle overbridge structure with a 5m wide cross section (Option 4b) over the canal and railway. It includes the demolition of both the existing cable stayed footbridge at the level crossing and the station footbridge to provide space for the proposed bridge.

The proposed bridge would cross the rail and Canal at a level of approximately 50.0m above MSL where the rail is at a level of 43.0m above MSL and the canal at a level of 39.7m above MSL.

Figure 9-29 Ashtown Option 4B - complimentary pedestrian and cycle overbridge at Ashtown
(Copyright Ordnance Survey Ireland – 0039720)

Option 5 – Underbridge East of Existing Crossing

This option would involve construction of a new road link parallel to the south of canal before turning northwards and under the rail and canal to connect with Rathborne Avenue to the north of the Canal. This route would descend from the Ashtown Road and run between Ashtown Railway Station and Martin Savage Park residential estate. The route would cross under the railway and canal at right angles before rising in a cutting to join into the existing circulatory roads to the north of the Pelletstown Development, impacting on the development lands. Th e option can accommodate a cross section of a 6m carriageway with 1.8m footpaths and 1.7m cycle track on the western side side of the carriageway and a 1.5m footpath and 1.5m cycle track on the eastern side of the carriageway.

The railway is at a level of 42.5m above MSL and the canal at a level of 39.5m above MSL with this option at a level of 32.0m MLS below providing 3.7m clearance. Due to the required levels for tying into the existing road network the normal clearance envelope under the railway would have to be reduced.

This option would have the disadvantage that it would not have the necessary design clearance for double decker buses, other higher delivery vehicles and service vehicles that use this route at present. As the option

would be in a cutting for most of its length this would be a disadvantage to cyclists, pedestrians and vulnerable road users. The underpass would also require a pumped drainage system.

Figure 9-30 Ashtown Option 5 – Underbridge East of Existing Crossing (Copyright Ordnance Survey Ireland – 0039720)

Option 6 – Overbridge 250m east of existing crossing with connection to Ashtown

This option would cross the railway and canal approximately 250m east of the existing level crossing. It incorporates a tightly curved plan layout which facilitates a link to the existing Ashtown road at the train station. The link would traverse the green area between Ashtown Station and Martin Savage Park and would climb to cross over the railway and canal to tie into the new circulation roads through the Pelletstown Development, impacting on the development lands. The option can accommodate a cross section of a 8m carriageway with 1.8m footpaths on both sides and 2.5m two-way cycle track on both sides .

The option would bridge over the railway and canal with approach gradients of 6% either side. The rail level at the crossing is approximately 42.1m above MSL and the canal at 39.3m above MSL with the bridge level over the railway at 50.00m above MSL. The road level crests to a height of 52.0m above MSL, 60m south of the rail line before descending over the rail and canal. The option can be walled or can be constructed with open embankments to provide a softer texture to the scheme. The provision of landscaped embankments would result in a need for more land acquisition.

There would also be impacts on Martin Savage park home to St Oliver Plunket's GAA club to the south and would be located within zoned housing development land within the Ashtown - Pelletstown SDZ to the north of the rail line and canal.

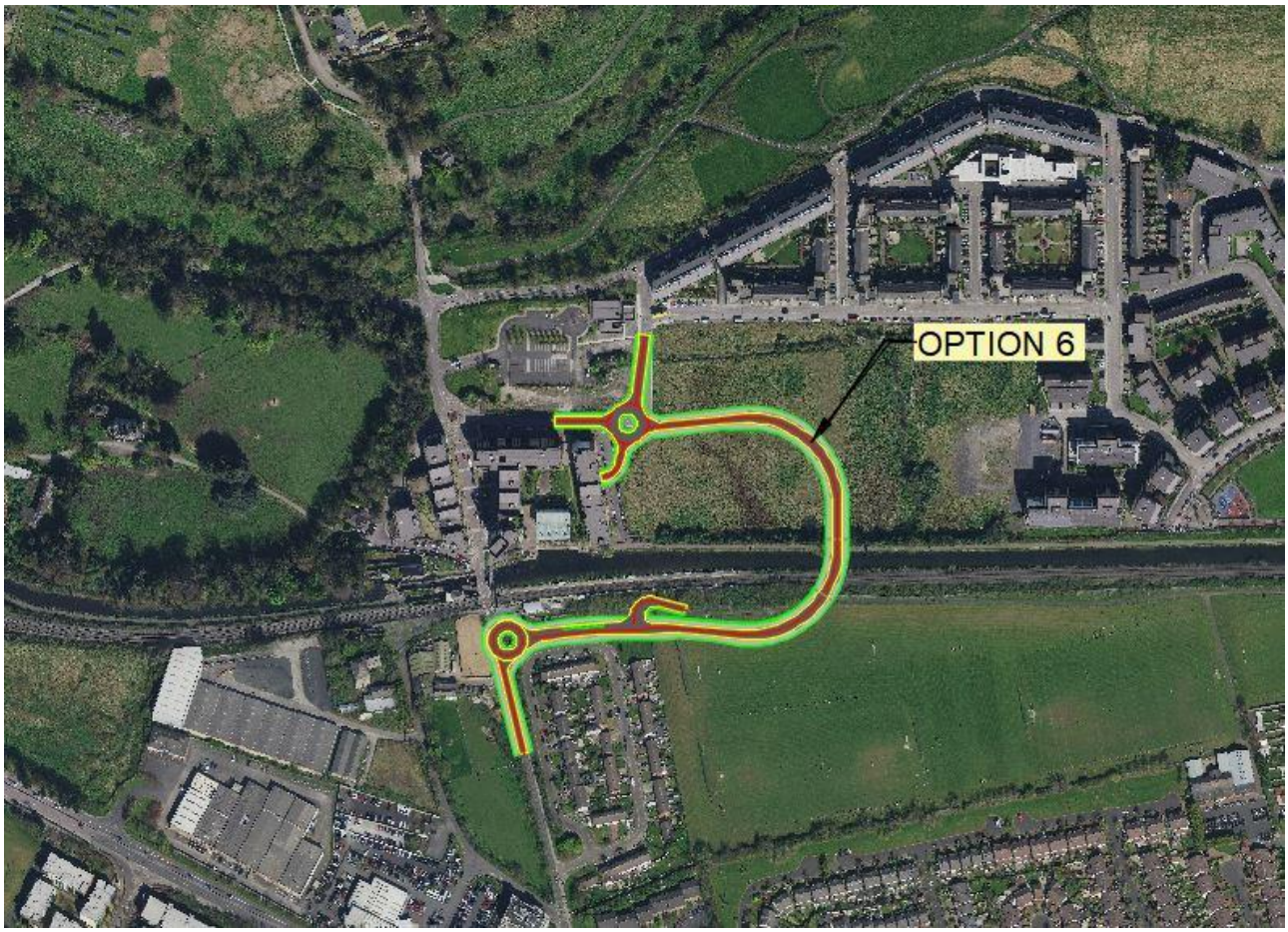

Figure 9-31 Ashtown Option 6 – Overbridge 250m east of existing crossing (Copyright Ordnance Survey Ireland – 0039720)

Option 7 - Road Overbridge 250m east of existing crossing with new road link to Navan Road

This option would involve the construction of a new road in front of Kempton Gardens from the Navan Road and a new bridge over the canal and railway accommodating a cross section of a 6.5m carriageway with 2m footpaths and 1.5m cycle tracks on both sides.

The option would bridge over the railway and canal with approach gradients of 6% either side. The rail level at the crossing is approximately 42.1m above MSL and the canal at 39.3m above MSL with the bridge level over the railway at 50.00m above MSL. The road level crests to a height of 52.0m above MSL, 60m south of the rail line before descending over the rail and canal.

The route would then tie into the new circulation roads through the Pelletstown Development to the north of the canal. S eparate 4m wide shared space cycle and pedestrian facilities to be provided both north of south of the canal linking from Ashtown Road to the proposed option.

This option will have impacts on the residents of Kempton Gardens. Furthermore, it would require the construction of a significant new junction on the Navan Road. There would also be impacts on Martin Savage park home to St Oliver Plunket's GAA club to the south and would be located within zoned housing development land within the Ashtown - Pelletstown SDZ to the north of the rail line and canal. The option can be walled or can be constructed with open embankments to provide a softer texture to the scheme. The provision of landscaped embankments would result in a need for more land acquisition.

Figure 9-32 Ashtown Option 7 – Overbridge with connection to the N3 Navan Road (Copyright Ordnance Survey Ireland – 0039720)

Option 8 – Provision of a Pedestrian/Cycle Overbridge

This option includes the provision of a new Pedestrian and cycle footbridge with a 3m wide cross section over the canal and railway, It include the demolition of the existing cable stayed footbridge at the level crossing and the station footbridge to provide space for the proposed bridge.

The proposed bridge would cross the rail and Canal at a level of approximately 50.0m above MSL where the rail is at a level of 43.0m above MSL and the canal at a level of 39.7m above MSL.

Separate pedestrian stairs could be provided with this option as well to ease pedestrian access and rails for pushing cycle on if required.

Constraints on bridge crossing here include the train station, the Royal Canal, the protected railway structures, and the canal bridge. Vehicular traffic will need to divert around the crossing, the diversion being an estimated 4.8km to the west or 5.7km to the east.

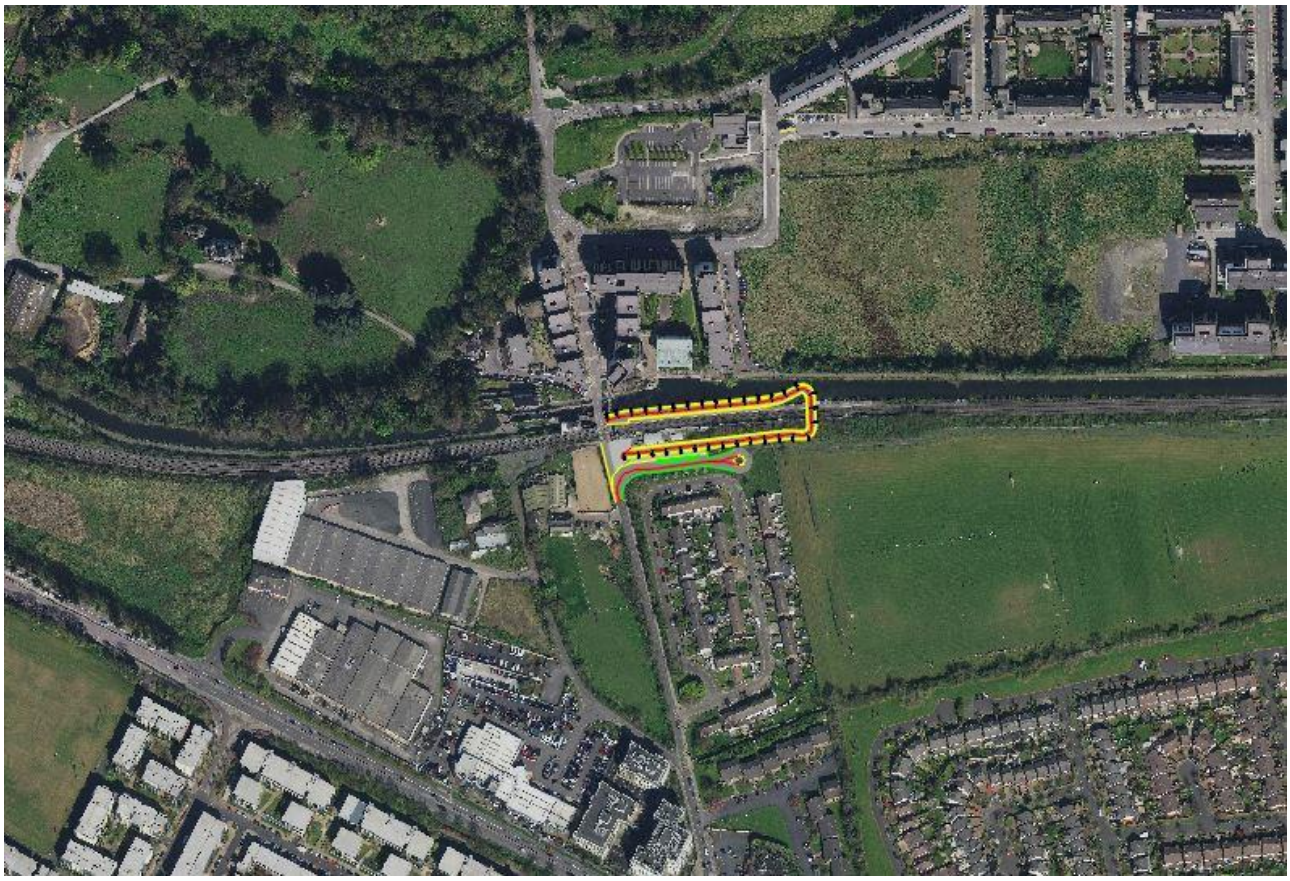

Figure 9-33 Ashtown Option 8 – Provision of a Pedestrian/Cycle Overbridge (Copyright Ordnance Survey Ireland – 0039720)

Option 9 – Lowering of the railway vertical alignment

This Option would entail lowering the track alignment for approximately 1km east and west of Ashtown Station with a track gradient of maximum 1%. This would result in a 7m clearance for overhead cables at the location of the existing level crossing. A road bridge would be required at the location of the existing level crossing to facilitate traffic movements. The proposed road bridge would tie in with the existing protected canal bridge. The existing station, footbridge and building on the south west side of the crossing would need to be demolished to facilitate the works.

Ashtown Station would be reconstructed at ground level with pedestrian access to the platform at track level. The platform would be approximately 200m in length on both sides of the railway line. A new footbridge would be required for passengers to access the northern platform.

On the eastern approach the rail line is bounded by playing fields and residential properties to the south and the Royal Canal and Ashtown town centre to the north. To facilitate the lowering of the rail line, retaining walls would be required on the north and south side of the rail line. The height of the retaining walls would range from 2m to 7m.

On the western approach the rail line is bounded by a commercial centre car park, stables and fields to the south and the Royal Canal, fields and Ashtown town centre where the canal deviates to the north on the northern side. The track vertical realignment will extend to the Navan Road Parkway Station. Alterations to the Parkway Station could be avoided by reducing the depth of the cut for lowering the railway and increasing the soffit level of the new road bridge at the level crossing.

This option would have significant impact on the royal canal channel and all of the associated heritage structures along the realigned section of railway. This includes the masonry arched bridge, the locks and the lock keepers cottage.

9.3.2.2 Preliminary Options Assessment

Table 9-4 below provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in Appendix 6.3B.

Table 9-4 Stage 1 MCA Matrix

Criteria	Do Nothing	Do Min	Options									
			1	2	3	4+4a	4+4b	5	6	7	8	9
Economy												
Integration												
Environment												
Social inclusion												
Safety												
Physical Activity												
Shortlisted for Stage 2 MCA	No	No	No	**Yes**	No	**Yes**	**Yes**	No	**Yes**	No	No	No

9.3.2.3 Summary and Recommendations

As shown above Option 2, Option 4a, Option 4b and Option 6 will progress for a more detailed MCA Stage 2 assessment.

- Option 2 – Underbridge on Mill Lane
- Option 4a – Link from River Road to Phoenix Park Station Grade Separated Junction and the construction of an underbridge structure at existing Ashtown level crossing for pedestrian and cycle access;
- Option 4b - Link from River Road to Phoenix Park Station Grade Separated Junction and the construction of an overbridge structure at existing Ashtown level crossing for pedestrian and cycle access;
- Option 6 - Road Overbridge 250m east of existing crossing connection to Ashtown

9.3.3 Coolmine MCA Stage 1

9.3.3.1 Description of Options

In addition to the Do minimum and Do Nothing scenarios described in Section 9.2.1, the Do – Something Options assessed as Stage 1 MCA are described in Table 9-5 below:

Table 9-5 Coolmine Level Crossing Do – Something Options

Option	Description
Option 1	Online Overbridge.
Option 2	Online Underbridge with Opening Canal Bridge.
Option 3	New Overbridge Connecting St. Mochta's Grove to Luttrellpark Road with Footbridge at station.
Option 4	New Underbridge with Opening Canal Bridge Connecting St. Mochta's Grove to Luttrellpark Road.
Option 5	New Underbridge Connecting St. Mochta's Grove to Luttrellpark Road with Diversion of Canal Over Proposed Road.
Option 6	Overbridge to East of Coolmine Road.
Option 7	Provision of a Pedestrian/Cycle Overbridge.
Option 8	Lowering of the Railway Vertical Alignment

Figure 9-34 below presents the options considered in Stage 1 MCA on aerial photography. Drawing **MAY–ROD-HRW-LC02-DR-C-0020** provided in Volume 2 shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background. Option 8 – Lowering of the Railway Vertical Alignment is not included in the drawing set.

Figure 9-34 Coolmine Level Crossing Options (Copyright Ordnance Survey Ireland – 0039720)

Option 1 – Online Overbridge

This online option is proposed along the existing Coolmine Road, north of the rail line and canal and along Carpenterstown Road to the south. The option extends for 245m to the north and 210m to the south, accommodating a cross-section of a 7m wide carriageway with 2m wide footway either side. There is insufficient room with this option to accommodate dedicated cycle tracks without increasing the overall road footprint and impact on the adjacent properties further.

Figure 9-35 Coolmine Option 1 – Online Overbridge (Copyright Ordnance Survey Ireland – 0039720)

The high side of the railway is currently at a level of 65.3m above MSL at the existing level crossing with the proposed overbridge structure being at a minimum road level of 72.6m above MSL to provide the minimum clearance required for the electrification of the railway line. Embankment heights adjacent to properties north of the railway would be up to 6.6m while houses immediately south west of the railway line would have embankments in the order of 6.4m high adjacent to them.

A structure approximately 30m in length and at an elevation of approximately 7.3m would be required to span the railway and canal. The option would involve the construction of walled approaches to the bridge as there is insufficient space available for the construction of embankments. Initial examination suggests that the works would extend approximately 160m along Coolmine Road on each approach to the bridge. Construction is likely to require the provision of noise abatement measures approximately 2.0m above to the embankment.

This option would also potentially require the demolition of the protected Kirkpatrick Bridge if not fully spanned.

Option 2 – Online Underbridge with Opening Canal Bridge

This online option is proposed along the existing Coolmine Road north of the railway line, canal and along Carpenterstown Road to the south. The option extends for 245m to the north and 210m to the south, accommodating a cross-section of a 7m wide carriageway with 2m wide footway either side. There is insufficient room to accommodate dedicated cycle tracks without increasing the overall road footprint and impact the adjacent properties further.

This option would entail passing under the railway through a tunnel /underpass structure and over the canal. Given the limited height clearance available, any bridge over the canal would require an opening spa n. Such a scheme would involve the construction of walled approaches to the bridge as there is insufficient space available for the construction of cut slopes. The cuttings would extend approximately 160m along the Coolmine Road on each approach to the bridge.

Figure 9-36 Coolmine Option 2 – Online Underbridge with opening canal bridge (Copyright Ordnance Survey Ireland – 0039720)

The low side of the railway is at a level of 65.0m above MSL at the existing level crossing, with the proposed tunnel /underpass structure at a level of 57.7m above MSL to provide the minimum clearance required for the electrification of the rail line. A lifting structure at a similar level would be required for the canal.

This option would require the demolition of the listed Kirkpatrick Bridge as its existing structure would be in the way of the proposed tunnel / underpass structure.

Option 3 – New Overbridge connecting St. Mochta's Grove/ Station Court to Riverwood Court and footbridge

This option involves a new bridge and road over the railway line and canal connecting the north of St. Mochta's Grove / Station Court to the south of the Riverwood Court road. The option extends for 320m to the north and 170m to the south, accommodating a cross-section of a 10m wide carriageway with 2.4m wide footpaths on both sides. A new roundabout junction to the south at the intersection of the Riverwood Court road with the Riverwood Distributor Road would be required along with realignment of the Riverwood Distributor Road.

Figure 9-37 Coolmine Option 3 – New overbridge connecting St. Mochta's Grove to Lutterallpark Road (Copyright Ordnance Survey Ireland – 0039720)

A structure approximately 50m in length would be required to span the railway line and canal. Initial examination suggests that the embankments would extend approximately 160m on each approach to the bridge. Embankment heights on either side of the railway would be up to 8.0m high. The existing railway level at the proposed crossing point is at approximately 65.1m above MSL with the highest proposed road level at 73.1m above MSL.

Embankment construction is likely to require the provision of noise abatement measures approximately 2.0m high above to the embankment. This option would also entail the acquisition and demolition of at least one property on the north side of the canal on Sheepmore Lane.

This option is considered to be too remote from the existing station for both pedestrians and cyclists and therefore a pedestrian and cyclist bridge is also provided at the existing level crossing to accommodate continued access from the north to Coolmine Station and vice versa.

Option 4 – New Underbridge with Opening Canal Bridge Connecting St. Mochta's Grove to Riverwood Court

This option would entail passing under the railway and over the canal. Given the limited height clearance available, any bridge over the canal would require an opening span. This option involves a new bridge under the railway and another opening bridge over the canal connecting the north of St. Mochta's Grove / Station Court to the south of the Riverwood Court road. The option extends for 320m to the north and 170m to the

south, accommodating a cross-section of a 7m wide carriageway with 2m wide footpaths and 1.5m wide cycle tracks on both sides. A new roundabout junction to the south at the intersection of the Riverwood Court road with the Riverwood Distributor Road would be required along with realignment of the Riverwood Distributor Road.

Two structures approximately 50m in total length would be required to go under the railway and span the canal. The initial assessment indicates that the approach cuttings would extend for at least 160m on each approach to both bridges.

The existing railway level on the low side at the proposed crossing point is at approximately 64.8m above MSL with the proposed road level at the tunnel /underpass structure and bridge over the canal proposed at a level of approximately 57.5m above MSL. This option would also entail the acquisition and demolition of at least one property on the north side of the canal on Sheepmore Lane.

Figure 9-38 Coolmine Option 4 – New Underbridge with Opening Canal Bridge Connecting St. Mochta's Grove to Riverwood Court (Copyright Ordnance Survey Ireland – 0039720)

This option is considered to be too remote from the existing station for pedestrians and cyclists. Measures would therefore be required to accommodate their continued access from the north to Coolmine Station at or near the location of the existing level crossing.

Option 5 – New Underbridge Connecting St. Mochta's Grove / Station Court to Riverwood Court with Diversion of Canal over Proposed Road

This option involves a new bridge under the railway and diverting the canal over the proposed road which will connect the north of St. Mochta's Grove / Station Court to the south of Riverwood Court road. The option extends for 320m to the north and 170m to the south accommodating a cross section of a 7m wide carriageway with 2m wide footpaths and 1.5m wide cycle tracks on both sides. A new roundabout junction to the south, at the intersection of the Riverwood Court road with the Riverwood Distributor Road would be required along with realignment of the Riverwood Distributor Road.

This option would entail passing under the railway and diverting the canal over the proposed road via a system of locks. Given the requirement to achieve suitable clearance for double decker buses and other high vehicles

along the proposed road, the canal would need to be diverted via two double locks. The existing railway level on the low side at the proposed crossing point is at approximately 64.8m above MSL with the proposed road level at the tunnel /underpass structure at a level of approximately 57.5m above MSL.

The new canal locks would then need to be raised by at least 2.5-3m higher than the existing rail level, to a level of 68m above MSL. This would also involve significant works on the canal and installation of facilities for the new locks. T he option would be in a cutting on the approach to the proposed bridge under the railway over 160m on either side.

This option is considered to be too remote from the existing station for pedestrians and cyclists and some measures would therefore be required to accommodate their continued access from the north to Coolmine Station at or near the location of the existing level crossing.

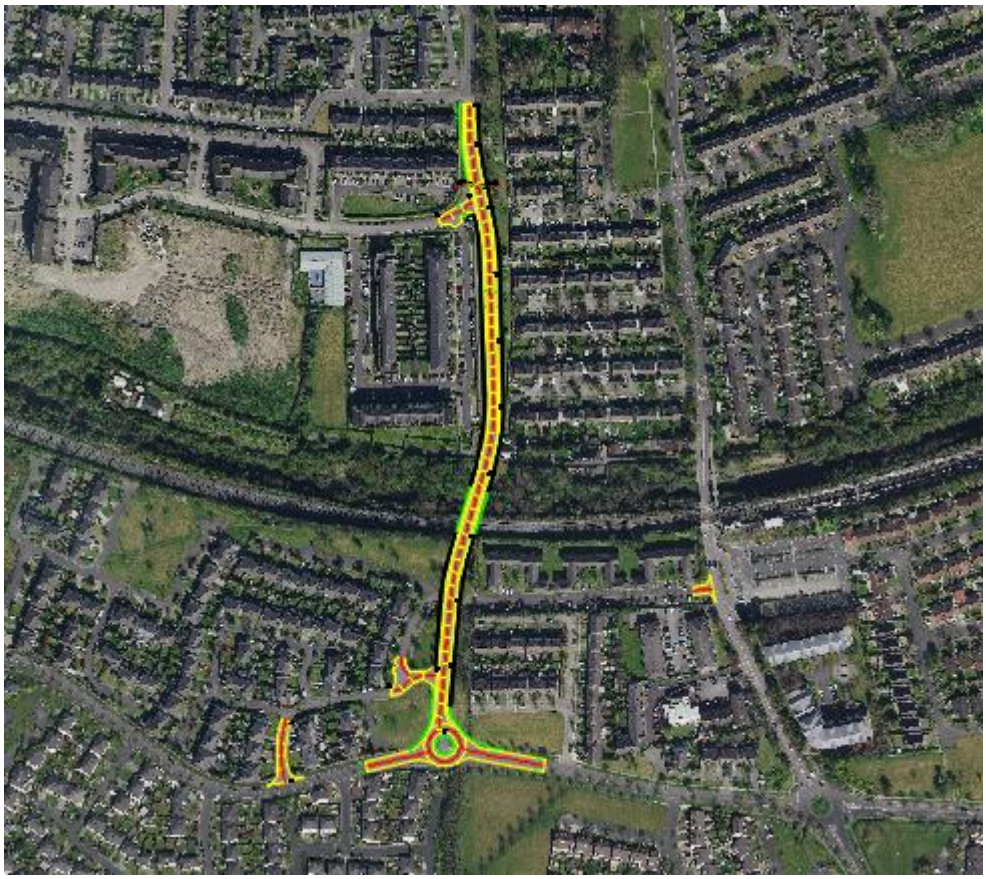

Figure 9-39 Coolmine Option 5 - New Underbridge Connecting St. Mochta's Grove / Station Court to Riverwood Court with Diversion of Canal over Proposed Road (Copyright Ordnance Survey Ireland – 0039720)

Option 6 – Overbridge to east of Coolmine Road and Carpenterstown Road

This option involves the offline construction of an overbridge, to the east of the existing Coolmine Road and Carpenterstown Road accommodating a cross-section of a 6.5m wide carriageway with 2m wide footpaths and 2.5m two-way cycletracks on both sides. The road would consist of a series of tight horizontal curves and at a gradient of at least 6% on both southern and northern approaches to the bridge. The geometry would be to DMURS standards with minimum radii horizontal radii. The length of the option would be approximately 320m.

A structure approximately 65m in length would span over the railway and canal, 80m east of the existing level crossing. The high side of railway at the bridge crossing point is at a level of 65.0m above MSL, with the

proposed overbridge structure being at a minimum road level of 71.5m above MSL to provide the minimum clearance required for the electrification of the rail line. The bridge structure would likely be similar to Reilly's Bridge on the Ratoath Road in form to allow for a shallower deck depth, allowing for the shortened approach road lengths while maintaining a suitable gradient on the road.

Embankment heights adjacent to properties north and south of the railway would be up to 6.6m. Noise abatement measures approximately 2.0m above to the embankment will be required here.

There would have impacts on properties to the east of the diversion with acquisition likely both north and south of the rail line.

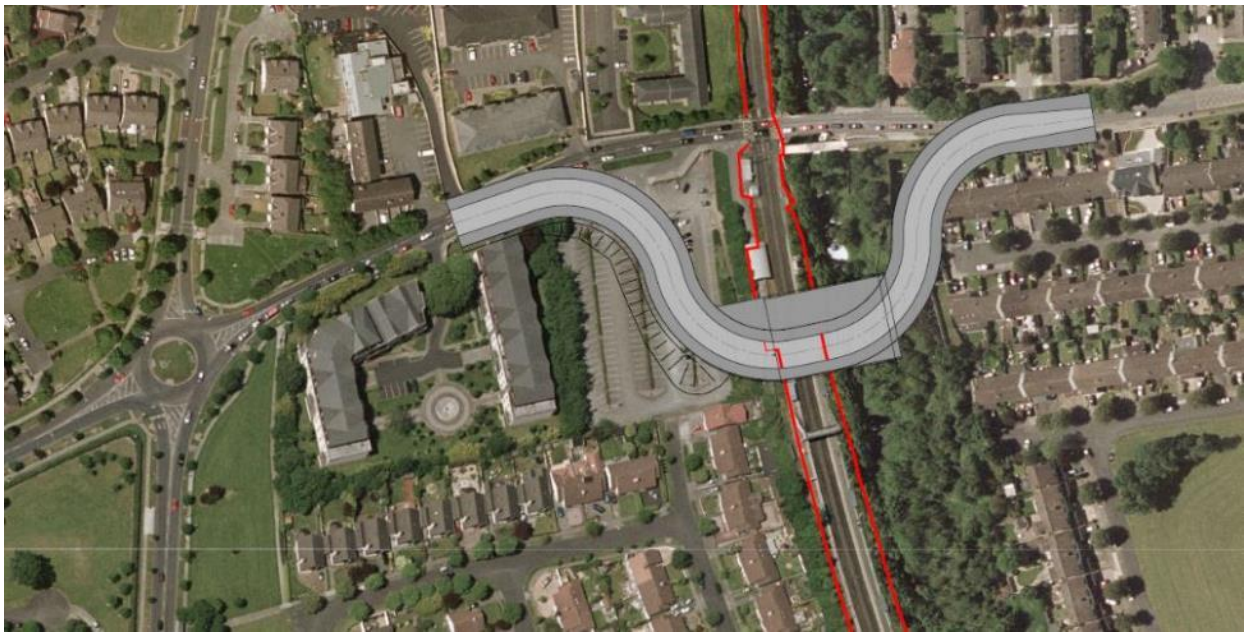

Figure 9-40 Coolmine Option 6 - Overbridge to east of Coolmine Road (Copyright Ordnance Survey Ireland – 0039720)

Option 7 – Provision of a Pedestrian/Cycle Overbridge

This option includes the provision of a new Pedestrian and cycle footbridge at 3.0m in width. The bridge provides a connection between Coolmine road to the north of the rail, and the Coolmine Rail Station to the south. The arrangement of the bridge utilises a set of ramps switchback ramps both north and south of the rail and canal crossing.

The high side of railway at the bridge crossing point is at a level of 65.1m above MSL with the proposed overbridge structure being at a minimum road level of 71.5m above MSL to provide the minimum clearance required for the electrification of the rail line. The ramps on either side of the bridge will not exceed 5% gradient.

Separate pedestrian stairs could be provided with this option as well to ease pedestrian access and rails for pushing cycles on if required.

Constraints on bridge crossing here include the train station, the Royal Canal, the protected railway structures, and the canal bridge. Vehicular traffic, without the provision of another road option, will need to divert around the crossing, the diversion being an estimated 3.4km to the west and 5.1km to the east.

Figure 9-41 Coolmine Option 7 - Provision of a Pedestrian/Cycle Overbridge (Copyright Ordnance Survey Ireland – 0039720)

Option 8 – Lowering of the Railway Vertical Alignment

This Option would entail lowering the track alignment for approximately 1km east and west of Coolmine Station with a track gradient of maximum 1%. This would result in a 7m clearance for catenary infrastructure at the location of the existing level crossing. A road bridge would be required at the location of the existing level crossing to facilitate traffic movements. The gradient of the track could be modified to reduce the level of cut with the corresponding road bridge soffit level increasing to provide sufficient height for the catenary infrastructure.

Coolmine Station would be reconstructed at ground level with pedestrian access to the platform at track level. The platform would be approximately 200m in length on both sides of the railway. A new footbridge would be required for passengers to access the northern platform.

On the eastern approach the rail line is bounded by Coolmine Station and associated parking, residential properties and a public park to the south and the Royal Canal to the north with housing to the north of the canal. To facilitate the lowering of the rail line, retaining walls will be required on the north and south side of the rail line. The height of the retaining walls would range from 2m to 7m.

On the western approach the rail line is bounded by residential properties and St. Mochtas Football Club to the south and the Royal Canal to the north with housing to the north of the canal. The vertical realignment of the track will extend under the Diswellstown Road viaduct and Porterstown Level Crossings. Temporary support of the viaduct would be required during construction.

If this option, Option 8, is determined to be the Emerging Preferred Option the preferred option for the Porterstown Level Crossing would need to take account of the new rail level.

Figure 9-42 Coolmine Option 8 - Lowering of the Railway Vertical Alignment (Copyright Ordnance Survey Ireland – 0039720)

9.3.3.2 Preliminary Options Assessment

Table 9-6 below provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in **Appendix 6.3B**.

Table 9-6 Stage 1 MCA Matrix

Criteria	Do Nothing	Do Min	Options							
			1	2	3	4	5	6	7	8
Economy										
Integration										
Environment										
Social inclusion										
Safety										
Physical Activity										
Shortlisted for Stage 2 MCA	No	No	Yes	No	Yes	No	No	Yes	Yes	No

9.3.3.3 Summary and Recommendations

As shown above Option 1, Option 3, Option 4 and Option 6 will progress for a more detailed MCA Stage 2 assessment.

- Option 1 – Online Overbridge;
- Option 3 – New Overbridge Connecting St.Mochta's Grove to Luttrellpark Road;
- Option 4 – Under Rail and Over Canal; and
- Option 6 – Overbridge to east of Coolmine Road.

9.3.4 Porterstown MCA Stage 1

9.3.4.1 Description of Options

In addition to the Do minimum and Do Nothing scenarios described in Section 9.2.1, the Do – Something Options assessed as Stage 1 MCA are described in Table 9-7 below:

Table 9-7 Porterstown Level Crossing Do – Something Options

Option	Description
Option 1	Pedestrian Link to Porterstown Viaduct
Option 2	Pedestrian and Cycle Bridge – Nested Ramps
Option 3	Pedestrian and Cycle Bridge – Straight Approach Ramps
Option 4	**Pedestrian and Cycle Bridge – Alternative Nested Ramps**

Figure 9-43 below presents the options considered in Stage 1 MCA on aerial photography. Drawing MAY-ROD-HRW-LC03-DR-C-0030 provided in Volume 2 shows the Options considered in MCA Stage 1 on aerial photography and OS Mapping background.

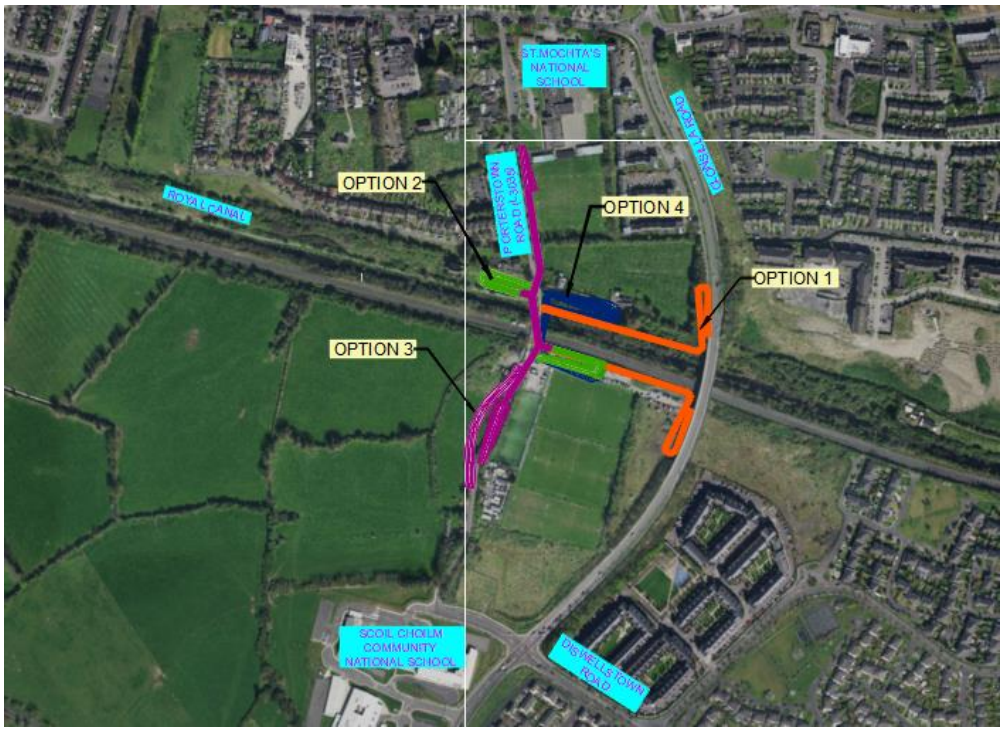

Figure 9-43 Porterstown Level Crossing Options (Copyright Ordnance Survey Ireland – 0039720)

Option 1 – Pedestrian link to Porterstown Viaduct

This option proposes two pedestrian footpaths of 5.6m in width both north and south of the railway line and Royal Canal connecting Old Porterstown Road to the Porterstown Viaduct on the Diswellstown Road (R121 at Dr. Troy bridge – a vehicular and pedestrian carriageway).

Figure 9-44 Option 1 Link to Porterstown Viaduct (Copyright Ordnance Survey Ireland – 0039720)

Option 2 – Pedestrian and Cycle Bridge – Nested Ramps

This option includes the provision of a new Pedestrian and cycle footbridge at 5m in width. The bridge provides a connection between Porterstown road either side of the crossing. The arrangement of the bridge utilises nested ramps to the north and south of the rail where it crosses.

The rail level at the crossing is approximately 63.15m above MSL with the bridge level over the railway at 69.65m above MSL. The ramps on either side of the bridge will not exceed 5% gradient.

Figure 9-45 Option 2 Pedestrian and Cycle Bridge – Nested Ramp (Copyright Ordnance Survey Ireland – 0039720)

Option 3 – Pedestrian and Cycle Bridge – Straight Approach Ramp

This option follows the same bridge alignment as Option 2 but features straight ramps on either side of the railway as opposed to nested ramps. The ramps on either side of the bridge will not exceed 5% gradient.

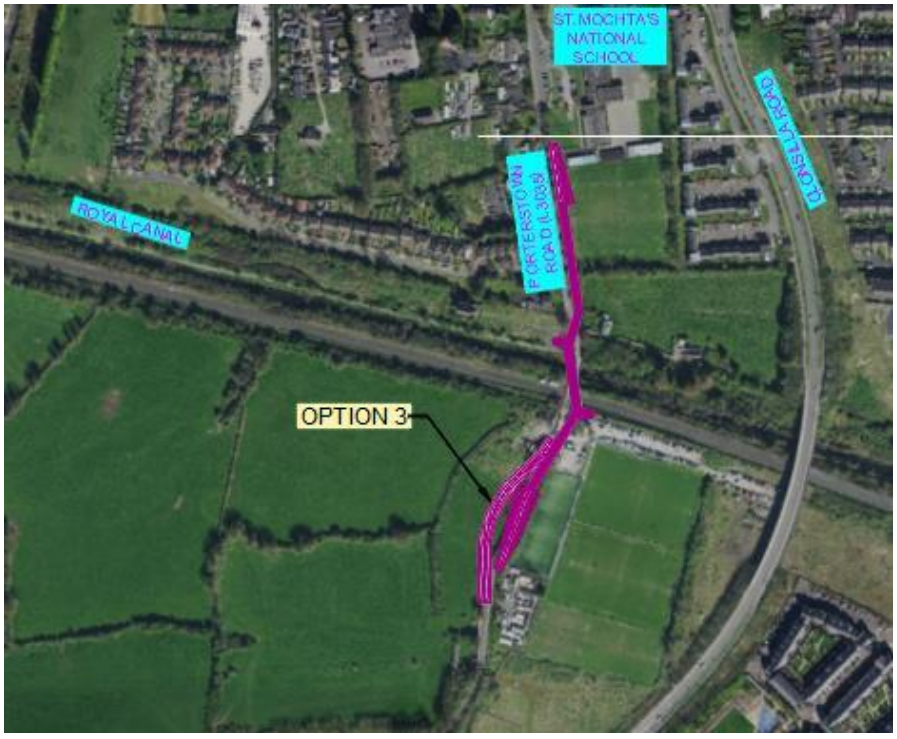

Figure 9-46 Option 3 Pedestrian and Cycle Bridge – Straight Approach Ramps (Copyright Ordnance Survey Ireland – 0039720)

Option 4 – Pedestrian and Cycle Bridge – Alternative Nested Ramp

This option follows the same bridge alignment as Option 2 but the northern ramps and abutment are to the east of the Porterstown Road. The ramps on either side of the bridge will not exceed 5% gradient.

Figure 9-47 Option 4 Pedestrian and Cycle Bridge – Alternative Nested Ramp (Copyright Ordnance Survey Ireland – 0039720)

9.3.4.2 Preliminary Options Assessment

Table 9-8 below provide a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in **Appendix 6.3B**.

Table 9-8 Stage 1 MCA Matrix

Assessment Criteria	Do Nothing	Do Min	Options			
			1	2	3	4
Economy						
Integration						
Environment						
Social inclusion						

Assessment Criteria	Do Nothing	Do Min	Options			
			1	2	3	4
Safety						
Physical Activity						
Shortlisted for Stage 2 MCA	No	No	Yes	Yes	Yes	Yes

9.3.4.3 Summary and Recommendations

As shown above Option 1, Option 2, Option 3 and Option 4 will progress for a more detailed MCA Stage 2 assessment.

- Option 1 – Pedestrian Link to Porterstown Viaduct;
- Option 2 – Pedestrian and Cycle Bridge – Nested Ramps;
- Option 3 – Pedestrian and Cycle Bridge – Straight Approaches;
- Option 4 – Pedestrian and Cycle Bridge – Alternative Nested Ramps

9.3.5 Clonsilla MCA Stage 1

9.3.5.1 Description of Options

In addition to the Do minimum and Do Nothing scenarios described in Section 9.2.1, the Do – Something Options assessed as Stage 1 MCA are described in Table 9-9 below:

Table 9-9 Clonsilla Level Crossing Do – Something Options

Option	Description
Option 1	Pedestrian and Cycle Bridge
Option 2	Overbridge 200m to the east of crossing
Option 3	Overbridge 370m to the west of crossing
Option 4	Overbridge 210m to the west of crossing
Option 5	Overbridge 200m to the east of crossing – Online at Larchgrove
Option 6	Overbridge 200m to the east of crossing – Online at Larchgrove
Option 7	Overbridge 200m to the east of crossing – Online of Larchgrove with Retained Walls

Figure 9-48 below presents the options considered in Stage 1 MCA on aerial photography. Drawing MAY-ROD-HRW-LC04-DR-C0040 shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background.

Figure 9-48 Clonsilla Level Crossing Options (Copyright Ordnance Survey Ireland – 0039720)

Option 1 – Pedestrian and Cycle Bridge

This option includes the provision of a new Pedestrian and cycle footbridge at 5m in width. The bridge provides a connection between Clonsilla road either side of the crossing. The arrangement of the bridge utilises nested ramps to the north and south of the existing station where it crosses.

The rail level at the crossing is approximately 63.2m above MSL and the canal at 61.5m above MSL with the bridge level over the railway at 69.7m above MSL. The ramps on either side of the bridge will not exceed 5% gradient. Constraints on bridge crossing here include the train station, the Royal Canal, the protected railway structures, and the canal bridge. Vehicular traffic will need to divert around the crossing, the diversion being an estimated 4.3km.

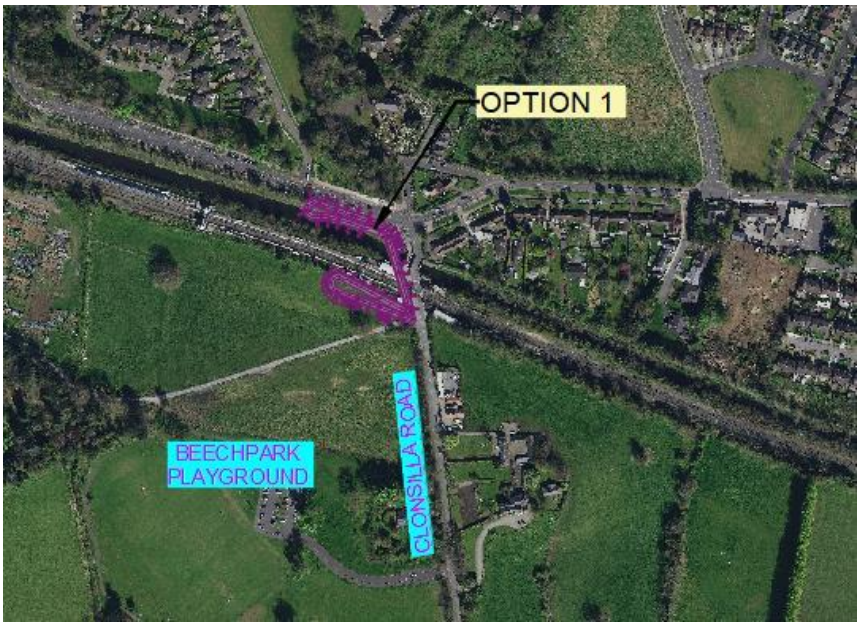

Figure 9-49 Option 1 Pedestrian and Cycle Bridge (Copyright Ordnance Survey Ireland – 0039720)

Option 2 – Overbridge 200m to the east

This option would involve construction of a new road link parallel to the existing Clonsilla Road connecting to Clonsilla Link Road to the north of the Canal. This route would descend from a relocated junction at Luttrellstown Cross and cross the rail and canal at 200m east of Clonsilla Railway Station.

Figure 9-50 Option 2 Overbridge 200m to the east (Copyright Ordnance Survey Ireland – 0039720)

The route would cross over the railway and canal at right angles before connecting into the Clonsilla Link Road. The existing R121 is proposed to be realigned to form a crossroads with the proposed overbridge link road. The option can accommodate a cross section of a 9m carriageway with 2m footpaths and 3m cycle/footway on both sides.

The length of the option is approximately 310m on the northern side and 320m south of the rail line. The option would rise to an approximate deck level of 68.2m above MSL above the rail the rail which is a at a level of 60.2m above MSL at the crossing point.

This option would require some property acquisition and modifications to existing accesses.

Option 3 – Overbridge 370m to the West

This option would involve construction of a new link road located at 370m west of Clonsilla Railway Station. This route would descend from the Woodwall Road and cross the rail and canal at right angles before connecting into the Hansfield Road. The existing Hansfield Road is proposed to be realigned into the greenfield site adjacent to the St James hospital in will pass beneath the proposed link road to rejoin the existing alignment. The option can accommodate a cross section of a 7m carriageway with 2m footpaths and 1.5m cycle tracks on both sides

The length of the option is approximately 310m on the northern side and 320m south of the rail line. The option would rise to an approximate deck level of 68.1m above MSL above the rail the rail which is a at a level of 60.1m above MSL at the crossing point.

This option would require some property acquisition and modifications to existing accesses.

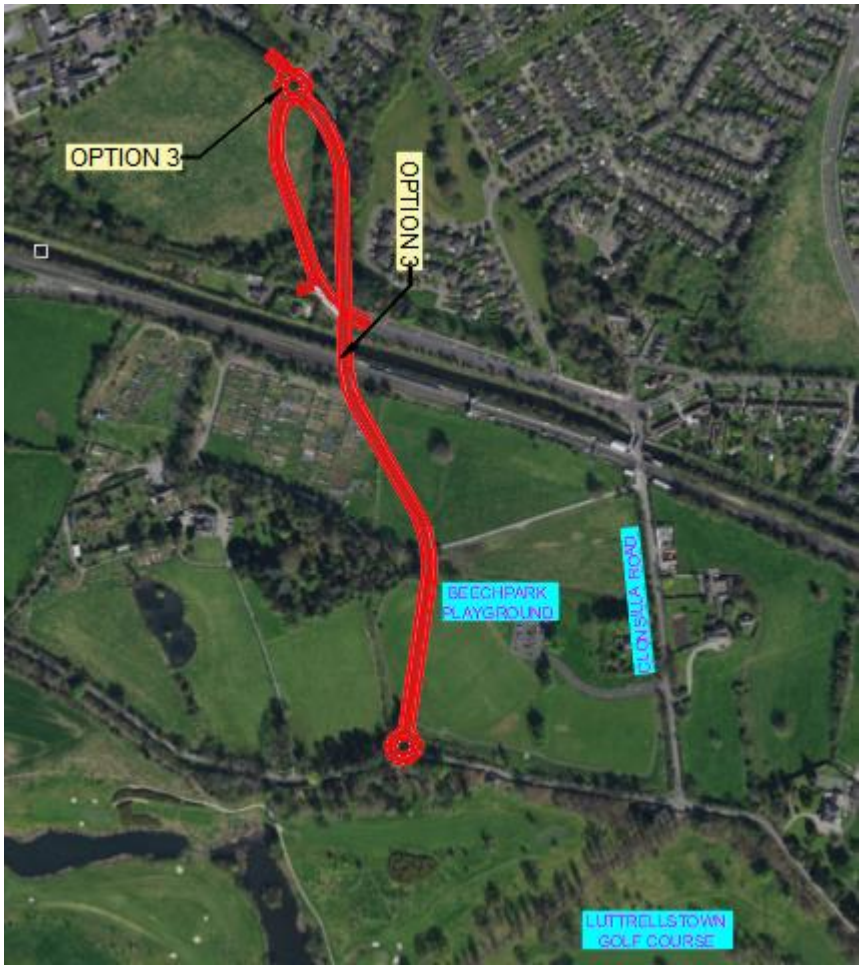

Figure 9-51 Option 3 Overbridge 370m to the West (Copyright Ordnance Survey Ireland – 0039720)

Option 4 – Overbridge 210m to the West

This option would involve construction of a realignment of the existing Clonsilla road. The realignment would commence 90m south of the existing crossing and will pass south of the Clonsilla railway station. The alignment then turns into a northern direction and bridges over the railway and canal at 210m west of the railway station. A junction is formed with Hansfield Road 50m north of the rail line. The option can accommodate a cross section of a 7m carriageway with 2m footpaths and 1.75m cycle tracks on both sides.

The option would rise to an approximate deck level of 68.1m above MSL above the rail the rail which is a at a level of 59.8m above MSL at the crossing point. This option would require some property acquisition and modifications to existing accesses.

Figure 9-52 Option 4 Overbridge 210m to the West (Copyright Ordnance Survey Ireland – 0039720)

Option 5 – Overbridge 200m to the East – Reduced Carriageway

This option is following a very similar alignment to Option 2 with an overbridge proposed approximately 200 metres east of the existing level crossing. However, a reduced 9m carriageway width is proposed, while retaining the 3.0m footway/cycle way, with un-retained embankments to the north of the rail crossing.

Although this option would reduce the road footprint the overall extent of the road and earthworks would be greater than Option 2. As a result, this would likely impact the surrounding properties to a greater degree.

Figure 9-53 Option 5 Overbridge 200m to the East – Reduced Carriageway (Copyright Ordnance Survey Ireland – 0039720)

Option 6 – Overbridge 200 metres to the East – Online of Larchgrove

This option involves the construction of an overbridge approximately 200 metres to the east of the existing level crossing.

This overbridge will span the railway and the canal perpendicularly at a similar location to Option 2 and will tie into an existing road on the northern end of scheme and at a proposed roundabout at the southern end of the scheme. The option can accommodate a cross section of a 9.0m carriageway with 3.0m segregated cycle/footways on both sides.

Similar to Option 2, a structure approximately 60 metres in length would be required to span the railway. Initial examination suggests that the embankments would extend at least 80 metres on each approach to the bridge. Embankment heights on either side of the railway would be up to 8.0 metres high. The existing railway level at the proposed crossing point is at approximately 60.2m above MSL with the highest proposed road level at 68.2m above MSL.

Following the alignment of Larchgrove north of the railway, this option eliminates the need to demolish two properties, though embankments are brought closer to existing residences, with the bottom of the embankment approximately 3m from the nearest house. It is unlikely that this will be acceptable to residents of the area.

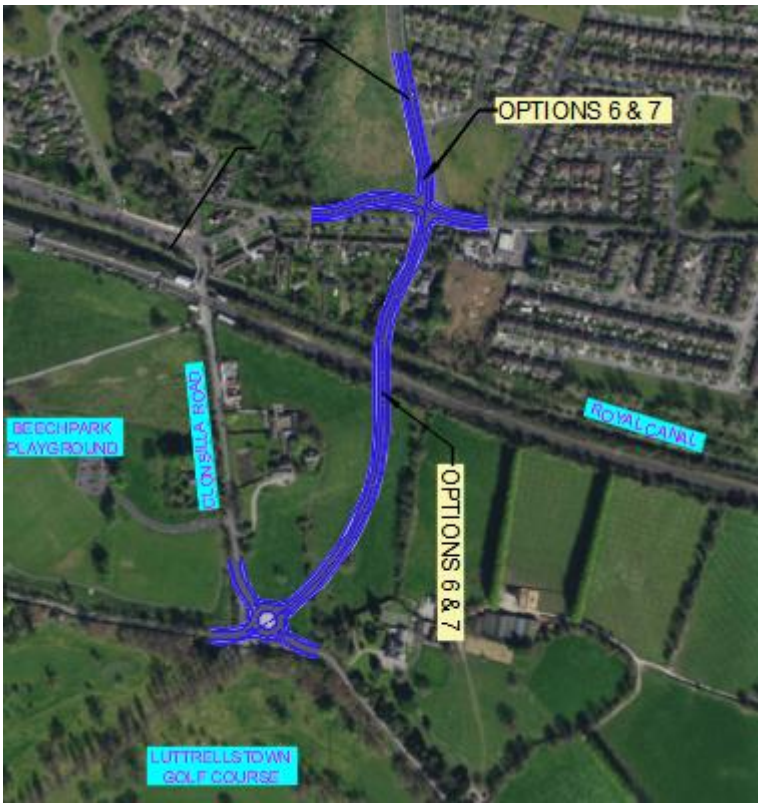

Figure 9-54 Option 6 Overbridge 200m to the East – Online of Larchgrove & Option 7 Overbridge 200 metres to the East – Online of Larchgrove with retaining walls (Copyright Ordnance Survey Ireland – 0039720)

Option 7 – Overbridge200m to the East – Online of Larchgrove with Retaining Walls

This option follows a similar alignment to Option 6 with an overbridge proposed approximately 200 metres east of the existing level crossing. However, to reduce the impact on adjacent residential properties the carriageway will be bounded by retaining walls. The retaining walls will be approximately 6.9m in height. At the closest point, residential properties will be approximately 13 metres from the retaining walls.

9.3.5.2 Preliminary Options Assessment

Table 9-10 below provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in **Appendix 6.3B.**

Table 9-10 Stage 1 MCA Matrix

Assessment Criteria	Do Nothing	Do Min	Options						
			1	2	3	4	5	6	7
Economy									
Integration									
Environment									
Social inclusion									
Safety									

Assessment Criteria	Do Nothing	Do Min	Options						
			1	2	3	4	5	6	7
Physical Activity									
Shortlisted for Stage 2 MCA	**No**	**No**	**Yes**	**Yes**	**No**	**Yes**	**No**	**No**	**No**

9.3.5.3 Summary and Recommendations

As shown above Option 1, Option 2, and Option 4 will progress for a more detailed MCA Stage 2 assessment.

- Option 1 – Pedestrian and Cycle Bridge;
- Option 2 – Overbridge 200m to the east of the existing crossing; and
- Option 4 – Overbridge 210m to the west of existing crossing.

9.3.6 Barberstown MCA Stage 1

9.3.6.1 Description of Options

In addition to the Do minimum and Do Nothing scenarios described in Section 9.2.1, the Do – Something Options assessed as Stage 1 MCA are described in Table 9-11 below:

Table 9-11 Barberstown Level Crossing Do – Something Options

Option	Description
Option 1	Online Overbridge
Option 2	Overbridge 130 metres to the West of the Existing Level Crossing
Option 3	Overbridge 195 metres to the east
Option 4	Overbridge 250 metres to the West of the Existing Level Crossing
Option 5	Provision of a Pedestrian/Cycle Overbridge
Option 6	Lowering of the Railway Vertical Alignment

Figure 9-55 below presents the options considered in Stage 1 MCA on aerial photography. Drawing MAY-ROD-HRW-LC05-DR-C-0050 provided in Volume 2 shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background. Option 6 – Lowering of the Railway Vertical Alignment is not included in the drawing set.

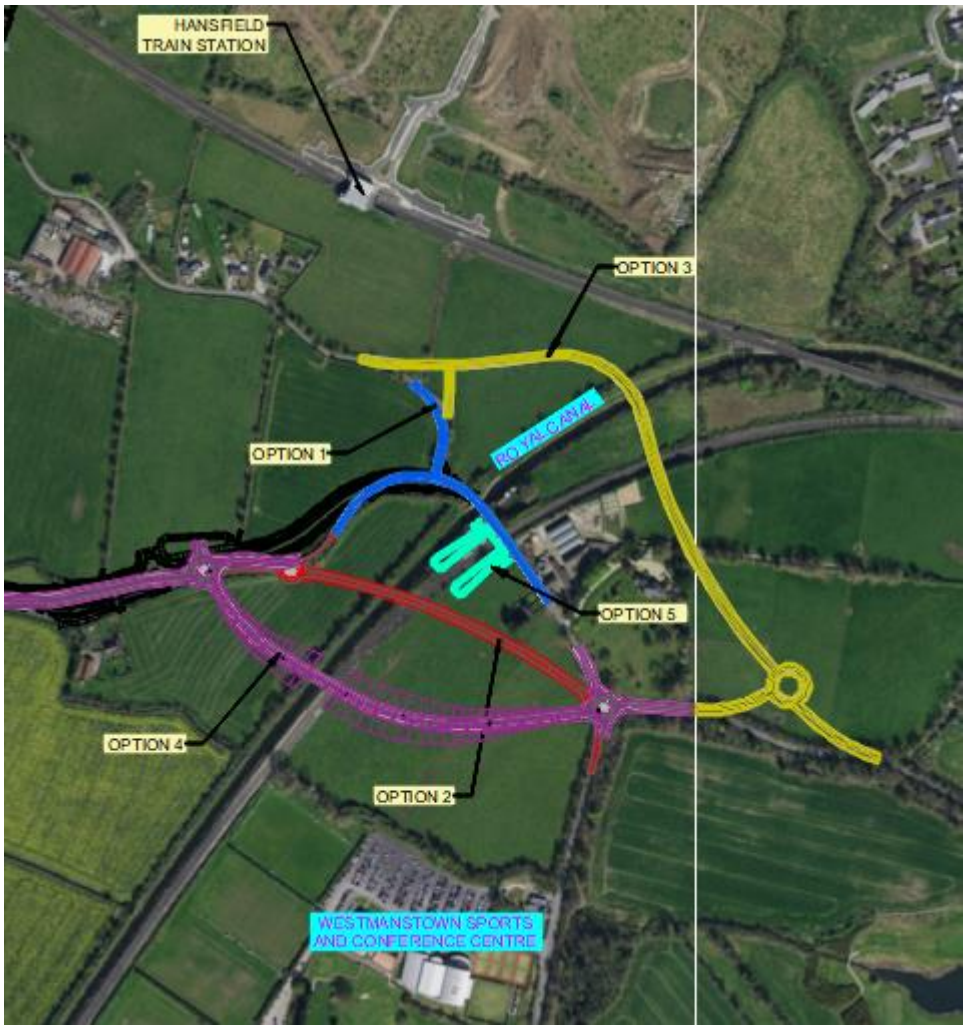

Figure 9-55 Barberstown Level Crossing Options (Copyright Ordnance Survey Ireland – 0039720)

Option 1 – Online Overbridge

This option will be online of the existing crossing and road which will be elevated at approx. 7m at the crossing with approaches of approx. 200m, accommodating a cross section of a 4m wide carriageway with 2.5m wide wide footpaths on both sides. There is insufficient room for with this option to accommodate dedicated cycle tracks without increasing the overall road footprint and impact on the adjacent properties further.

A structure approximately 15m in length would be required to span the railway with a separate bridge to span the canal of approximately 20m. Due to the location of the bridge over the canal this option would likely require the demolition of the protected Pakenham Bridge if not fully spanned.

The railway is currently at a level of 59.5m above MSL at the existing level crossing with the proposed overbridge structure being at a minimum road level of 66.8m above MSL to provide the minimum clearance required for the electrification of the rail line.

Embankment heights adjacent to properties north of the railway would be up to 6.6m while houses immediately south west of the railway would have embankments in the order of 6.4m high adjacent to them.

Properties on either side of the road to the south-east of the railway would severely restrict the construction of an online route at this location without partial or complete property acquisitions.

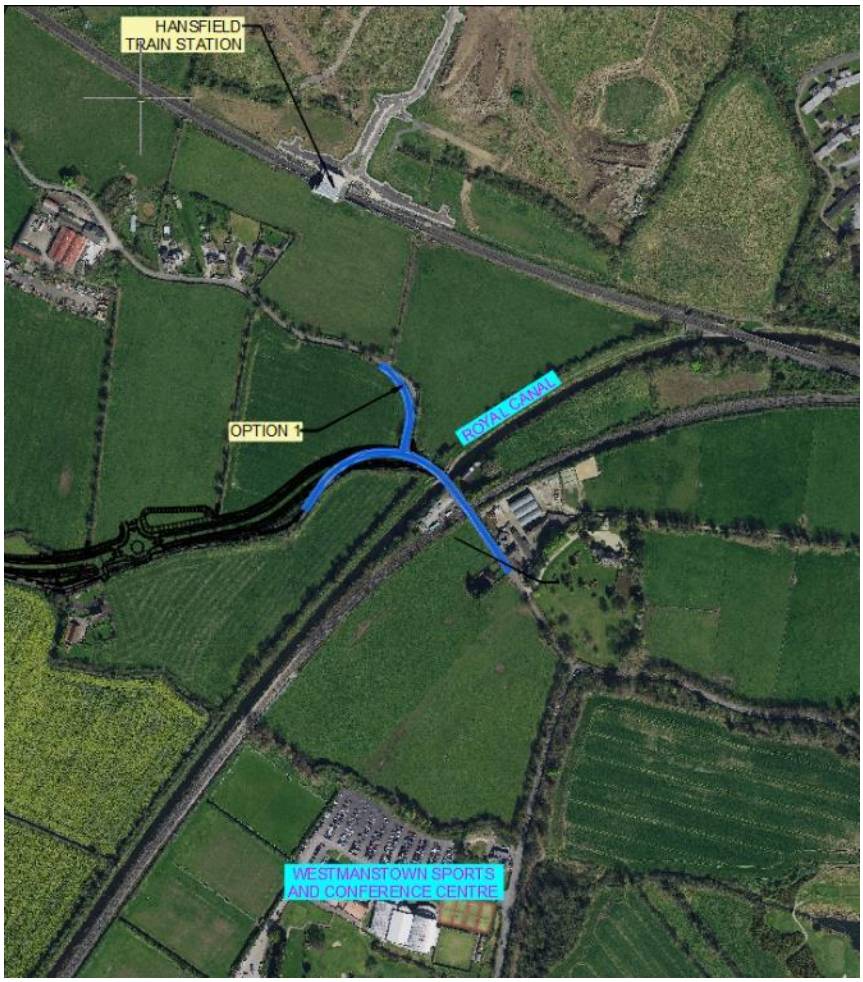

Figure 9-56 Barberstown Option 2 – Overbridge 130m to the West of the existing Level Crossing
(Copyright Ordnance Survey Ireland – 0039720)

Option 2 – Overbridge 130m to the West of the existing Level Crossing

This option would take the form an overbridge spanning the railway and an overbridge spanning the canal along with a roundabout at either end of route option to facilitate a tie-in with the existing road network. Alternatively, a single longer bridge crossing both the canal and the railway could be implemented. There is restricted access between the canal and the railway to construct this option.

The structure approximately 10m in length would be required to span the railway with a separate bridge to span the canal of approximately 20m, accommodating a cross-section of a 6m wide carriageway with 3m foot/cycleway on both sides.

The railway is currently at a level of 58.9m above MSL at the existing level crossing with the proposed overbridge structure being at a minimum road level of 66.2m above MSL to provide the minimum clearance required for the electrification of the rail line.

This option was developed to the west of the level crossing considering the known constraints, and it should be noted that this route option is slightly shorter that Option 4. This option would require land take on either side of the rail, which is primarily greenfield, but includes a residential property on the south of the rail.

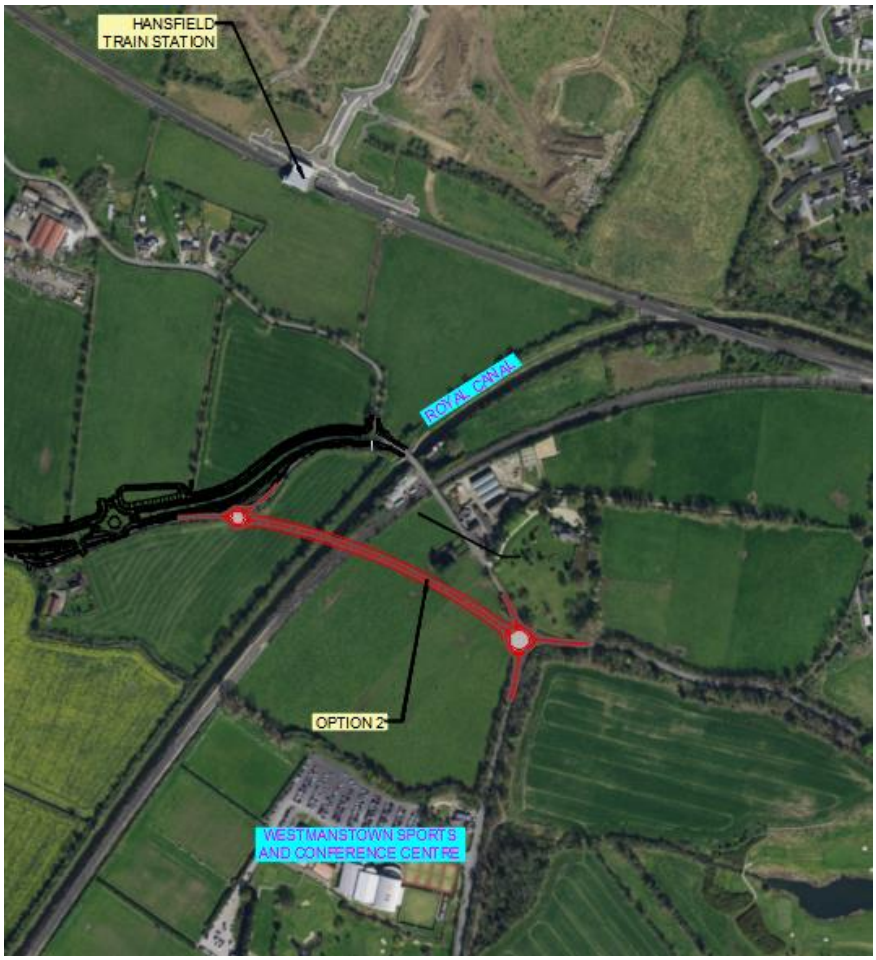

Figure 9-57 Barberstown Option 2 – Overbridge 130m to the West of the existing Level Crossing
(Copyright Ordnance Survey Ireland – 0039720)

Option 3 – Overbridge 195m to the east

This option would take the form multiple overbridges spanning the railway, the canal along with a roundabout at either end of route option to facilitate a tie-in with the existing road network. The route approximately 195 metres to the east of the level crossing was developed considering the surrounding constraints.

This option is approximately 1150m in length and links the R121 to the south and the Ongar Distributor Road to the north. To the north the route ties into an existing roundabout on the Ongar Distributor Road while to the south a new off-line roundabout would need to be constructed with a realignment of the R121.

Three new overbridges would be required at an elevation of approx. 7m above the railway, one to span the Dublin Sligo Line, another over the Royal Canal and further bridge to span the Clonsilla Navan Line in the vicinity of Hansfield Station accommodating a cross-section of a 6.5m wide carriageway with 2.5m wide footpaths on both sides.

This option would require land take on either side of the rail which is primarily greenfield.

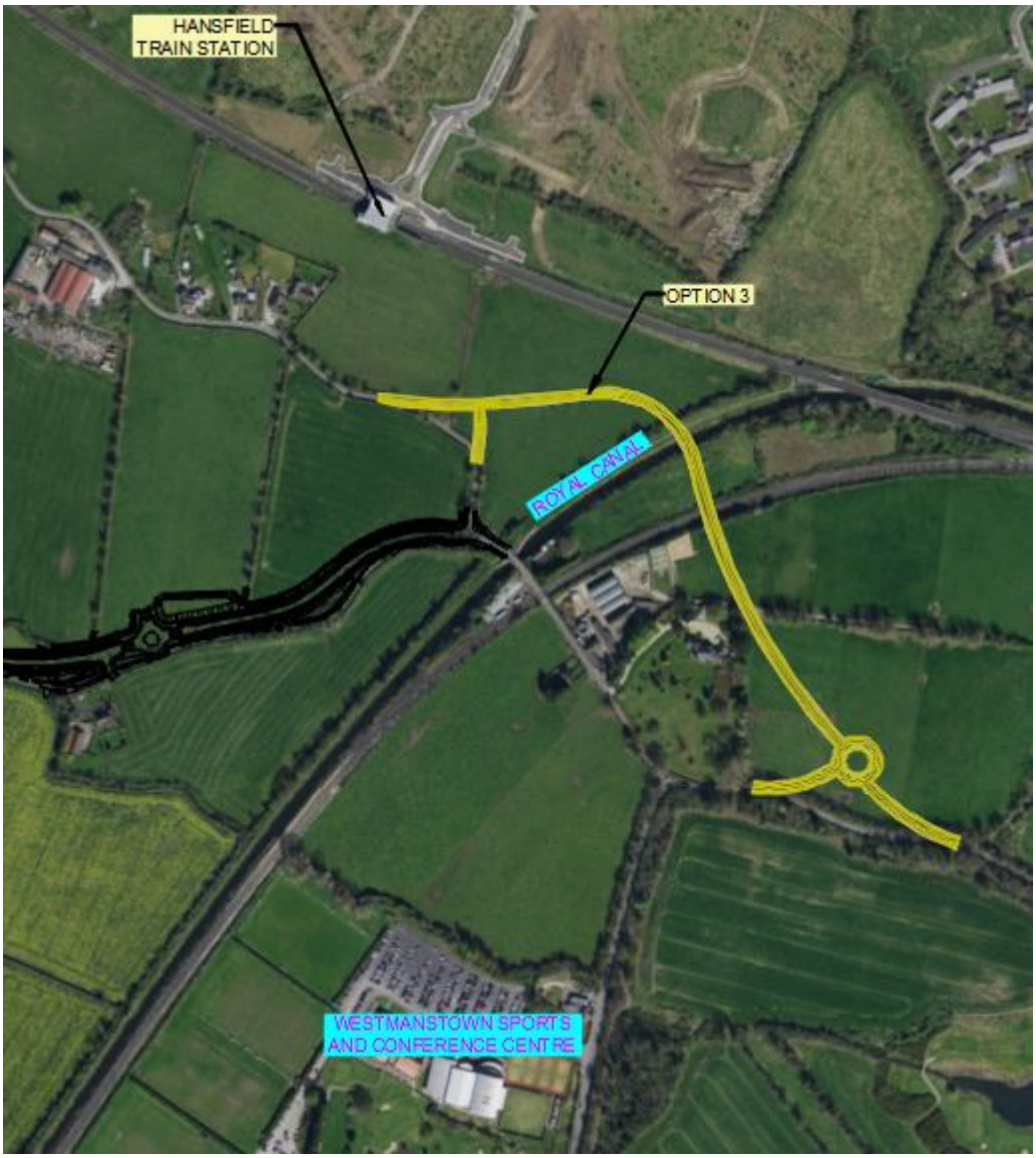

Figure 9-58 Barberstown Option 3 – Overbridge 195m to the east (Copyright Ordnance Survey Ireland – 0039720)

Option 4 – Overbridge 250m to the West of the Existing Level Crossing

This option would take the form of an a bridge spanning over the railway and the canal along with a roundabout at the northern end of the proposed route and a junction with the Kellystown Road at the southern end, facilitating a tie-in with the existing road network. There is restricted access between the canal and the railway to construct this option.

The corridor is approximately 10m wide and the canal corridor is approximately 20m wide, accommodating a cross section of a 7m wide carriageway with 1.7m raised verge on either side with a 3.8m wide pedestrian cycleway on both sides.

The proposed overbridge structure will rise to 9.3m above the railway to provide the minimum clearance required for the electrification of the rail line.

This option would require landtake on either side of the railway, which is primarily greenfield, but includes a residential property on the south of the railway.

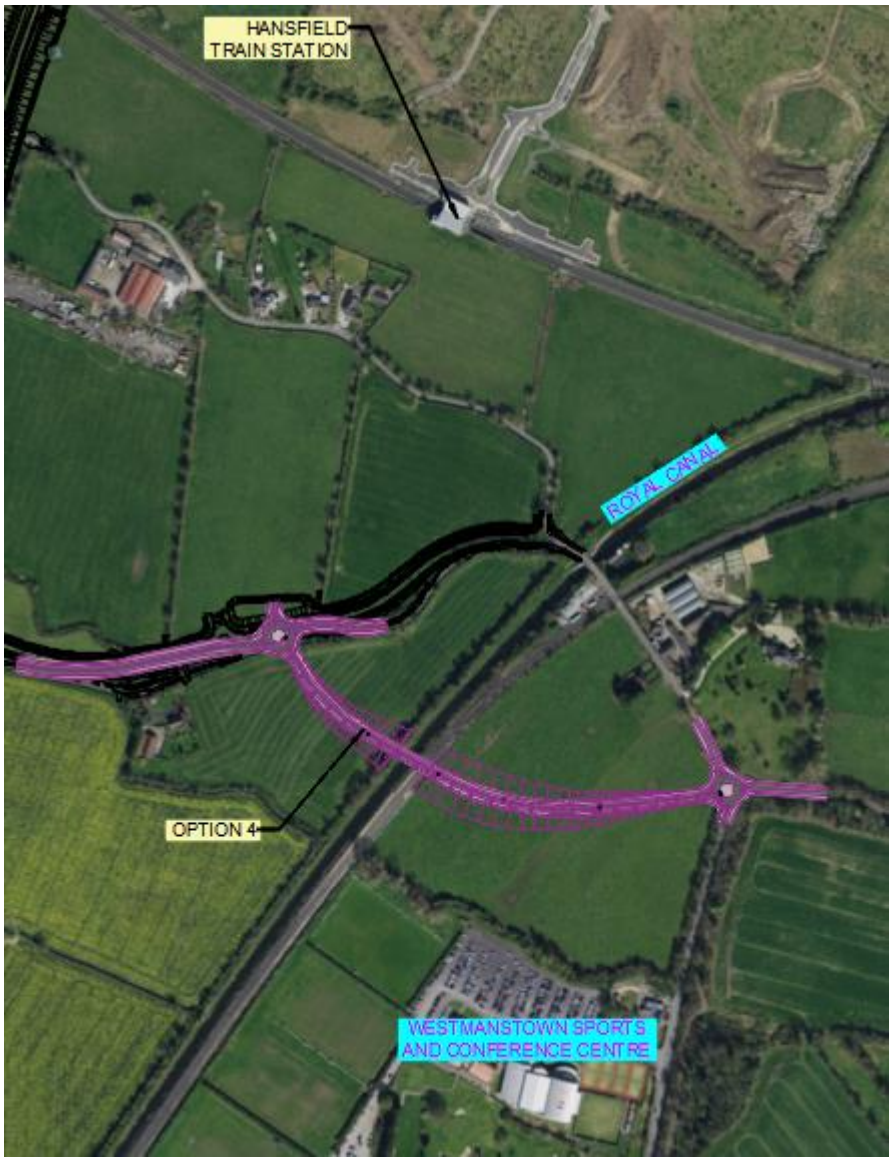

Figure 9-59 Option 4 – Overbridge 250m to the West of the Existing Level Crossing (Copyright Ordnance Survey Ireland – 0039720)

Option 5 – Provision of a Pedestrian/Cycle Overbridge

This option includes the provision of a new Pedestrian and Cycle Footbridge. The bridge will provide connection for pedestrian and cyclists over the railway between Barberstown Lane and Milestown Road. Cyclists will cross the railway via a set 3.4m wide switch back ramps on the west side of Barberstown Lane. The ramps are both approximately 150m long at a gradient of approximately 5%. Separate pedestrian stairs will be provided on either side of the railway joining to the railway span.

The bridge will be at 66.00MSL at its highest point, approximately 6.5m above the railway level to provide minimum clearance for electrification of the rail line.

Constraints in the vicinity include the list Royal Canal bridge and rail infrastructure on the north side of the rail line.

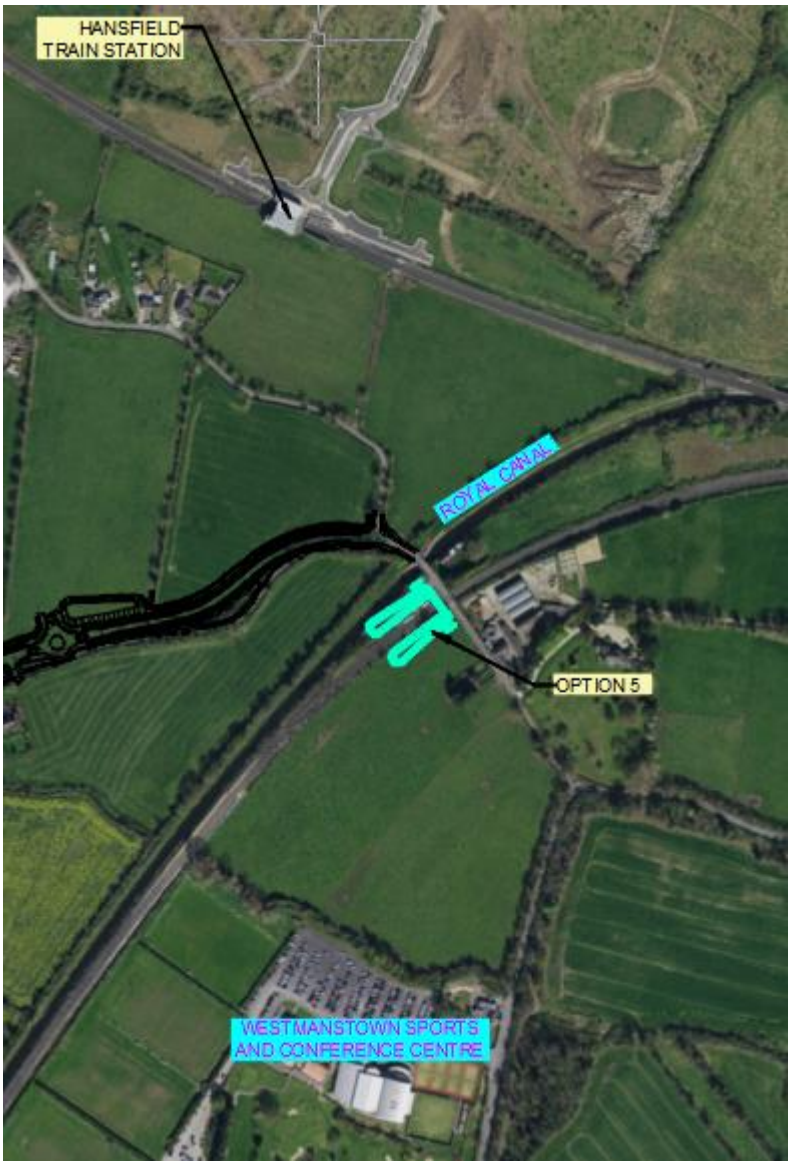

Figure 9-60 Option 5 – Provision of a Pedestrian/Cycle Overbridge (Copyright Ordnance Survey Ireland – 0039720)

Option 6 – Lowering of the Railway Vertical Alignment

This Option would entail lowering the track alignment for approximately 500m east and west of the existing Barberstown Level Crossing with a track gradient at a maximum of 1%. The track lowering would commence west of the railway junction between the Maynooth Line and M3 Parkway Line.

A new road bridge would be required at the location of the existing level crossing with a soffit level approximately 3.5m above the existing level crossing. The southern approach road would need to be realigned to meet the road level of the new road bridge. The realignment would impact the farm building to the east of the existing road and farmland to the west. The northern approach road would tie in with the existing canal bridge. To the south of the railway on the eastern approach the railway is bounded by farm buildings adjacent to the level crossing and farmland further east. A retaining wall will be required adjacent to the farm buildings for approximately 150m with heights ranging from 2m to 4m. Adjacent to the farmland the lowering of the alignment could be facilitated in a cutting requiring the acquisition of a strip of farmland. Alternatively, the retaining wall could be continued for the full 500m. To the north of the railway the railway is bounded by fields

for the full 500m. The lowering of the railway could be facilitated in a cutting but would require the CPO of a strip of the fields. Alternatively, a retaining wall could be built for 500m ranging in height from 2m to 4m.

On the western approach, the railway is bounded by farmland to the south and the Royal Canal to the north. A existing railway maintenance depot is located adjacent to the level crossing on the northern side. To the south the lowering of the railway could be facilitated in a cutting requiring the acquisition of a strip of farmland. Alternatively, a retaining wall could be built for 500m ranging in height from 2m to 4m. It is envisaged that the railway maintenance depot could be reinstated following the works.

9.3.6.2 Preliminary Options Assessment

Table 9-12 below provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in **Appendix 6.3B**.

Table 9-12 Stage 1 MCA Matrix

Assessment Criteria	Do Nothing	Do Min	Options					
			1	2	3	4	5	6
Economy								
Integration								
Environment								
Social inclusion								
Safety								
Physical Activity								
Shortlisted for Stage 2 MCA	No	No	No	**Yes**	No	**Yes**	No	No

9.3.6.3 Summary and Recommendations

As shown above and outlined below Option 2 and Option 4 will progress for a more detailed MCA Stage 2 assessment.

- Option 2 – Overbridge 130 metres to the West of the Existing Level Crossing
- Option 4 – Overbridge 250 metres to the West of the Existing Level Crossing

9.3.7 Blakestown MCA Stage 1

9.3.7.1 Description of Options

In addition to the Do minimum and Do Nothing scenarios described in Section 9.2.1, the Do – Something Options assessed as Stage 1 MCA are described in Table 9-13 below.

Table 9-13 Blakestown Level Crossing Do – Something Option

Option	Description
Option 1	Pedestrian and Cycle Bridge

Figure 9-61 below presents the option considered in Stage 1 MCA on aerial photography. Drawing MAY-ROD-HRW-LC06-DR-C-0050 provided in Volume 2 - Drawings shows the Options considered in MCA Stage 1 on aerial photography and OS mapping background.

Figure 9-61 Blakestown Level Crossing Option (Copyright Ordnance Survey Ireland – 0039720)

Option 1 – Pedestrian and Cycle Bridge

This option includes the provision of a new Pedestrian and cycle footbridge at 4m in width. The bridge provides a connection between the L81206 either side of the crossing. The arrangement of the bridge utilises nested ramps to the north and south of the existing station where it crosses.

The rail level at the crossing is approximately 63.15m above MSL and the canal at 61.5m above MSL with the bridge level over the railway at 69.65m above MSL. The ramps on either side of the bridge will not exceed 5% gradient.

Constraints on bridge crossing here include the Royal Canal and the canal bridge. Vehicular traffic will need to divert around the crossing, the diversion being an estimated 3.2km.

Figure 9-62 Option 1 – Pedestrian and Cycle Bridge (Copyright Ordnance Survey Ireland – 0039720)

9.3.7.2 Preliminary Options Assessment

Table 9-14 below provides a summary matrix of the comparative assessment undertaken as part of Stage 1 MCA. Options deemed to be feasible and comparably more advantageous than other options are identified to progress to Stage 2 MCA for a more detailed assessment. A complete detailed Stage 1 MCA matrix is provided in Appendix 6.3B.

Table 9-14 Stage 1 MCA Matrix

Assessment Criteria	Do Nothing	Do Min	Option 1
Economy			
Integration			
Environment			
Social inclusion			
Safety			
Physical Activity			
Shortlisted for Stage 2 MCA	**No**	**Yes**	**Yes**

9.3.7.3 Summary and Recommendations

As shown above the Do-Minimum and Option 1 will progress for a more detailed MCA Stage 2 assessment.

9.4 Stage 2 – MCA

9.4.1 Introduction

The short-listed options from Stage 1 MCA were brought forward into the Stage 2 MCA process. As described in **Section 5** of this Report, the same MCA process and methodology applies to Stage 2 MCA whereby each option is assessed against the six CAF criteria. The adopted methodology is again comparative, in-line with CAF expectations, and undertaken on a similar basis as other appraisals for major transport infrastructure. In the case of this project Stage 2 Options Selection process, the assessment will:

- Determine the best performing option using a comparative assessment to reduce the number of live options to one Emerging Preferred Option relevant to each element of the project.
- The best performing option is determined as that which attains the highest comparative score across all six CAF criteria. While economy is undoubtedly important (though often specifically focused upon), the delivery of a an efficient, sustainable, low carbon and climate resilient heavy rail network serving existing and future demand is one of the overarching objectives of the DART+ Project.

The data collection and design process are developed further as part of Stage 2 MCA process and is described in the respective project elements in the sections below.

9.4.2 Level Crossing Options Selection Process

9.4.2.1 General

The Stage 2 MCA Spreadsheet is included in Appendix 7.2A of this report provides the detailed consideration of the selection of Emerging Preferred Option for the level crossings. We have presented below summary detail of the selection process for each one.

9.4.2.2 Ashtown MCA

9.4.2.2.1 Description of Options

As outlined in Section 6.3.2 above the following options have progressed from MCA Stage 1 to Stage 2 assessment

- *Option 2 – Underbridge on Mill Lane*
- *Option 4a – Link from River Road to Phoenix Park Station Grade Separated Junction and the construction of an underbridge structure at existing Ashtown level crossing for pedestrian and cycle access;*
- *Option 4b - Link from River Road to Phoenix Park Station Grade Separated Junction and the construction of an overbridge structure at existing Ashtown level crossing for pedestrian and cycle access;*
- *Option 6 - Road Overbridge 250m east of existing crossing connection to Ashtown*

Detailed descriptions of the options are provided in Section 9.3 above.

9.4.2.2.2 Options Assessment

Table 9-15 below provides a summary matrix of the comparative assessment undertaken at Stage 2 to identify the Emerging Preferred Option. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the Emerging Preferred Option has been selected. The full matrix is provided in Appendix 7.2A.

Table 9-15 Ashtown Stage2 MCA Matrix

Criteria	Option 2	Option 4 & 4a	Option 4 & 4b	Option 6
Economy	Some comparative disadvantage over other options	Some comparative disadvantage over other options	Some comparative disadvantage over other options	Some comparative advantage over other options
Integration	Significant comparative advantage over other options	Some comparative disadvantage over other options	Some comparative disadvantage over other options	Some comparative advantage over other options
Environment	Some comparative disadvantage over other options	Significant comparative disadvantage over other options	Some comparative advantage over other options	Significant comparative disadvantage over other options
Accessibility and Social Inclusion	Comparable to other options	Comparable to other options	Comparable to other options	Comparable to other options
Safety	Comparable to other options	Comparable to other options	Comparable to other options	Comparable to other options
Physical Activity	Comparable to other options	Comparable to other options	Comparable to other options	Comparable to other options
Preferred Option Ranking	**1**	**4**	**3**	**2**

As can be seen from the above Option 2 has been identified as the Emerging Preferred Option over Option 6, Option 4b with Option 4a finishing fourth.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 2 being selected as the Emerging Preferred Option.

Economy

Under the parameter of Economy Option 6 is currently estimated to have the lowest construction costs however work is still ongoing in order to accurately estimate the land costs associated with Option 6 given that it affects Martin Savage Park and development lands, which have planning permission and are subject of a new planning application. Option 2 and 6 have comparative advantage over Option 4a and 4b in terms of journey times and traffic functionality. Option 2 is considered to have higher inspection and maintenance costs due to the introduction of an Underbridge.

In terms of Economy, Option 6 is the preferred, however the comparative advantage may be reduced or lost following the completion of the land cost estimations.

Integration

Option 2 is identified as the Emerging Preferred Option as it has the shortest diversion route and minimises impacts on zoned lands at Pelletstown (Option 6) and does not affect 'High Amenity' zoned lands as is the case with both Option 4a and 4b.

In terms of Integration, Option 2 is identified as the preferred option.

Environment

Although it affects a number of architectural heritage sites Option 2 is considered to have some comparative advantage over other options as it does not involve an elevated bridge structure over the Royal Canal and railway and therefore reduces visual impact on properties and the landscape character and structure of the receiving environment. It is also considered to have some comparative advantage over other options due to the fact that it has no connectivity to European sites and does not affect Martin Savage Park the playing pitches of St Oliver Plunketts Eoghan Ruadh which are used for foraging in significant numbers by Light-bellied Brent Goose (QI of SPAs).

In terms of Environment, Option 2 is identified as the preferred option.

Accessibility and Social Inclusion

Option 2 is considered to have significant advantages over other options as it has a significantly shorter diversion than the other 3 options.

In terms of Environment, Option 2 is identified as the preferred option over Option 6 due to the reduced diversion length.

Safety

In terms of Safety, there is no comparative advantage or disadvantage between the options. There may be a perceived safety concern associated with the provision of an underpass for cyclists and pedestrians.

Physical Activity

In terms of Physical Activity, there is no comparative advantage or disadvantage between the options. However, it could be considered that as Option 6 would require the loss of lands from martin Savage Park perhaps it could result in an adverse impact on Physical Activity due to the loss of space for playing and training.

9.4.2.2.3 Summary and Recommendations

As can be seen from the above Option 2 has been identified as the Emerging Preferred Option over Option 6 with Options 4a and 4b finishing third and fourth respectively. Option 2 will now be presented at Public Consultation No.1 as the Emerging Preferred Option and subject to further assessment and feedback from consultations will be developed as the Preferred Option.

9.4.2.3 Coolmine MCA

9.4.2.3.1 Description of Options

As outlined in Section 6.3.3 above the following options have progressed from MCA Stage 1 to Stage 2 assessment

- Option 1 - Online Overbridge
- Option 3 - New overbridge connecting St. Mochta's Grove to Luttrellpark along with pedestrian and cycle bridge at existing level crossing
- Option 4 - Under Rail and Over Canal
- Option 6 - Overbridge to East of Coolmine Road

Detailed descriptions of the options are provided in Section 6.3.3.1 above.

9.4.2.3.2 Options Assessment

Table 9-16 below provides a summary matrix of the comparative assessment undertaken at Stage 2 to identify the Emerging Preferred Option. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the Emerging Preferred Option has been selected. The full matrix is provided in Appendix 7.2A.

Table 9-16 Coolmine - Stage2 MCA Matrix

Criteria	Option 1	Option 3 with Footbridge	Option 4	Option 6
Economy	Some comparative advantage over other options	Some comparative advantage over other options	Significant comparative disadvantage over other options	Some comparative disadvantage over other options
Integration	Significant comparative disadvantage over other options	Some comparative advantage over other options	Some comparative advantage over other options	Some comparative disadvantage over other options
Environment	Some comparative disadvantage over other options	Significant comparative disadvantage over other options	Significant comparative disadvantage over other options	Some comparative disadvantage over other options
Accessibility and Social Inclusion	Comparable other options	Comparable other options	Comparable other options	Comparable other options
Safety	Significant comparative advantage over other options	Significant comparative advantage over other options	Significant comparative advantage over other options	Some comparative advantage over other
Physical Activity	Some comparative disadvantage over other options	Significant comparative advantage over other options	Significant comparative advantage over other options	Some comparative disadvantage over other
Preferred Option Ranking	**2**	**1**	**4**	**3**

As can be seen from the above Option 3 has been identified as the Emerging Preferred Option over Option 1, Option 6 with Option 6 finishing third.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 3 being selected as the Emerging Preferred Option.

Economy

Under the parameter of Economy Option 1 and 6 are currently estimated to have the lowest construction costs. Option 1 and 6 have comparative advantage over Option 1 in terms of Long-Term Maintenance costs. Option 3 and 4 have comparative advantages over Option 1 & 6 in terms of journey times and traffic functionality.

In terms of Economy, Option 1 and 3 are the preferred.

Integration

Option 3 & 4 are identified as the Emerging Preferred Option as rerouted access to train station car park provides general improvements in connectivity and journey times.in comparison to Option 1 and 6.

In terms of Integration, Option 3 & 4 are identified as the preferred option.

Environment

Option 1 & 6 holds significant advantage over the other options as it provides the least impact on the environment.

In terms of Environment, Option 1 & 6 is identified as the preferred option.

Accessibility and Social Inclusion

In terms of Accessibility & Social inclusion, there is no comparative advantage or disadvantage between all the options. In terms of Integration, all options are identified as comparative.

Safety

In terms of Safety, there is no comparative advantage or disadvantage between all options for rail safety and vehicular traffic safety. There are some comparative advantages over other options for pedestrian, cyclist, and vulnerable road user's safety for both option 2 and 4.

In terms of Safety, Option 3 are identified as the preferred options.

Physical Activity

In terms of Physical Activity, there is no comparative advantage or disadvantage between the options for connectivity to adjoining cycling facilities. However, there is some comparative advantages and disadvantages over other options for option 3 & 4 in terms of Permeability and local connectivity opportunity.

In terms of Physical Activity, Option 3 is identified as the preferred option.

9.4.2.3.3 Summary and Recommendations

As can be seen from the above, Option 3 has been identified as the Emerging Preferred Option over Option 1 with Options 6 and 4 finishing third and fourth respectively. Option 3 will now be presented at Public Consultation No.1 as the Emerging Preferred Option and subject to further assessment and feedback from consultations will be developed as the Preferred Option.

9.4.2.4 Porterstown MCA

9.4.2.4.1 Description of Options

As outlined in Section 6.3.4 above the following options have progressed from MCA Stage 1 to Stage 2 assessment

- Option 1 - Link to Porterstown Viaduct
- Option 2 - Pedestrian and Cycle Bridge – Nested Ramps
- Option 3 - Pedestrian and Cycle Bridge – Straight Ramps
- Option 4 - Pedestrian and Cycle Bridge – Alternative Nested Ramps

Detailed descriptions of the options are provided in Section 6.3.4.1 above.

Options AssessmentTable **9-17Table 9-17** below provides a summary matrix of the comparative assessment undertaken at Stage 2 to identify the Emerging Preferred Option. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the Emerging Preferred Option has been selected. The full matrix is provided in Appendix 7.2A.

Table 9-17 Stage 2 MCA Matrix

Criteria	Option 1	Option 2	Option 3	Option 4
Economy	Some comparative advantage over other options	Some comparative disadvantage over other options	Significant comparative disadvantage over other options	Some comparative disadvantage over other options
Integration	Some comparative disadvantage over other options	Some comparative advantage over other options	Some comparative advantage over other options	Some comparative advantage over other options
Environment	Some comparative advantage over other options	Some comparative advantage over other options	Some comparative disadvantage over other options	Some comparative disadvantage over other options
Accessibility and Social Inclusion	Significant comparative disadvantage over other options	Some comparative advantage over other options	Some comparative advantage over other options	Some comparative advantage over other options
Safety	Some comparative advantage over other options	Significant comparative advantage over other options	Significant comparative advantage over other options	Significant comparative advantage over other options
Physical Activity	Some comparative advantage over other options	Significant comparative advantage over other options	Significant comparative advantage over other options	Significant comparative advantage over other options
Preferred Option Ranking	4	1	3	2

As can be seen from the above Option 2 has been identified as the Emerging Preferred Option over Option 4, Option 3 with Option 1 finishing fourth.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 2 being selected as the Emerging Preferred Option.

Economy

With regards to overall costs and Option 1 is the least expensive option while Option 3 is the most expensive option with regards to construction costs and requires the most land acquisition along the existing Porterstown Road. As the Porterstown road has already been bypassed in effect by the Diswellstown Road via the Porterstown Viaduct and an alternative route is already being used by all but local traffic. Therefore, all the options are comparable in terms of traffic and associated economic benefit.

In terms of Economy, Option 1 is the preferred.

Integration

In terms of integration, all options are comparable as they all involve the diversion of the traffic onto Diswellstown Road while maintaining access for pedestrians and cyclists at the current crossing via a bridge other than Option 1 which requires the diversion of pedestrians and cyclists onto the Diswellstown Road, which is less preferable than the other options.

Environment

Option 1 holds significant advantage over the other options as it provides the least impact on the environment compared to the construction of a new bridge over the railway impacting the landscaping, visual, and noise throughout the construction phase. In terms of Environment, Option 1 is identified as the preferred option.

Accessibility and Social Inclusion

The diversion of pedestrians and cyclists onto Diswellstown Road within Option 1 makes this less preferable than other options. The remaining options are comparable.

Safety

All options are comparable with regards to safety as all option provide similar levels of safety for pedestrians and cyclists removing the level crossing access and interface with the rail line with similar benefits for road traffic and rail safety.

Physical Activity

The diversion of pedestrians and cyclists onto the Diswellstown Road within Option 1 makes this less preferable than other options with the longer diversion making this option less attractive for commuters choosing to walk or cycle along this route. The remaining options are comparable with regard to benefits for physical activity.

9.4.2.4.2 Summary and Recommendations

As can be seen from the above, Option 2 has been identified as the Emerging Preferred Option over Option 4 with Options 3 and 1 finishing third and fourth respectively. Option 2 will now be presented at Public Consultation No.1 as the Emerging Preferred Option and subject to further assessment and feedback from consultations will be developed as the Preferred Option.

9.4.2.5 Clonsilla MCA

9.4.2.5.1 Description of Options

Following the Stage 1 MCA, the following options were considered the most feasible and were progressed to Stage 2 MCA:

- Option 1 Pedestrian and Cycle Bridge
- Option 2 Overbridge 200 metres to the East
- Option 4 Overbridge 210 metres to the West

The options are as described in the section9.4.2 of this report:

9.4.2.5.2 Options Assessment

Table 9-18 below provides a summary matrix of the comparative assessment undertaken at Stage 1 to identify the most feasible options to progress to Stage 2 for a more detailed assessment. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the Emerging Preferred Option has been selected. The full matrix is provided in Appendix B.

Table 9-18 Short-listed MCA Stage 1 Options Summary Matrix

Criteria	Option 1	Option 2	Option 4
Economy	Some comparative advantage over other options	Significant comparative disadvantage over other options	Significant comparative disadvantage over other options
Integration	Some comparative disadvantage over other options	Some comparative advantage over other options	Some comparative advantage over other options
Environment	Significant comparative advantage over other options	Significant comparative disadvantage over other options	Some comparative disadvantage over other options
Accessibility and Social Inclusion	Some comparative disadvantage over other options	Some comparative advantage over other options	Some comparative advantage over other options
Safety	Significant comparative advantage over other options	Some comparative disadvantage over other options	Some comparative disadvantage over other options
Physical Activity	Significant comparative advantage over other options	Some comparative advantage over other options	Some comparative advantage over other options
Preferred Option Ranking	**1**	**3**	**2**

As can be seen from the above Option 1 has been identified as the Emerging Preferred Option over Option 4 with Options 2 finishing third.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 1 being selected as the Emerging Preferred Option under

Economy

Under the parameter of Economy Option 1 is currently estimated to have the lowest construction costs. Option 2 and 4 have comparative advantage over Option 1 in terms of journey times and traffic functionality. Each option has comparable results with terms of the long-term maintenance costs. In terms of Economy, Option 1 is the preferred.

Integration

Option 4 is identified as the Emerging Preferred Option as it has a short diversion route for traffic and provides some improvement in journey time; potential for induced trips; diversion required for local residents in comparison to Option 1 and 2. In terms of Integration, Option 4 is identified as the preferred option.

Environment

Option 1 holds significant advantage over the other options as it provides the least impact on the environment compared to the construction of a new link road. This option also promotes sustainable travel, therefore improving air quality and noise for the local area. In terms of Environment, Option 1 is identified as the preferred option.

Accessibility and Social Inclusion

Option 2 and 4 are comparable in their advantage over Option 1, this is due to the social severance caused by closing the existing crossing and not providing any vehicular alternatives.

Safety

With regards to safety, each of the options are comparable, with advantage for pedestrians and cyclists being given through Option 1. Options 2 and 4 feature lower diversion lengths for vehicle traffic and therefore are advantageous over Option 1.

Physical Activity

Option 1 holds a significant advantage over the options by providing a direct replacement to the existing provision with no major diversion required for NMU's.

9.4.2.5.3 Summary and Recommendations

Option 1 has been selected as the Emerging Preferred Option. It will be presented to the public at Public Consultation No.1 as the Emerging Preferred Option subject to feedback from PC1 and the results of further surveys and consultations.

Following the further consultation, surveys and analysis the Preferred Route will be selected and presented to the Public at Public Consultation No.2 in Q3 2020

9.4.2.6 Barberstown MCA

9.4.2.6.1 Description of Options

Following the Stage 1 MCA, the following options were considered the most feasible and were progressed to Stage 2 MCA:

- Option 2 - Overbridge 130 metres to the West of the Existing Level Crossing
- Option 4 - Overbridge 250 metres to the West of the Existing Level Crossing

The options are as described in the section 9.4.2 of this report:

9.4.2.6.2 Options Assessment

Table 9-19 below provides a summary matrix of the comparative assessment undertaken at Stage 1 to identify the most feasible options to progress to Stage 2 for a more detailed assessment. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the Emerging Preferred Option has been selected. The full matrix is provided in Appendix B.

Table 9-19 Short-listed MCA Stage 1 Options Summary Matrix

Criteria	Option 2	Option 4
Economy	Some comparative disadvantage over other options	Some comparative advantage over other options
Integration	Comparable to other options	Comparable to other options
Environment	Some comparative disadvantage over other options	Some comparative advantage over other options
Accessibility and Social Inclusion	Comparable to other options	Comparable to other options
Safety	Comparable to other options	Comparable to other options
Physical Activity	Comparable to other options	Comparable to other options
Preferred Option Ranking	2	1

As can be seen from the above Option 4 has been identified as the Emerging Preferred Option over Option 2.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in Option 4 being selected as the Emerging Preferred Option.

Economy

Under the parameter of Economy Option 4 is currently estimated to have the lowest construction costs. Option 2 and 4 are comparable to other options in terms of journey times and traffic functionality.

In terms of Economy, Option 4 is the preferred.

Integration

In terms of Integration, there is no comparative advantage or disadvantage between the option. In terms of Integration, Option 2 and 4 are identified as comparative.

Environment

Option 4 will have a significant advantage over other options due to the reduced impact on agricultural property. There is an impact on an equine farm holding resulting in land severance of lands located west of the Barberstown local road from the farmyard and equine facilities.

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

Accessibility and Social Inclusion

In terms of Accessibility & Social inclusion, there is no comparative advantage or disadvantage between the option. In terms of Integration, Option 2 and 4 are identified as comparative.

Safety

In terms of Safety, there is no comparative advantage or disadvantage between option 2 and 4 for rail safety and vehicular traffic safety. There are some comparative advantages over other options for pedestrian, cyclist, and vulnerable road user's safety for both option 2 and 4.

In terms of Safety, Option 2 and 4 are identified as comparative.

Physical Activity

In terms of Physical Activity, there is no comparative advantage or disadvantage between the options for permeability and local connectivity opportunity. However, there is some comparative advantages over other options for option 2 & 4 in terms of connectivity to adjoining cycling facilities.

In terms of Physical Activity, Option 2 and 4 is identified as the preferred option.

9.4.2.6.3 Summary and Recommendations

Option 4 has been selected as the Emerging Preferred Option. It will be presented to the public at Public Consultation No.1 as the Emerging Preferred Option subject to feedback from PC1 and the results of further surveys and consultations.

Following the further consultation, surveys and analysis the Preferred Route will be selected and presented to the Public at Public Consultation No.2 in Q3 2020.

9.4.2.7 Blakestown MCA

9.4.2.7.1 Description of Options

Following the Stage 1 MCA, the following options were considered the most feasible and were progressed to Stage 2 MCA:

- Do Minimum Closure of the existing crossings with no alternative provided. All traffic would be diverted to alternative routes around the crossing location.
- Option 1 Pedestrian and Cycle Bridge

The options are as described in the section 9.4.2 of this report:

9.4.2.7.2 Options Assessment

Table 9-20 below provides a summary matrix of the comparative assessment undertaken at Stage 1 to identify the most feasible options to progress to Stage 2 for a more detailed assessment. Excerpts of the matrix are provided under each of the criteria below with an assessment of why the Emerging Preferred Option has been selected. The full matrix is provided in Appendix B.

Table 9-20 Short-listed MCA Stage 1 Options Summary Matrix

Criteria	Do-Minimum	Option 1
Economy	Significant comparative advantage over other options	Significant comparative disadvantage over other options
Integration	Some comparative disadvantage over other options	Some comparative advantage over other options
Environment	Significant comparative advantage over other options	Significant comparative disadvantage over other options
Accessibility and Social Inclusion	Some comparative disadvantage over other options	Some comparative advantage over other options
Safety	Some comparative advantage over other options	Significant comparative advantage over other options

Criteria	Do-Minimum	Option 1
Physical Activity	Significant comparative disadvantage over other options	Significant comparative advantage over other options
Preferred Option Ranking	**1**	**2**

As can be seen from the above the “Do-minimum” Option has been identified as the Emerging Preferred Option over Option 1.

The sections below provide summaries of the MCA Stage 2 assessment that resulted in ”Do-minimum” being selected as the Emerging Preferred Option.

Economy

Under the parameter of Economy, the do minimum option is currently estimated to have the lowest construction and long-term maintenance costs. Each option has comparable results with terms of the traffic functionality.

In terms of Economy, Option 1 is the preferred.

Integration

Option 1 is identified as the Emerging Preferred Option as it has a direct replacement of facilities for NMU’s at the crossing locations, whereas the Do Min option closes the crossing with no alternatives.

Environment

The do minimum option holds significant advantage over the other options as it provides the least impact on the environment compared to the construction of a new link road. This option also promotes sustainable travel, therefore improving air quality and noise for the local area.

Accessibility and Social Inclusion

Option 1 holds an advantage over the do minimum due to the provision of replacing the existing crossing with NMU facilities, despite the removal of traffic access.

Safety

With regards to safety, each of the options are comparable, with advantage for pedestrians and cyclists being given through Option 1. Options 2 and 4 feature lower diversion lengths for vehicle traffic and therefore are advantageous over Option 1.

Physical Activity

Option 1 holds a significant advantage over the options by providing a direct replacement to the existing provision with no major diversion required for NMU’s.

9.4.2.7.3 Summary and Recommendations

The Do Minimum has been selected as the Emerging Preferred Option. It will be presented to the public at Public Consultation No.1 (PC1) as the Emerging Preferred Option subject to further consideration arising from feedback from PC1 and the results of further surveys and consultations.

Following the further consultation, surveys and analysis the Preferred Route will be selected and presented to the Public at Public Consultation No.2 in Q3 2020.

10 STRUCTURES

10.1 OHLE Clearance Challenging Overbridges

As an output from the MAY-MDC-ELE-ROUT-RP-E-0002 (OHLE early clearance assessment report), a number of overbridges (OBs) present a challenge for the implementation of the overhead electrical catenary system, due to reduced available gauge. In four cases, OBD226 (Newcomen bridge), OBG5 (Broom bridge), OBG11 (Granard Bridge) and OBG23 (Jackson's Bridge), there is insufficient headroom for any catenary solution. Twenty-two other locations require a non-standard solution, and in most cases, they only allow a contact wire height of 4200 mm.

The classification of OBs, according to the clearance categories is made based on colours (amber, red and black) where amber is the best case and black the worst case:

For the OB overbridges categorised as Black (no OHLE solution is possible) four alternative permanent way and structural solutions are considered:

- *Track lowering to achieve 4.4 contact wire system*
- *Track lowering to achieve 4.7 contact wire system*
- *Bridge modification*
- *New track alignment*

For the OB overbridges categorised as Red and Amber four alternative solutions are considered:

- *Reduce/Special Reduce clearance OHLE solution*
- *Track lowering to achieve 4.4 contact wire system*
- *Track lowering to achieve 4.7 contact wire system*
- *Bridge modification*

The results of MCA1 have led the Design Team to recommend the options for further analysis in MCA2.

Table 10-1 Red and Amber OB's Options Assessment

DART Maynooth & City Centre Enhancements. Draft Permanent Way Preliminary Assessment Criteria and parameters

Red and Amber OB's Options Assessment								
ID Details								
ID	Name	Location		Protected	Option 1. Special Reduce Catenary solution	Option 2. Lowering track 4.4 m contact wire	Option 3. Lowering track 4.7 m contact wire	Option 4. Deck bridge modification
		Section	Chainage					
2	OBG18 (Pike Bridge)	6 UP&DN	79+930	Yes	Special Reduce	Flooding issues	Flooding issues Bridge foundation	Listed OB
3	OBG16 (Louisa Bridge)	6 UP&DN	76+450	No	Special Reduce	Flooding issues Lexilip Louisa Station	Flooding issues Lexilip Louisa Station Bridge foundation	Current Flat deck. Singular bridge solution
4	OBG14 (Cope Bridge)	6 UP&DN	74+600	No	Reduced	Flooding issues Lexilip Confley Station	Flooding issues Lexilip Confley Station	Bridge modification

Red and Amber OB's Options Assessment								
ID Details								
ID	Name	Location		Protected	Option 1. Special Reduce Catenary solution	Option 2. Lowering track 4.4 m contact wire	Option 3. Lowering track 4.7 m contact wire	Option 4. Deck bridge modification
		Section	Chainage					
							Bridge foundation	
5	OBG13 (Collins Bridge)	6 UP&DN	72+700	No	Reduced	Flooding issues	Flooding issues Bridge foundation	Bridge modification
7	OBG9 (Old Navan Road Bridge)	6 UP&DN	65+720	No	Special Reduce	Drainage issues	Drainage issues Bridge foundation	Current Flat deck. Singular bridge solution
8	OBG7C (East M50 Roundabout)	6 UP&DN	65+640	No	Minimum normal (fitted)	Short distance to achieve required lowering	UBG7B Constrain	Current Flat deck. Huge impact on M5 autoroute
9	OBG7A (West M50 Roundabout / Navan Road)	6 UP&DN	65+460	No	Special Reduce	Short distance to achieve required lowering	Short distance to achieve required lowering Bridge foundation	Current Flat deck. Huge impact on M5 autoroute
11	OBD223 (Binns Bridge)	5 UP&DN	51+940	No	Reduced	Flooding issues	Flooding issues Bridge foundation	Bridge modification (special) Impact on urban mobility
12	OBD224 (Clonliffe Bridge)	5 UP&DN	51+500	No	Special Reduce	Drainage issues	Drainage issues Bridge foundation	Current Flat deck. Singular bridge solution Impact on urban mobility
13	OBD225 (Clarke's Bridge)	5 UP&DN	51+020	No	Special Reduce	Drainage issues Bridge foundation	Drainage issues Bridge foundation	Current Flat deck. Singular bridge solution Impact on urban mobility
15	OBD227 (Railway bridge)	5 UP&DN	50+550	No	Special Reduce	Drainage issues	Drainage issues Bridge foundation	Current Flat deck. Singular bridge solution Impact on north train lines
16	OBCN286 (Barnhill Bridge)	8 UP&DN	101+700	Yes	Reduced	Drainage issue	Drainage issues Bridge foundation	Listed OB

Red and Amber OB's Options Assessment								
ID Details								
ID	Name	Location		Protected	Option 1. Special Reduce Catenary solution	Option 2. Lowering track 4.4 m contact wire	Option 3. Lowering track 4.7 m contact wire	Option 4. Deck bridge modification
		Section	Chainage					
17	OBCN287 (Barnhill Bridge)	8 UP&DN	103+100	No	Minumum normal (Free Running)	-	Drainage issues	Structure already modificated
18	OBCN290 and OBCN290A (Dunboyne Bridge)	8 UP&DN	104+900	No	Reduced OHLE Solution	Impact on Dunboyne Station Bridge foundation	Impact on Dunboyne Station Bridge foundation	Bridge modification

Table 10-2 OBG23 Options Assessment

OBG 23 Options Assessment									
ID Details									
ID	Name	Location		Listed	Option 1. Do minimum. One track electrified	Option 2. Double track. lowering	Option 3. Double track. Bridge modification	Option 4. Double track. New alignment for one track	Option 5. Double track. New alignment for both tracks
		Section	Chainage						
1	OBG23 (Jackson's Bridge)	7	91+100	Yes	Decisive operational disadvantage	Increase of flooding and drainage issues	Protected Bridge Study of unique performances	Decisive operational disadvantage	Flooding risk assesstment

Table 10-3 OBG11, OBG5 and OBD226 Options Assessment

OBG 11, OBG5 and OBD226 Options Assessment								
ID Details								
ID	Name	Location		Listed	Option 1. Track lowering to allow a 4.2 m contact wire system	Option 2. Track lowering to allow a 4.7 m contact wire system	Option 3. Demolish/modify bridge structure	Option 4. New alignment solution
		Section	Chainage					
6	OBG11 (Granard Bridge)	6 UP&DN	66+020	No	Castleknock Station impact	Castleknock Station impact	Allows a better catenary solution and does not impact on Castleknock Station	Huge cost and a serious social impact
10	OBG5 (Broombridge)	6 UP&DN	61+120	No	Flooding issues	Increase of flooding and drainage issues Bridge foundation	Special modification solution.	Huge cost and a serious social impact

OBG 11, OBG5 and OBD226 Options Assessment								
ID Details								
ID	Name	Location		Listed	Option 1. Track lowering to allow a 4.2 m contact wire system	Option 2. Track lowering to allow a 4.7 m contact wire system	Option 3. Demolish/modify bridge structure	Option 4. New alignment solution
		Section	Chainage					
14	OBD226 (Newcomen bridge)	5 UP&DN	50+760	No	Drainage issues. Limited lowering because of UBD223	No possible because of UBD223	Current Flat deck. Singular bridge solution Impact on urban mobility	Huge cost and a serious social impact

The options chosen in the preliminary analysis of MCA1 should be studied further to determine their feasibility in the subsequent MCA2. The flood risk assessment and the information that will be obtained from the surveys will feed into them.

10.1.1 Options Selection Process

A comparative assessment is undertaken for each option in accordance with the CAF criteria.In this first phase of the process (MCA1), the recommended options go on to the next study phase (MCA2) in which the Emerging Preferred Option is identified.

10.1.1.1.1 Economic

Economy includes criteria for construction cost associated with earthworks, tracks, bridge modifications, structures, impact on other existing infrastructures, and other civil works.

It also considers maintenance and reinvestments costs for each solution.

Catenary solutions require higher maintenance cost and monitoring on OHLE and allow minimum tamping works.

Track lowering solutions requires higher maintenance when pumping drainage systems are required.

10.1.1.1.2 Integration

Integration assesses the impact on the operation of other transport services during construction.

Bridge modification solution is the only option that has a negative impact on other transport services during the works.

10.1.1.1.3 Environment

The environment parameters consider the criteria and sub-criteria established at MCA.

10.1.1.1.4 Accessibility and Social Inclusion

In terms of accessibility and social inclusion, all solutions proposed do not have any impact to be considered.

10.1.1.1.5 Safety

Safety includes the criteria related to Vehicular Traffic Safety and Structure Safety.

Bridge modification has a positive impact on traffic security, with the improvement of the structures' parapets.

Track lowering can impact negatively on structural safety in cases where the structure foundation is reached.

10.1.1.1.6 Physical Activity

Finally, physical activity considers the connectivity to adjoining cycling facilities and green areas, and all the alternatives are comparable to one another.

10.1.2 Description of Options

The Permanent Way and structural solutions proposed to gain sufficient clearance and allow the contact wire at a nominal height where possible are:

Vertical lowering:

This solution consists of a track lowering to reach a 4.4 m or 4.7 m contact wire height. It is proposed to lower one line and thereafter the other in a segmental track lowering, based on the maximum depth of 300-350 mm each time. That means that in some cases, to reach the required contact wire height, this action must be done two or three times.

These works will require possessions throughout weekend periods (it cannot be achieved during a single night possession), first lowering one track and the following weekend second track.

Bridge remodelling:

To increase the vertical clearance on arch bridges, where it is not possible to allocate a standard solution for OHLE, a precast concrete girder deck supported by a precast abutment is proposed.

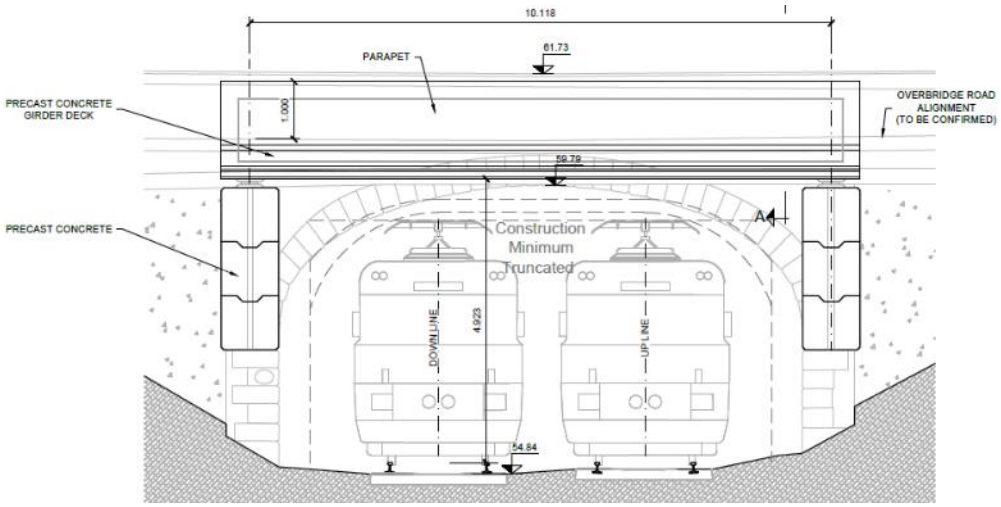

Figure 10-5 Proposed Bridge Remodelling

10.1.3 Summary and Recommendations

The options chosen in the preliminary analysis of MCA1 should be studied further to determine their feasibility in MCA2.

In situations resulting in track lowering, it must be verified that this does not result in flooding or drainage problems and that the foundations of the structures are not compromised.

Where bridge modifications are required, the clearance obtained with the modification must be verified and in the case of singular (protected) bridges and flat-deck bridges, the singular actions required by this modification must be studied.

10.2 OBG24

The existing overbridge OBG24 is an unlisted flat deck bridge that is likely to be demolished due to the new Depot and the new potential structure that will be constructed to allow its access (see section 6.8). This new bridge, however, is still under an optioneering exercise with permanent way, operation and depot design. The design solution will vary depending on the siding and operational strategy when the limit or extent of the electrification is confirmed in this area.

Figure 10-1 Existing OBG24 to be demolished

The OBG24 is currently under study. MCA1 is ongoing and consequent MCA2 and Emerging Preferred Option will be presented at PC2.

11 DEPOT

11.1 Options Selection Process

This process aims to select an Emerging Preferred Option for the depot layout that will be developed for the Railway Order. The process will rely on a multicriteria analysis (MCA) and the conclusions given from the analysis carried out. For that purpose, a Depot Options Selection Report has been prepared, assessing the various options under consideration. The following sections are a summary of the key points, while the full report is provided in Appendix 6.5A.

Option 3 has been determined to be the Emerging Preferred Option and, as a such, will be presented at PC1. Once comments have been received and further engagement with the impacted stakeholders is achieved, MCA2 will be prepared.

11.1.1 Site Location

The proposed Depot will be located to the west of Maynooth and south of the rail line and canal. It will be used for train maintenance and stabling.

Figure 11-1 Proposed Depot location in Maynooth West

11.1.2 Economic

Economy includes criteria for the construction cost associated with earthworks and tracks (because the facilities and buildings are similar in all alternatives) and for new overbridge for the road access and overhead power line diversion. It also considers traffic functionality and benefits related to reduction in movement time.

Alternatives 1 and 3 are ranked better in terms of economy and alternative 3 provides the most efficiency related to train flows between the main facilities although it requires a higher cost for construction and maintenance.

11.1.3 Integration

Integration assesses the adaptability in the future related to the extension of the stabling area or other facilities.

Alternative 6 is the top-rated because of the ease to link more stabling tracks in a one side stabling yard and to link future facilities to a longer alternative.

11.1.4 Environment

In the case of the environment parameter the land occupation is considered. Alternatives 2, 4 and 5 have higher evaluation as they require a smaller land occupation and result in less agricultural impact.

11.1.5 Accessibility and Social Inclusion

In terms of accessibility and social inclusion, the impact on residents and accessibility to employment is considered, alternatives 3 and 5 have less impact on the residents adjoining the main depot buildings in the central area.

11.1.6 Safety

Safety includes the criteria related to security, ease of supervision and road flows avoiding any internal level crossing. Alternatives 1 and 6 have been evaluated higher as they avoid any crossing with the track yard for road and staff flows.

11.1.7 Physical Activity

Finally, physical activity considers the connectivity to adjoining cycling facilities and linkage to green areas, and all alternatives provide similar levels of benefit.

11.2 Description of Options

The alternatives consist of different layouts of the tracks and facilities according to the assumed depot requirements. The following figures depict the layouts:

Alternative 1:

Stabling (one-ended tracks) and Main building are parallel in the West.
Area: 328.947 m^2
Length along main line: 2,25 km
Earthworks: 6.884 m^3 cut / 387.989 m^3 fill
Tracks length: 16,6 km
Turnouts: 62 units
Carriageways + parking area: 34.718 m^2

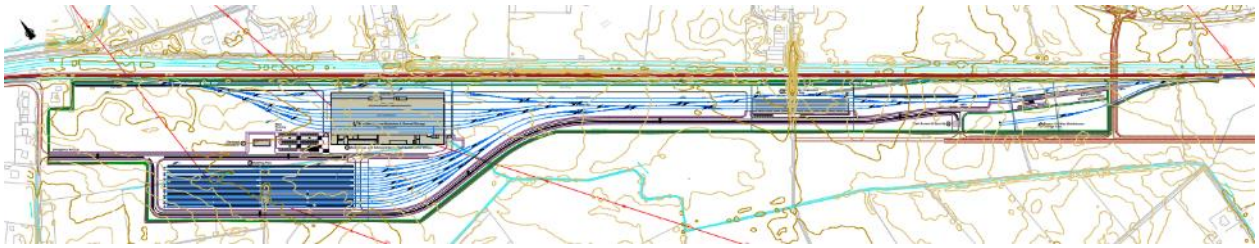

Figure 11-2 Depot Layout Alternative 1

Alternative 2:

Stabling (one-ended tracks) in the West and Main building in the East.
Area: 330.939 m²
Length along main line: 2,25 km
Earthworks: 1.729 m³ cut / 367.403 m³ fill
Tracks length: 18,1 km
Turnouts: 64 units
Carriageways + parking area: 42.291 m²

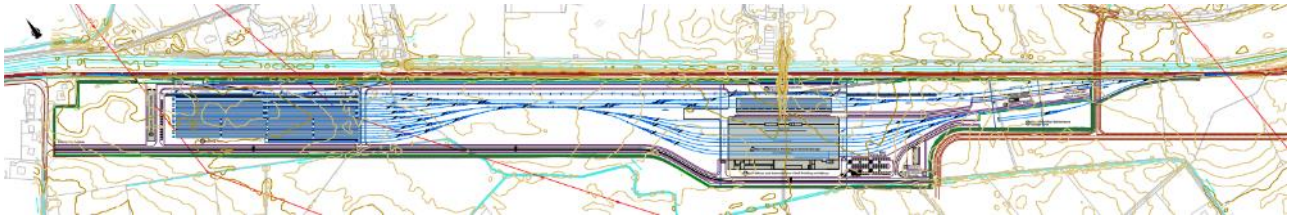

Figure 11-3 Depot Layout Alternative 2

Alternative 3:

Stabling (two-ended tracks) and Main building are adjacent in the central area.
Area: 326.389 m²
Length along main line: 2,58 km
Earthworks: 608 m³ cut / 587.518 m³ fill
Tracks length: 18,7 km
Turnouts: 76 units
Carriageways + parking area: 33.686 m²

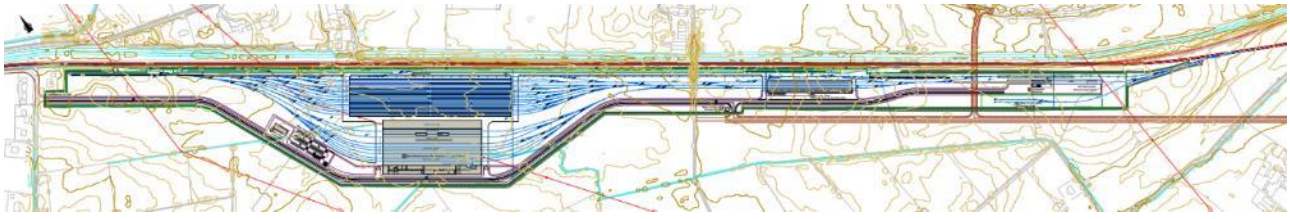

Figure 11-4 Depot Layout Alternative 3

Alternative 4:

Stabling (one-ended tracks) in the West and Main building in the central area.
Area: 316.704 m²
Length along main line: 2,58 km
Earthworks: 17.995 m³ cut / 446.659 m³ fill

Tracks length: 17,0 km
Turnouts: 63 units
Carriageways + parking area: 32.257 m²

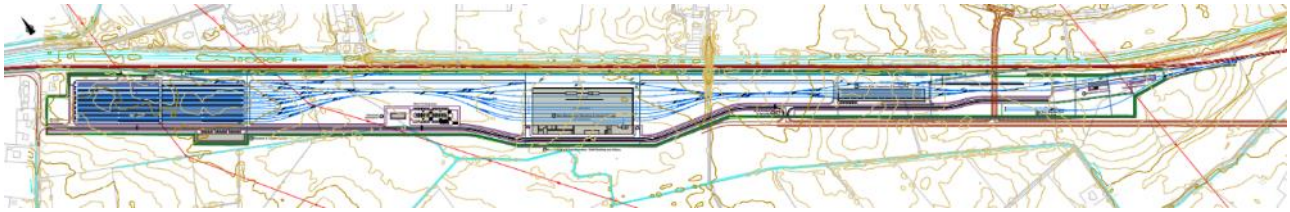

Figure 11-5 Depot Layout Alternative 4

Alternative 5:

Stabling (two-ended tracks) and Main building are adjacent in the central area, avoiding as much as possible electrical power lines clash.
Area: 309.829 m²
Length along main line: 2,58 km
Earthworks: 277 m³ cut / 624.746 m³ fill
Tracks length: 17,4 km
Turnouts: 64 units
Carriageways + parking area: 33.887 m²

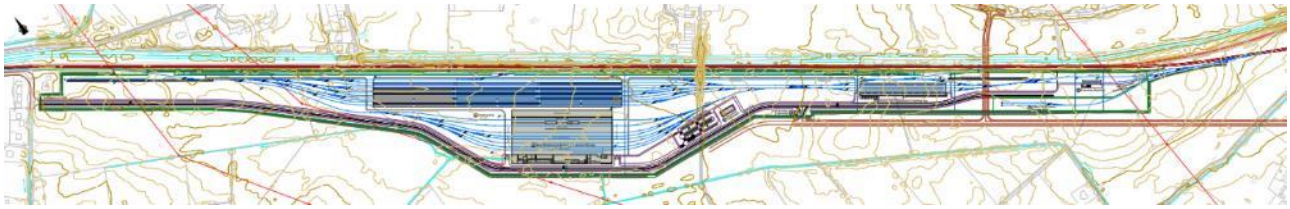

Figure 11-6 Depot Layout Alternative 5

Alternative 6:

Stabling (one-ended tracks) and Main building are parallel in the West and reception area has been included close to the entrance.
Area: 368.769 m²
Length along main line: 2,58 km
Earthworks: 6.637 m³ cut / 495.144 m³ fill
Tracks length: 17,6 km
Turnouts: 64 units
Carriageways + parking area: 41.026 m²

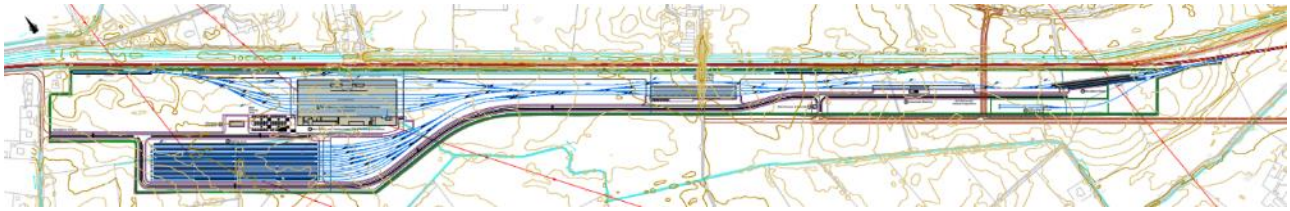

Figure 11-7 Depot Layout Alternative 6

11.3 Preliminary Options Assessment

The results of the Preliminary Options Assessment is shown in the table below.

Table 11-1 Depot Options Assessment Summary

N°	Parameter	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 6
1	Economy	Some comparative advantage 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	Some comparative disadvantage over other options
2	Integration	Some comparative advantage over other options	Some comparative disadvantage over other options	Some comparative advantage over other options	Some comparative advantage over other options	Some comparative advantage over other options	Some comparative advantage over other options
3	Environment	Some comparative disadvantage 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	Significant comparative disadvantage over other options
4	Accessibility & Social inclusion	Some comparative disadvantage over other options	Significant comparative disadvantage over other options	Some comparative advantage over other options	Significant comparative disadvantage over other options	Some comparative advantage over other options	Some comparative disadvantage over other options
5	Safety	Some comparative advantage 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	Some comparative advantage over other options
6	Physical Activity	Comparable to other options	Comparable to other options	Comparable to other options	Comparable to other options	Comparable to other options	Comparable to other options

11.4 Summary and Recommendations

Alternative 3 has been identified as the Emerging Preferred Option. The main advantages of this alternative are related to economy (taking into account all the criteria involved in the economic parameters), as it provides the most functional layout, albeit at higher construction and long term cost), integration (considering adaptability for link futures facilities), accessibility & social inclusion and safety.

The disadvantage compared to other options is related to the environment, where land acquisition and agricultural impacts are higher.

For more detail about the MCA assessment and criteria involved in each parameter, please refer to Appendix 6.5A.

12 DEPOT ACCESS

12.1 Options Selection Process

The MCA main goal is to compare some key parameters for each alternative and to highlight the emerging preferred one. The MCA methodology is informed by Department of Transport Tourism and Sport (DTTAS), Common Appraisal Framework for Transport Project and Programmes March 2016 guidance document.

The criteria list includes 6 main parameters (groups of criteria) from the Common Appraisal Framework (CAF). A number of criteria were developed under each of the six CAF parameters, informed by CAF/MCA guidance and the unique characteristics of the project. Sub-criterion for the quantitative and qualitative statements have been adapted relevant to the analysis.

Table 12-1 Parameters and Criteria

Parameter	Criteria	Sub-Criteria
Economy	Construction and Land Cost	Assessment of cost of construction of option, land costs, acquisition costs and temporary works
	Long Term Maintenance Costs	Assessment of Long-Term Maintenance
	Traffic Functionality / Economic Benefit	Benefits to vehicular traffic through reduction in journey time lengths and delays through removal of level crossings. Consideration of potentially longer routes for traffic.
Integration	Transport Integration	Impact on scope for and ease of interchange between modes. Impact on the operation of other transport services both during construction and in operation. New interchange nodes and facilities; Reduced walking and wait times associated with interchanges. Modal shift figures during construction and operations. Changes to journey times to transport nodes.
	Land Use Integration	Impact on land use strategies and regional and local plans. Assessment of support for land use factors local land use and planning. Inclusion of project in relevant local and regional planning documents.
Environment	Noise and Vibration	Estimated number of people likely to be affected by transport
	Air Quality and Climate	Local air quality effects. Number of receptors within 50m.
	Landscape and Visual (including Light)	Key landscape characteristics affected; Effects on listed/ key views; Impact on landscape character.
	Biodiversity (Flora and Fauna)	Potential compliance/conflict with biodiversity objectives; Indirect impacts on protected species, designated sites; Overall effect on nature conservation resource.
	Cultural, Archaeological and Architectural Heritage	Overall effect on cultural, archaeological and architecture heritage resource. Likely effects on RPS, National Monuments, SMRs, Conservation areas, etc. Number of designated sites/structures (by level of designation) directly impacted by scheme (land take)
	Water Resources	Overall potential significant effects on water resource attributes likely to be affected during construction and operation.

Parameter	Criteria	Sub-Criteria
	Agriculture and Non-Agricultural	Overall impact on land take & property. Number of properties to be impacted/acquired. Likely temporary or permanent severance effects, etc.
	Geology and Soils (including Waste)	Soils and Geology and likely impact on geological resources based on preliminary / likely construction details. Soil resources to be developed / removed. Existing information relating to potential to encounter contaminated land. High-level assessment based on the likely structures/ works required and the potential for ground contamination due to historic landfills, pits and quarries.
	Radiation and Stray Current	Overall likely impact on existing sources of electromagnetic radiation.
Accessibility & Social Inclusion	Impact on Neighbours	Potential impacts (positive / negative) on neighbours
Safety	Vehicular Traffic Safety	Quality of Access for road users, lengths of diversions, removal of interface with rail and other modes of transport
	Pedestrian, Cyclist and Vulnerable Road User Safety	Quality of Access for road users. removal of interfaces

Option 4 has been selected as the Emerging Preferred Option and it will be developed in the Reference Design and presented to Public Consultation No. 1. Once comments have been received and further engagement with the impacted stakeholders is achieved, MCA2 will be prepared if it is considered necessary.

12.2 Description of Options

The road access to the depot site has been studied to determine a suitable route for depot staff for site access, delivery of stock or equipment and HGV routing. Several routes have been proposed:

- 2 western accesses originating at Exit 8 of the M4 from Kilcock.
- 1 eastern access originating at Exit 7 of the M4 from Maynooth.
- 1 northern access linked to R148 that requires the construction of a new bridge.

Option 1 is an access road originating at Exit 8 of the M4 from Kilcock, at the existing road network. A ring one direction could be provided due to the narrow road width. Therefore, no new infrastructure is necessary, but this option would require the rearrangement of the direction of traffic.

Figure 12-1 Depot Access Route Option 1

Option 2 is an access from Kilcock interchange through a residential area where the final stretch up to the depot is a new road 670 m long (dotted line).

Figure 12-2 Depot Access Route Option 2

Option 3 is a road access from Maynooth interchange, this route goes through a large residential area with narrow meandering roads and the final stretch up to the depot is a new road 850m long (dotted line).

Figure 12-3 Depot Access Route Option 3

Option 4 is a road access from road R148 (connecting traffic to Maynooth and Kilcock interchanges) that requires the construction of a new bridge, which is related to the operation of the mainline because of the singularity of OBG23, which has a clearance issue with the OHLE when doubling track. This is Jackson´s Bridge, and it is protected (Categories of Special Interest: Architectural Historical Social Technical). The bridge (over the Royal Canal) and the Royal Canal drop are dated from 1793. The new OBG24 enables a new connection to the R148 crossing the canal and the mainline for the depot access and for the road network located south of the mainline.

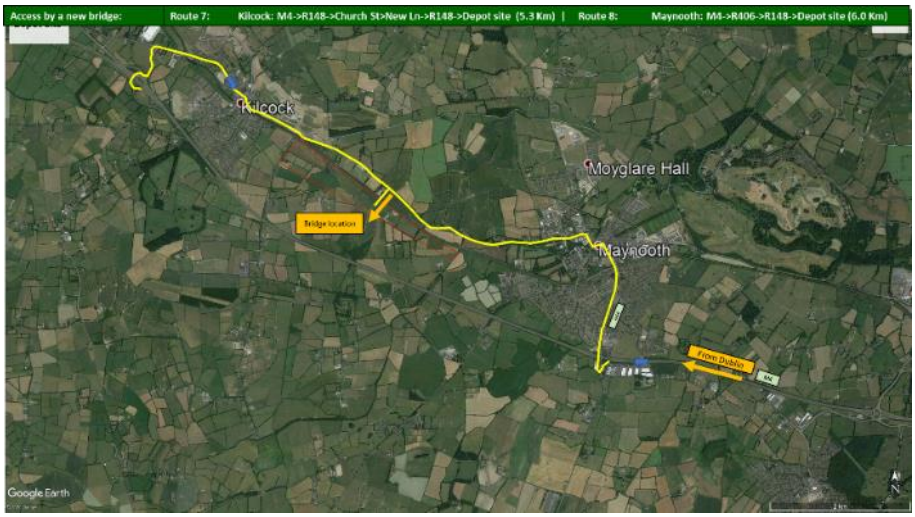

Figure 12-4 Depot Access Route Option 4

12.3 Preliminary Options Assessment

The summary of the results is shown in the table below.

Table 12-2 Summary of MCA1

Nº	Parameter	Option 1	Option 2	Option 3	Option 4
1	**Economy**	Some comparative disadvantage over other options	Some comparative disadvantage over other options	Some comparative disadvantage over other options	Some comparative advantage over other options
2	**Integration**	Some comparative disadvantage 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 advantage over other options	Some comparative disadvantage over other options	Some comparative disadvantage over other options	Some comparative disadvantage over other options
4	**Accessibility & Social inclusion**	Some comparative disadvantage over other options	Some comparative disadvantage over other options	Some comparative disadvantage 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 disadvantage over other options	Some comparative advantage over other options
6	**Physical Activity**	Some comparative disadvantage over other options	Some comparative disadvantage over other options	Some comparative disadvantage over other options	Some comparative advantage over other options

12.4 Summary and Recommendations

Option 4 has been selected as the Emerging Preferred Option and it will be taken forward in the reference design and presented to Public Consultation No. 1.

13 FURTHER WORK

13.1 General

13.1.1 Non Statutory Public Consultation No.1

This report presents a point in time description of the Option Selection Process and the Emerging Preferred End to End Option for the DART + Maynooth Line at the initiation of the first of 2 No. Non Statutory Public Consultations (PC01 and PC02), to be carried out by Iarnród Éireann. The report and annexed documentation have been assembled so as to ensure the public is best informed as to the status of development of the design at the time of publication.

13.1.2 Non Statutory Public Consultation No.2

As part of PC02 we will receive observations from the public. The observations will inform the choice of Preferred Option and the design development of same to PC02. At PC02 the Preferred End to End Option will be presented to the public in greater detail than is available for PC01. The enhanced level of detail will 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 Planeala.

It is noted that Preferred End to End Option for the project may differ from the Emerging Preferred End to End Option following consideration of observations from the public and following further development of the design.

This document will be updated for PC02. Feedback from PC02 will inform the design to be advanced to Railway Order.