
Chapter 4

Description of the Proposed Development

CONTENTS

4.	DESCRIPTION OF THE PROPOSED DEVELOPMENT	1
4.1	Introduction	1
4.2	Project Location	1
4.3	Project Overview	3
4.3.1	Key Infrastructural components of DART+ Coastal North	4
4.3.2	Key Infrastructural Elements in each Geographic Zone	8
4.3.3	Rolling Stock	10
4.3.4	Energy Efficiency	10
4.4	DART+ Design Standards	11
4.5	DART+ Coastal North General Linear Works	12
4.5.1	Electrification: The OHLE System	12
4.5.2	Electrification: HV Power, Substations & Electrical Buildings	17
4.5.3	Signalling System	24
4.5.4	Telecommunications System	26
4.5.5	Equipment Cabins	27
4.5.6	Works to the Permanent Way (or track & railway corridor)	32
4.5.7	Bridges & Structures	35
4.5.8	Fencing and Boundary Walls	39
4.5.9	Station Modifications	41
4.5.10	Depots	42
4.5.11	Other Ancillary Infrastructure	42
4.6	Zone A: North of Connolly Station to south of Howth Junction & Donaghmede Station	44
4.6.1	Proposed Development Zone A – Permanent Way (Track)	44
4.6.2	Interventions at Stations	44
4.6.3	Interventions at Bridges and Structures	44
4.6.4	Proposed Substations	44
4.6.5	Fairview Depot	45
4.7	Zone B: South of Howth Junction & Donaghmede Station to the north of Malahide Viaduct. (Including Howth Branch)	45
4.7.1	Proposed Development Zone B – Permanent Way (Track)	46
4.7.2	Proposals for equipment buildings	54
4.7.3	Interventions at stations	55
4.7.4	Interventions at Bridges and Structures	63
4.7.5	Proposed Substations	67
4.7.6	Donabate Level Crossing removal (XB001)	67
4.7.7	Otter Crossing	68
4.8	Zone C: North of Malahide viaduct to south of Gormanston Station (Fingal boundary)	68

4.8.1	Proposed Development Zone C – Permanent Way (Track)	69
4.8.2	Proposals for equipment buildings	72
4.8.3	Interventions at Stations	72
4.8.4	Interventions at Bridges and Structures	72
4.8.5	Proposed Substations	77
4.9	Zone D: South of Gormanston Station (Fingal border) to Louth/Meath border	84
4.9.1	Proposed Development Zone D – Permanent Way (Track)	84
4.9.2	Interventions at stations	85
4.9.3	Interventions at Bridges and Structures	85
4.9.4	Proposed Substations	86
4.10	Zone E: Drogheda Station and surrounds (boundary of Louth approx. 1.5km southeast of Drogheda Station)	89
4.10.1	Proposed Development Zone E – Permanent Way (Track)	90
4.10.2	Interventions at Drogheda MacBride Station	93
4.10.3	Proposed Drogheda Equipment Buildings	95
4.10.4	Interventions at Bridges and Structures	95
4.10.5	Proposed substations and equipment buildings	103
4.10.6	Drogheda MacBride Depot	104
4.11	DART+ Coastal North Operational Railway Characteristics	107
4.11.1	Operational Railway System	108
4.12	Maintenance Works	110
4.12.1	OHLE Maintenance	110
4.12.2	Preventative Rail Maintenance	110
4.12.3	Corrective maintenance	111
4.12.4	Maintenance machinery	111
4.12.5	Substations and technical building maintenance	112
4.12.6	Noise management	112
4.13	References	113

4. DESCRIPTION OF THE PROPOSED DEVELOPMENT

4.1 Introduction

This chapter presents the description of the proposed DART+ Coastal North project.

Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU on the assessment of the effects of certain public and private projects on the environment of the European Parliament and of the Council of 16 April 2014 (the EIA Directive) requires that the Environmental Impact Assessment Report (EIAR) includes ‘*a description of the proposed development comprising information on the site, design, size and other relevant features of the project*’. The description of the site, design and scale of the project provided in this chapter considers all relevant phases of the project, i.e., from the Construction Phase through to the Operational Phase (and in some cases its decommissioning).

This chapter should be read in conjunction with Chapter 5 (Construction Strategy) detailing the strategy for construction of the proposed DART+ Coastal North development, referred to hereafter as ‘the Proposed Development’. This chapter should also be cross referenced to drawing sets within Volume 3A of this EIAR.

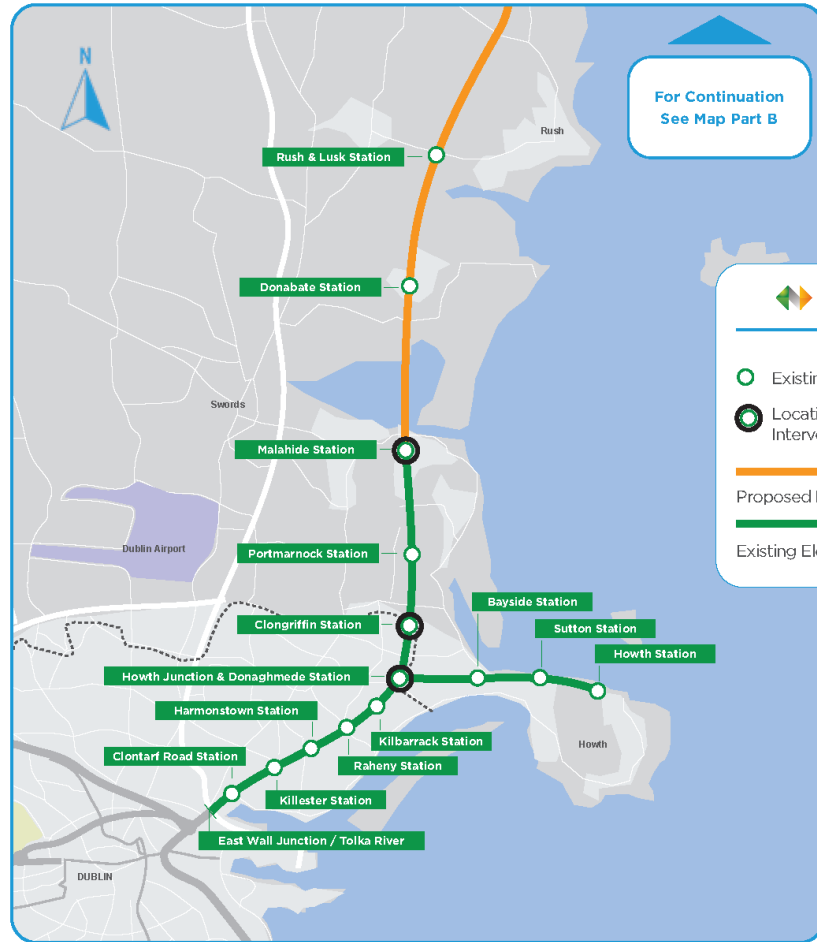
The Proposed Development features modifications to the existing line, which are referred to as General Linear Works as they are required across the entirety of the Proposed Development. These modifications, from Dublin City Centre to Drogheda, are described in Section 0 of this Chapter.

Sections 4.6 to 4.10 describe the end-to-end development, broken down by zone, which include details of all other elements that are specific to certain locations. (e.g., stations, depots, substations, and bridge interventions etc.).

4.2 Project Location

The Proposed Development will modify the current rail network between Dublin City Centre (north of Connolly Station) and Drogheda MacBride Station. The Proposed Development extends across four local authority areas including Louth, Meath, and Fingal County Council, as well as Dublin City Council. The total length of the Proposed Development is approximately 50 kilometres.

Map Part A



Map Part B



Image 4-1 Schematic of DART+ Coastal North

4.3 Project Overview

The DART+ Coastal North project is the third infrastructure project to launch as part of the DART+ Programme. The extents of the DART+ Coastal North project is presented in Image 4-1.

The DART+ Coastal North project, as part of the DART+ Programme, will deliver an improved and extended electrified rail network and will enable increased passenger capacity and an enhanced train service between Dublin City Centre and Drogheda, including the Howth Branch. This increased rail capacity will be achieved by implementing an extended electrified railway network with high-capacity DART trains and an increased frequency of rail services. In addition, the DART+ Coastal North project requires that some track modifications are implemented, including the provision of turnback facilities at Drogheda, Malahide, Clongriffin, and Howth Junction & Donaghmede Stations. These modifications are essential to facilitate the increase in train services by improving operational flexibility, allowing trains to be turned back clear of continuing services and enabling a higher frequency and a more reliable service.
















To achieve the peak capacity increases proposed by the DART+ Programme (see Image 4-2), the DART+ Coastal North project will seek a reconfiguration of Howth Junction & Donaghmede Station and the removal of train crossing conflicts at the station; these currently limit both capacity and frequency of services on the Northern and Howth Branch lines. The project is seeking to deliver the infrastructure at Howth Junction & Donaghmede Station that could enable the operation of both a DART shuttle service on the Howth Branch line as required, and/or a direct through service to/from Dublin City Centre.

The majority of proposed works and interventions are expected to be carried out within the existing railway corridor boundary. Some works and interventions, however, will be required outside of the existing railway boundary for some project elements such as:

- bridge modifications/improvements to facilitate extended electrification;
- construction of substations (to facilitate the provision of power to the line); and
- use of land for temporary construction/storage compounds.

Through this project, IÉ (Iarnród Éireann) is working to advance environmental sustainability by:

- decarbonising transport, ensuring climate change resilience,
- reducing our impact on the natural environment, and
- proactively protecting and enhancing biodiversity.

Planned increase in train frequency and passenger capacity for the 3-hour AM peak period for inbound/southbound services to Dublin City Centre.		
* Note: <ul style="list-style-type: none"> Enterprise & Commuter Services, originating in Belfast and Dundalk respectively, are expected to continue with current stopping patterns. DART Services to have potential to stop at all stations. 		
 Increase from 12,500 to 26,600 passengers (per 3hr peak)	 Increase from 11 to 24 services (per 3hr peak)	 1 Enterprise Service per hour 2 Commuter Services per hour 5 DART Services per hour <i>* All services originating in Drogheda</i>
 Increase from 23,300 to 33,800 passengers (per 3hr peak)	 Increase from 20 to 30 services (per 3hr peak)	 1 Enterprise Service per hour 2 Commuter Services per hour 7 DART Services per hour <i>* 2 services originating in Malahide</i>
 Increase from 23,300 to 33,800 passengers (per 3hr peak)	 Increase from 20 to 36 services (per 3hr peak)	 1 Enterprise Service per hour 2 Commuter Services per hour 9 DART Services per hour <i>* 2 services originating in Clongriffin</i>
 Increase from 10,800 to 21,600 passengers (per 3hr peak)	 Increase from 9 to 18 services (per 3hr peak)	 0 Enterprise Service per hour 0 Commuter Services per hour 6 DART Services per hour
 Increase from 35,100 to 41,000 passengers (per 3hr peak)	 Increase from 29 to 36 services (per 3hr peak)	 1 Enterprise Service per hour 2 Commuter Services per hour 9 DART Services per hour

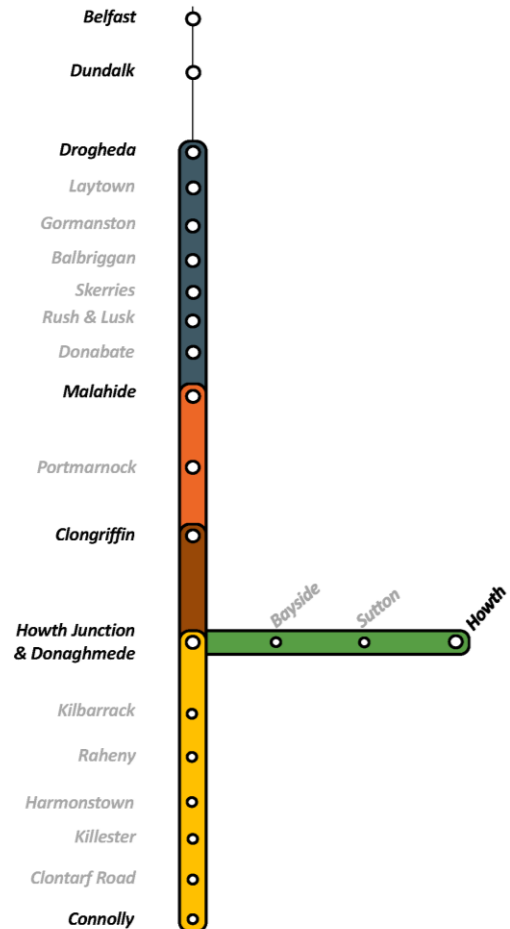


Image 4-2 Service capacity increases during AM peak period

In advance of the changes that the DART+ Coastal North project will enable in respect of increased capacity and train frequency, Iarnród Éireann plans to purchase Battery Electric Multiple Unit trains (BEMUs). The provision of these BEMUs will allow for the possibility of running enhanced services on the network in advance of full electrification. Iarnród Éireann identified the Northern Line as the most suitable route for BEMU deployment, with Drogheda MacBride Station and depot area as the preferred charging location. These BEMU works will be delivered under a separate project and the increase in service levels provided will be in advance of the electrification under the DART+ Coastal North project. Accordingly, the increase in service level referred to in Image 4-2 compares DART+ Coastal North to service levels post implementation of the BEMU fleet.

4.3.1 Key Infrastructural components of DART+ Coastal North

The key infrastructural components of the DART+ Coastal North project include:

- Extension of existing 1500V DC electrification, which currently terminates at Malahide, as far as Drogheda MacBride Station (approximately 37km); this includes:
 - The installation of foundations, masts, and overhead wires to supply power to the railway;

- Undertaking upgrades to existing signalling, telecoms, and power supplies to support the planned increase in train services, including the introduction of new electrical substations at key locations alongside the railway line at:
 - Drogheda;
 - Bettystown;
 - Gormanston;
 - Balbriggan;
 - Skerries North;
 - Skerries South;
 - Rush & Lusk (this location also incorporates an overhead line equipment (OHLE) maintenance compound); and
 - Donabate.
- Undertaking improvements / modifications to bridges spanning the railway arising from track reconfigurations and / or meeting required electrical clearances;
- Undertaking localised bridge modifications to enable OHLE to be fixed to bridges carrying the railway;
- Canopy modifications at Drogheda MacBride Station to accommodate OHLE clearances; and
- Modified railway boundary fences to protect the public from contacting the overhead line.
- Infrastructure works to facilitate the increase in service frequency and capacity, in specific areas of intervention as outlined below:
 - works around Howth Junction & Donaghmede Station;
 - works around Clongriffin Station;
 - works around Malahide Station & Viaduct;
 - works to the existing user worked level crossing (XB001) south of Donabate; and
 - works around Drogheda MacBride Station.
- Modifications to existing depots at Drogheda and Fairview to support the new train fleet, including the provision of additional train stabling at Drogheda; and
- Ancillary civils, utility diversions, drainage, and power work to cater for the changes.

For the purposes of describing the specific works relevant only to a particular location of the DART+ Coastal North project in this EIAR, the development has been divided into 5 geographical zones.

The EIAR zones are described using the local authority boundaries. As Fingal County Council covers a large area of the Proposed Development, this has been split into two zones. The zones are described in Table 4-1 and illustrated in Image 4-3.

Table 4-1 DART+ Coastal North geographical zones.

Zone	Location	Description	Local Authority
Zone A	North of Connolly Station to south of Howth Junction & Donaghmede Station	The area between north of Connolly Station to south of Howth Junction & Donaghmede Station, including Fairview Depot.	Dublin City Council
Zone B	South of Howth Junction & Donaghmede Station to the L6165 Coast Road north of Malahide Viaduct. (Including Howth Branch)	The area between Howth Junction & Donaghmede Station, and just north of Malahide Viaduct, plus the entire Howth Branch. Includes works within Howth Junction & Donaghmede Station, Clongriffin Station and the Malahide Viaduct.	Fingal County Council
Zone C	North of Malahide Viaduct to south of Gormanston Station (Fingal boundary)	The area between south of Donabate Station to south of Gormanston Station. Area includes Donabate, Rush & Lusk, Skerries and Balbriggan stations.	Fingal County Council
Zone D	South of Gormanston Station (Fingal border) to Louth/Meath border	The area between Gormanston Station (Fingal border) and the Louth/Meath border (boundary of Louth County 1.5km southeast of Drogheda MacBride Station). Includes Gormanston and Laytown Stations.	Meath County Council
Zone E	Drogheda MacBride Station and surrounds	Drogheda MacBride Station and surrounds including the area between the Dublin Road Bridge (UBK01) to the Louth/Meath border.	Louth County Council

Map Part A



Zone E - Description	Local Authority
Drogheda MacBride Station and surrounds including the area between the Dublin Road Bridge (UBK01) to the Louth/Meath border	Louth County Council
Zone D - Description	Local Authority
The area between Gormanston Station and the Louth/Meath border (boundary of Louth approx. 1.5km southeast of Drogheda MacBride Station). Includes Gormanston and Laytown Stations.	Meath County Council
Zone C - Description	Local Authority
North of Malahide viaduct to south of Gormanston Station (Fingal boundary). The area between south of Donabate Station to south of Gormanston Station. Area includes Donabate, Rush & Lusk, Skerries and Balbriggan Stations.	Fingal County Council
Zone B - Description	Local Authority
South of Howth Junction & Donaghmede Station to north of Malahide Viaduct (Including Howth Branch). The area between Howth Junction & Donaghmede Station, and just north of Malahide Viaduct, plus the entire Howth Branch. Includes works within Howth Junction & Donaghmede Station, Clongriffin Station and the Malahide Viaduct.	Fingal County Council
Zone A - Description	Local Authority
The area between north of Connolly Station to south of Howth Junction & Donaghmede Station, including Fairview Depot.	Dublin City Council

Map Part B



Image 4-3 DART+ Coastal North geographical zones

4.3.2 Key Infrastructural Elements in each Geographic Zone

Infrastructural changes are required along the length of the Proposed Development. The key interventions in each geographic zone are presented in Table 4-2.

Table 4-2 Key Infrastructural Elements in each Geographic Zone.

Zone	Activity
Zone A	<p>This zone from north of Connolly Station to south of Howth Junction & Donaghmede Station includes the following works:</p> <ul style="list-style-type: none"> • Minor upgrades and internal modifications to Fairview Depot and sidings; and • New drainage connection to combined sewer on Alfie Byrne Road.
Zone B	<p>This zone from south of Howth Junction & Donaghmede Station to north of Malahide Viaduct (including Howth Branch) includes the following works:</p> <ul style="list-style-type: none"> • Modification of Howth Junction & Donaghmede Station Accesses and Footbridge (OBB17A); • Construction of the Howth Junction & Donaghmede Station Platform 2 Extension; • Construction of a new crossover on the Howth Branch Line at Howth Junction & Donaghmede Station (Howth Junction Turnback); • Construction of two new turnouts on the Up Dublin Line, and a new Loop Line to the east of Clongriffin Station. (Clongriffin Turnback); • Construction of a new retaining wall at Clongriffin Station, utility diversions and associated earthworks; • Construction of new Underbridge UBB19A (Mayne River), UBB18D culvert extension and embankment north of Clongriffin Station; • Construction of a new central turnback line north of Malahide Station, new crossover on the Up Dublin Line and new turnout on the Down Belfast Line. (Malahide Turnback); • Construction of new reinforced earth wall alongside the proposed Broadmeadow Way greenway and embankment widening, north of Malahide Station; • Modification of Underbridge UBB30 (Malahide Viaduct) to support OHLE; • Closure of (user worked) level crossing (XB001); • Construction of a new Otter Crossing, adjacent to the Underbridge UBB31 (River Pill); • OHLE and Signalling, Electrification and Telecoms (SET) modifications at Malahide, Howth and Clongriffin; and • OHLE and Signalling, Electrification and Telecoms (SET) line-wide works north of Malahide Turnback.
Zone C	<p>The zone from the north of Malahide Viaduct to south of Gormanston Station (Fingal boundary) includes the following works:</p> <ul style="list-style-type: none"> • Construction of Donabate Substation compound; • Modification of Underbridge UBB36 (Rogerstown Viaduct / Estuary) to support OHLE; • Construction of Rush and Lusk Substation and OHLE maintenance compound; • Upgrade of existing station access road junction at Rush and Lusk Station; • Track lowering at Overbridge OBB39 (carrying Station Road / R128); • Track lowering at Overbridge OBB44 (carrying local road in Tyrrelstown Big); • Construction of Skerries South Substation compound; • Construction of Skerries North Substation compound; • Track lowering at Overbridge OBB55 (carrying Lawless Terrace / R127); • Modification of Underbridge UBB56 (Balbriggan Viaduct) to support OHLE; • Construction of Balbriggan Substation compound; • Road overbridge parapet modifications for compliant safety standards to: <ul style="list-style-type: none"> ○ OBB32A (carrying the Donabate Distributor Road), ○ OBB35 (access to Beaverstown Golf Club), ○ OBB38 (carrying Rogerstown Lane),

Zone	Activity
	<ul style="list-style-type: none"> ○ OBB41 (carrying local road in Rathartan), ○ OBB46 (carrying the L1285 / Baldongan Close), ○ OBB47 (historic access to Skerries Golf Club), ○ OBB49 (carrying Golf Links Road), ○ OBB55 (carrying Lawless Terrace / R127) and ○ OBB68 (local access adjacent Gormanston Camp). • Pedestrian footbridge parapet modifications for compliant safety standards to: <ul style="list-style-type: none"> ○ OBB33A (Donabate Station footbridge), ○ OBB38A (Rush & Lusk Station footbridge), ○ OBB51A (Skerries Station footbridge), ○ OBB54 (The Ladies Stairs) and ○ OBB57A (Balbriggan Station footbridge). • OHLE and Signalling, Electrification and Telecoms (SET) line-wide works; • Diversion of overhead power lines railway crossings into Under Track Crossings (UTX) at Rush & Lusk, Tyrrelstown, Golf Links Road, Baldongan, and Balbriggan; and • Utility diversions.
Zone D	<p>The zone south of Gormanston Station (Fingal border) to Louth/Meath border includes the following works:</p> <ul style="list-style-type: none"> • Construction of Gormanston Substation compound; • Modification of Underbridge UBB72 (Laytown Viaduct) to support OHLE; • Construction of Bettystown Substation compound; • Track lowering at Overbridge OBB78 (carrying Colpe Road); • OHLE and Signalling, Electrification and Telecoms (SET) line-wide works; • Diversion of overhead power lines railway crossings into Under Track Crossings (UTX) at Gormanston, Laytown, and Drogheda; • Road overbridge parapet modifications for compliant safety standards to: <ul style="list-style-type: none"> ○ OBB68 (Irishtown), ○ OBB77 (Colpe East), and ○ OBB78 (carrying Colpe Road). • Pedestrian footbridge parapet modifications for compliant safety standards to: <ul style="list-style-type: none"> ○ OBB74A (Laytown Station footbridge); and • Utility diversions.
Zone E	<p>Drogheda MacBride Station and surrounds includes the following works:</p> <ul style="list-style-type: none"> • Demolition and replacement of triple span Overbridge OBB80/80A/80B (Railway Terrace); • Realignment of Railway Terrace and McGrath's Lane; • Reconstruction of Underbridge UBK01 (R132/Dublin Road Bridge); • Reconstruction of Overbridge OBB81 (Drogheda Station Footbridge); • Modification to existing Platform 1 Station Canopy; • Construction of new Platform 4 (on the Drogheda Freight Sidings) and associated modifications to station car park and connectivity to Drogheda MacBride Station; • Track works on Drogheda Freight Sidings at Drogheda (Drogheda Turnback); • Construction of Drogheda Substation compound; • Civil Works on Light Maintenance Roads, Under Frame Cleaning (UFC) facility and Northern Headshunt; • Reprofitting existing earthwork bund at Drogheda Depot; • Track works on Stabling Roads 7a, 7b; • OHLE and Signalling, Electrification and Telecoms (SET) line-wide works; • Diversion of overhead power lines railway crossings into Under Track Crossings (UTX) at Drogheda; and • Utility diversions.

4.3.3 Rolling Stock

On completion of the electrification project, new DART trains will operate on the route, along with the existing fleet of trains. Iarnród Éireann (IÉ) has recently signed a 10-year Framework Agreement for the supply of a new fleet for operation in the expansion of the DART network. This fleet will be a mixture of Electric Multiple Units (EMU) and Battery Electric Multiple Units (BEMU).

The main features of the new rolling stock are in line with IÉ standards regarding gauge and infrastructure and thus they will be capable of operating on the routes stated in the Train Infrastructure Interface Specification (TIIS) (CME-NFP-TS-001). The maximum length of the new trains is 164m. The units will operate as 5-car units, 10-car units or two coupled 5-car units. The 5-car units have shorter vehicles than the existing DART fleet and, as such, a 5-car unit of the new fleet is the equivalent of a 4-car unit of the existing fleets.

The current DART fleet is composed of two types of EMU: the 8100 and the 8500 fleets. The 8100 EMUs were the first electric units of the DART fleet and are expected to be out of service in 2027/2028. The newer 8500 fleet (8500, 8510 and 8520) will coexist with the new fleet. A basic unit configuration for this fleet is a 4-car unit with two trailers and two motor cars, while in-service most of the units will be coupled as an 8-car unit.

4.3.4 Energy Efficiency

The energy efficiency approach in the DART+ Coastal North project is aligned with the following three key aspects:



- energy: the Proposed Development will promote energy saving with a cost-optimal approach by reducing the energy demand with passive architectural strategies, reducing energy consumption with energy-efficient equipment, and producing energy with renewable technologies. Energy is also related to CO₂ emissions and IÉ's future Carbon Neutrality goal. Architectural design will consider NZEB (Nearly Zero Energy Building) strategies;



- water: the Proposed Development will aim to minimise potable water consumption using low consumption fixtures and through recycling and reuse of greywater; and



- materials: the Proposed Development will prioritise the use of environmentally friendly materials and the use of recycled and recyclable materials.

4.4 DART+ Design Standards

The elements of the Proposed Development have been designed in accordance with various technical and safety related standards which include relevant IÉ National and EU standards and guidelines listed in Table 4-3.

Table 4-3 Design standards and guidance documents.

Design Element	Standard
Roadworks (urban streets, bus facilities, cycle facilities and public realm)	The Design Manual for Urban Roads and Streets (DMURS)
	The National Cycle Manual (NCM)
	TII Publications: Standards for National Roads in Ireland
	The Traffic Signs Manual (TSM)
Stations	Building Regulation 2010 – Technical Guidance Documents
Track	CCE (Chief Civil Engineer) Department Technical Standards
Depot	Building Regulation 2010 – Technical Guidance Documents
	CME (Chief Mechanical Engineer) Department Standard
High Voltage (HV) Power System	SET (Signalling, Electrification and Telecoms) Department Standards
Signalling System	SET (Signalling, Electrification and Telecoms) Department Standards
Communications System	SET (Signalling, Electrification and Telecoms) Department Standards
OHLE System	SET (Signalling, Electrification and Telecoms) Department Standards
Drainage Design	Greater Dublin Regional Code of Practice for Drainage
Utilities Diversions	Irish Water Code of Practice for Water Infrastructure
	Irish Water Code of Practice for Wastewater Infrastructure
	Gas Network Ireland Code of Practice
	ESB (Electricity Supply Board) Code of Practice
Structures	Design Manual for Roads and Bridges (DMRB), relevant for certain technical elements TII Publications: Standards for National Roads in Ireland
	Eurocodes
	Irish Building Regulations
	IÉ Structure Standards

4.5 DART+ Coastal North General Linear Works

The Proposed Development will require enhancements and modernisation of the existing Northern Line, within the DART+ Coastal North project extents.

This section provides an overview of all the works, which are proposed along the railway line between Dublin City Centre and Drogheda, including the Howth Branch. The description includes those general linear works that manifest along the full extent of the scheme, as well as other discrete localised interventions to be repeated at regular points along the railway. Mileage quoted is for the Dublin to Belfast Line taken from the 0 milepost at Dublin Connolly.

The general linear works include:

- Electrification: the OHLE system;
- Electrification HV Power, substations & electrical buildings;
- Signalling system;
- Telecommunications system;
- Equipment cabins;
- Fencing and boundary walls; and
- Other ancillary infrastructure (including temporary compounds, drainage and utility diversions).

Sections 4.6 to 4.9 provide a more detailed description of the main elements of the works within each geographic zone without repeating some of the general linear elements of infrastructure described in Section 0. These include:

- Works to the Permanent Way (or track & railway corridor);
- Bridges and structures;
- Proposed substations;
- Station modifications; and
- Depots.

4.5.1 Electrification: The OHLE System

The railway lines north of Malahide through to Drogheda will be electrified to support operation of new Electrical Multiple Unit (EMU) trains from the point at which the current electrification terminates just north of Malahide Station as far as Drogheda MacBride Station. The proposed method of electrification is through using Overhead Line Equipment (OHLE) at 1500V DC (direct current). The configuration of the proposed OHLE will be similar to the arrangements between Malahide and Connolly, allowing for minor differences taking account of technological changes in the intervening period.

The OHLE is formed primarily by two aerial electrical live wires (catenary and contact wire) located above the tracks which power the trains through the contact between a train's pantograph and the OHLE contact wire. Additional aerial earth and parallel feeder wires are also required to be installed along the track. The OHLE system is fed from new substations located along the line, as described in Section 4.5.2.1 of this report.

To support the OHLE wires, masts and other infrastructure will be erected along the line and through stations, from north of Malahide to Drogheda (including Drogheda Depot and part of the Drogheda Freight Sidings). Typical spacing between OHLE support structures will be between 40m and 50m, with a maximum spacing of 65m. The OHLE support heights will vary between 6.5m and 8.5m.

The OHLE support structure types will vary depending on the location and system requirements and consist of four different configurations; single-track cantilever, double-track cantilever, headspans and portal frames similar to examples present on the existing DART Lines (see to).



Plate 4-1 Example single & two-track cantilevers (Arup)



Plate 4-2 Example Headspan (DART)



Plate 4-3 Example portal frame (DART)

To enable the safe operation of the OHLE equipment, it is necessary to manage vegetation clearance, and keep vegetation to a minimum of 1.5m from the rear of masts or 1.5m from any wire running between masts.

Apart from its visual impact, the OHLE also generates electromagnetic fields. For that reason, EMC (electromagnetic compatibility) needs to be assessed for certain adjacent areas to allow for a safe design, which includes earthing and bonding. An EMC assessment has been carried out for the DART+ Coastal North project: see Chapter 22 (Electromagnetic Effects and Stray Current) in Volume 2 of this EIAR. Image 4-4 to Image 4-7 illustrate typical OHLE cross-sections that will be used for the Proposed Development. Due to spatial constraints, a single track cantilever is the most common OHLE configuration. Double track cantilevers will be used where there is space available on only one side of the track. Back-to-back cantilevers are used (in limited locations) where there is space available between the tracks. Finally, portal frames are used at viaducts (with sufficient vertical clearance) and at stations where multiple tracks are present.

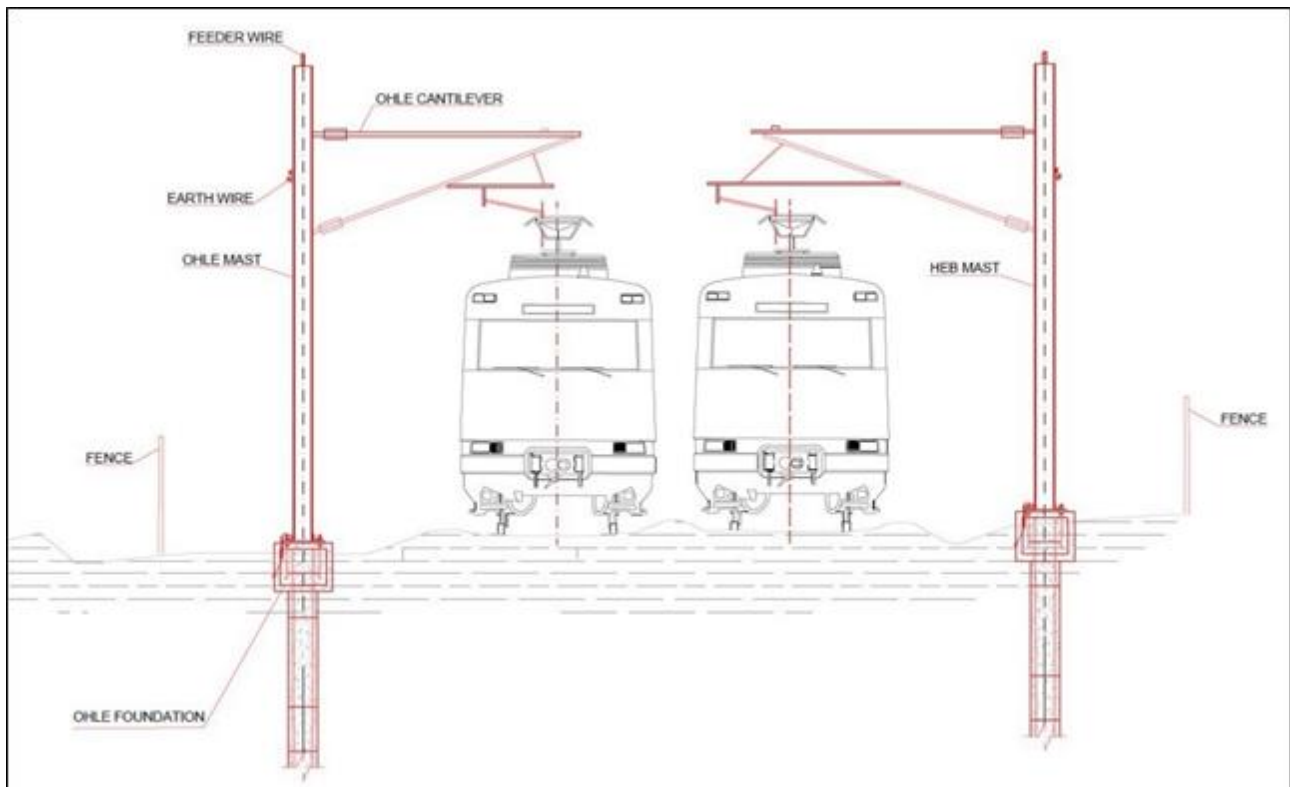


Image 4-4 Typical single track cantilever cross section

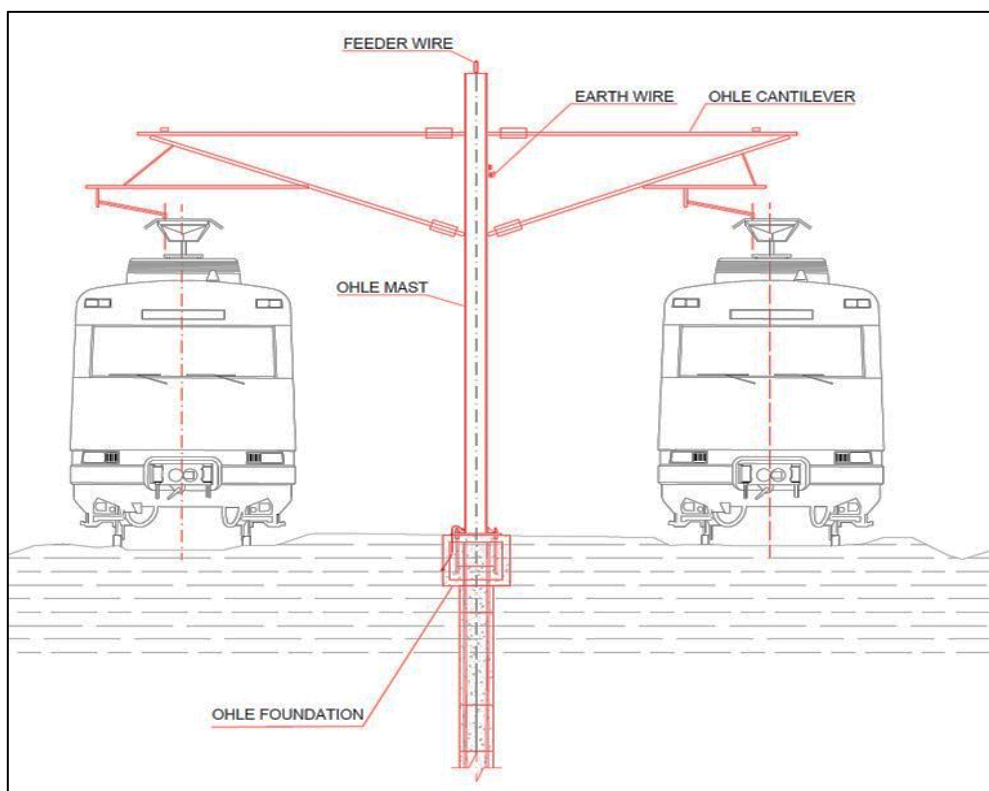


Image 4-5 Typical back-to-back cantilever cross section

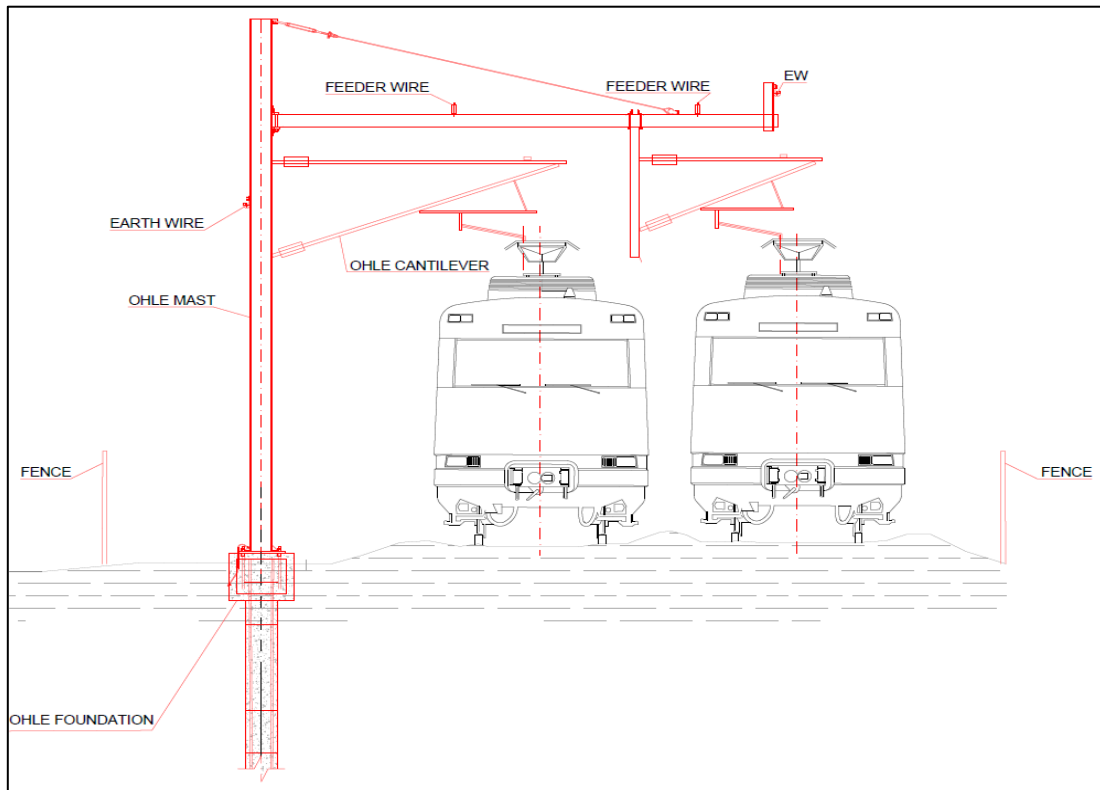


Image 4-6 Typical two track cantilever cross section

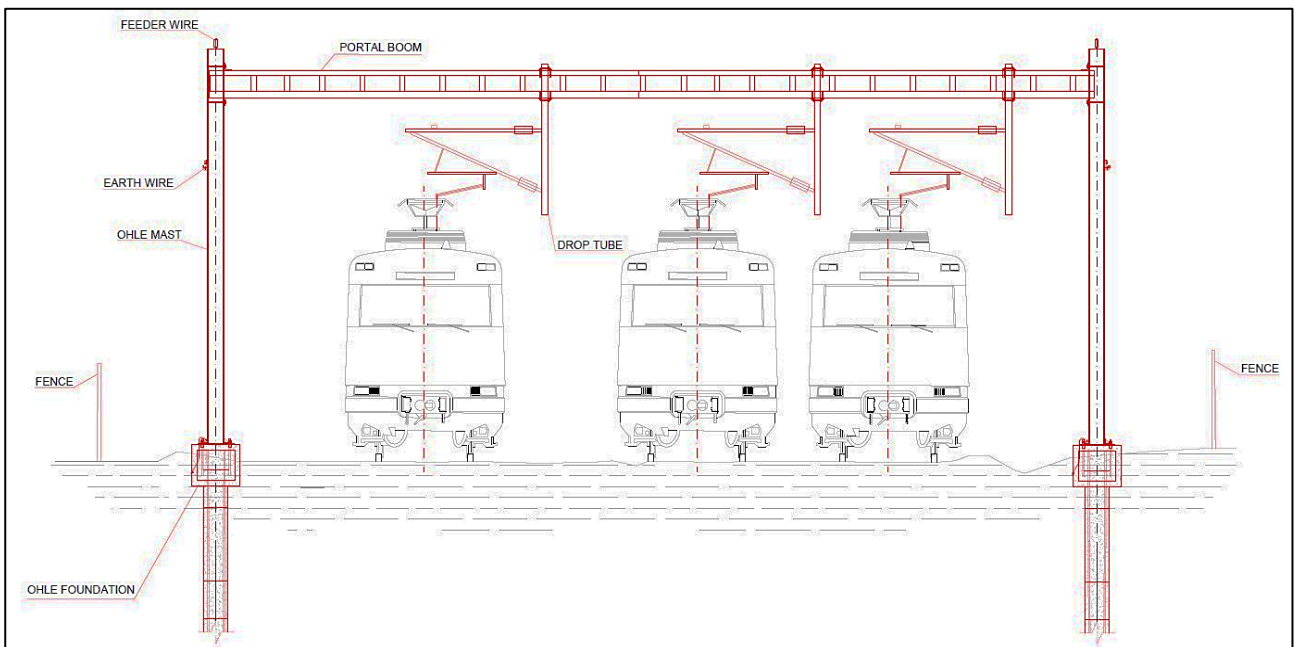


Image 4-7 Typical portal frame cross section

4.5.2 Electrification: HV Power, Substations & Electrical Buildings

HV (high voltage) power will be supplied to DART+ Coastal North from the ESB distribution network via new substations located at regular intervals between Malahide (the current extent of the electrified line) and Drogheda. These substations will be similar to those shown in Plate 4-4 and Image 4-8.



Plate 4-4 Existing Malahide substation building

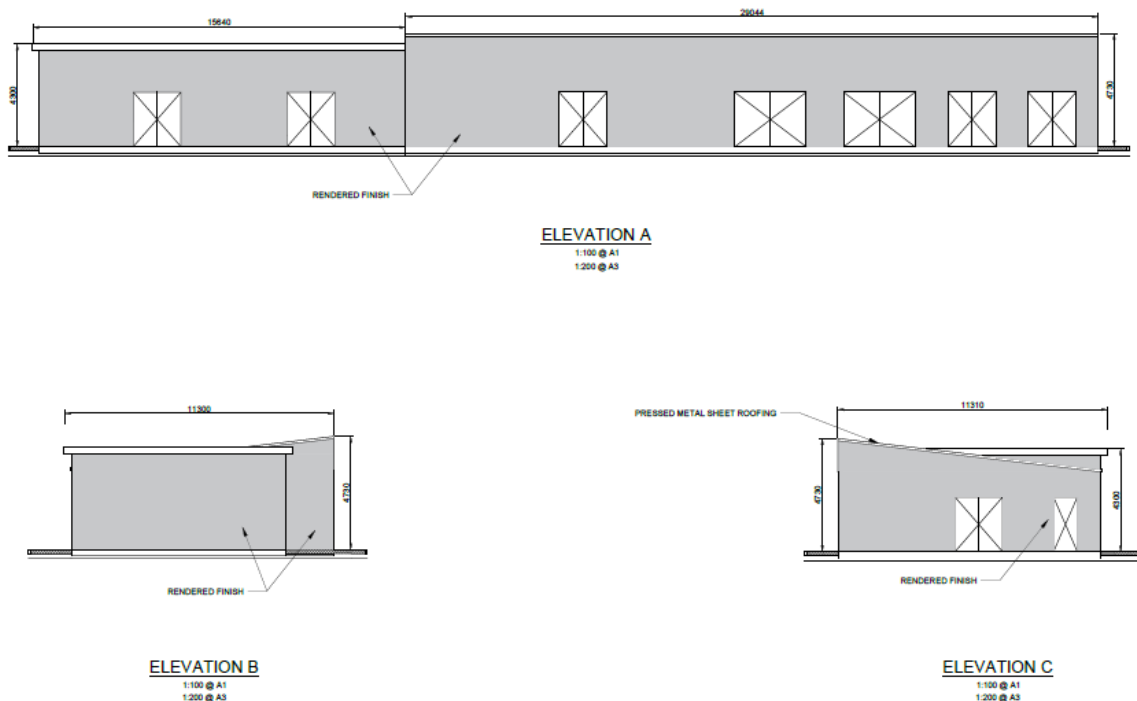


Image 4-8 Example substation building

4.5.2.1 Substations

The required number and the location of these substations has been determined from a traction power simulation study which has established that eight new substations will be required between Malahide and Drogheda to supply power to the railway network. Substations are proposed at the following locations:

1. Donabate (Zone C);
2. Rush & Lusk (Zone C);
3. South Skerries (Zone C);
4. North Skerries (Zone C);
5. Balbriggan (Zone C);
6. Gormanston (Zone D);
7. Bettystown (Zone D); and
8. Drogheda (Zone E).

A detailed description of the substations that are proposed for electrification is provided below.

Electrical power from the ESB network will be supplied to the substations, and it will be converted from 38kV to 1,500V direct current (DC) to power the overhead line electrical system. The substation buildings are divided into two parts, shared between IÉ and ESB. IÉ will have the largest part of the building (approximately 5.0m high x 30m long x 11m wide) and ESB will have the smaller part of the building (approximately 5.0m high x 16m long x 10m wide).

The substations will be located within a secure compound, behind IÉ green palisade fencing for security purposes. Where practicable, substations have been located within IÉ owned lands with screening vegetation proposed in front of the palisade fencing. It is noted that the Rush and Lusk Substation location will also include an OHLE maintenance compound.

Characteristics

Key characteristics of the substations are as follows:

- Approximate substation building dimensions (including IÉ and ESB parts): 45m x 9m x 5m (length x width x height);
- The exterior and the access to the substations must be sufficiently illuminated to assure the mobility and the security of any operation during the night. Typically, the substation paths will be lit by pathway lighting and the buildings by use of low Lux level LED floodlighting mounted to the buildings and activated by motion sensors;
- An access road will be provided to allow for vehicle and pedestrian access to the building. The minimum road access width required by ESB is 4.5m. Parking spaces for each substation will also be provided; and
- The finish proposed for the substations is grey render on all elevations with pressed metal roof sheeting, keeping the same architectural finishes as the existing Iarnród Éireann substations. They will have a similar appearance to the substation elevations shown in Image 4-8.

The traction power simulation study has also established the power requirements (in MVA) for each traction substation. The substations will be fed by a 38kV supply from two ESB connections. The supply will be conditioned and converted into a 1500V DC supply and then connected to the OHLE system. A typical substation layout is shown in Image 4-9, including the ESB area (left) and the IÉ area (right). There will be a dual locking system at the entrance of the compound, so that both ESB and IÉ have access.

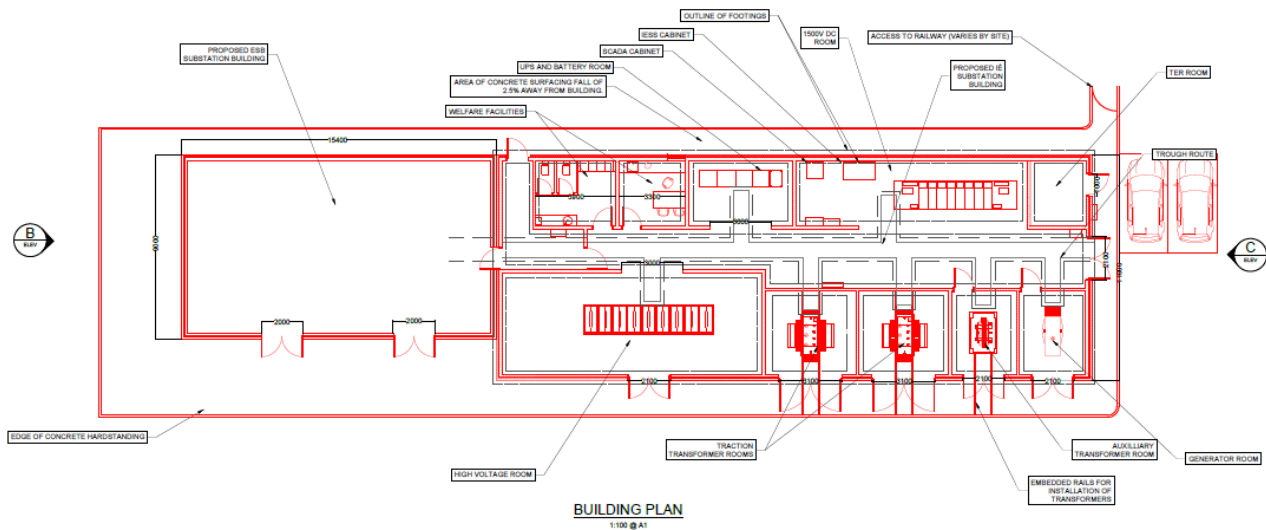


Image 4-9 Example substation layout

The power demand - maximum import capacity (MIC) - for each substation is presented in Table 4-4.

Table 4-4 DART+ Coastal North proposed substations.

Substation	Maximum Import Capacity (MIC) in MVA
Drogheda	4.451
Bettystown	1.890
Gormanston	1.872
Balbriggan	1.874
Skerries North	1.702
Skerries South	1.619
Rush & Lusk (& OHLE maintenance compound)	1.957
Donabate	1.918
Howth Branch	2.580

In addition to the substations, other equipment cabins/buildings are required to support the signalling, electrical and telecommunications infrastructure. These will be located within existing IÉ land, where possible, and will typically be in stations where similar cabins are currently located. The various cabins/buildings required are described in Section 4.5.5. As noted above, the Rush and Lush Substation site is also to be used as an OHLE maintenance compound, which is described in Section 4.8.5.2.

4.5.2.2 Track Paralleling Huts (TPH)

Track Paralleling Huts (TPHs) are part of the HV (high voltage) power supply system. They are used for monitoring, detecting and correcting traction failures in critical sections to increase reliability. There are only two new TPHs required for DART+ Coastal North: one to support operation around Skerries Station under certain fault conditions and the other at the end of the electrified section adjacent to Drogheda Depot.

The minimum size requirements for the TPHs are approximately 5m x 4.5m x 4.6m (length x width x height), as shown in Image 4-10, and an example of a TPH is shown in .

Typical TPH characteristics are:

- Contain electrical cabins, low-voltage power supply and communications equipment;
- The building will only be accessed occasionally for maintenance or repair activities;
- The external architectural finish for the TPH is cement plaster finish on all elevations with a pressed metal roof sheeting; and
- No connection to the Irish Water network is required.

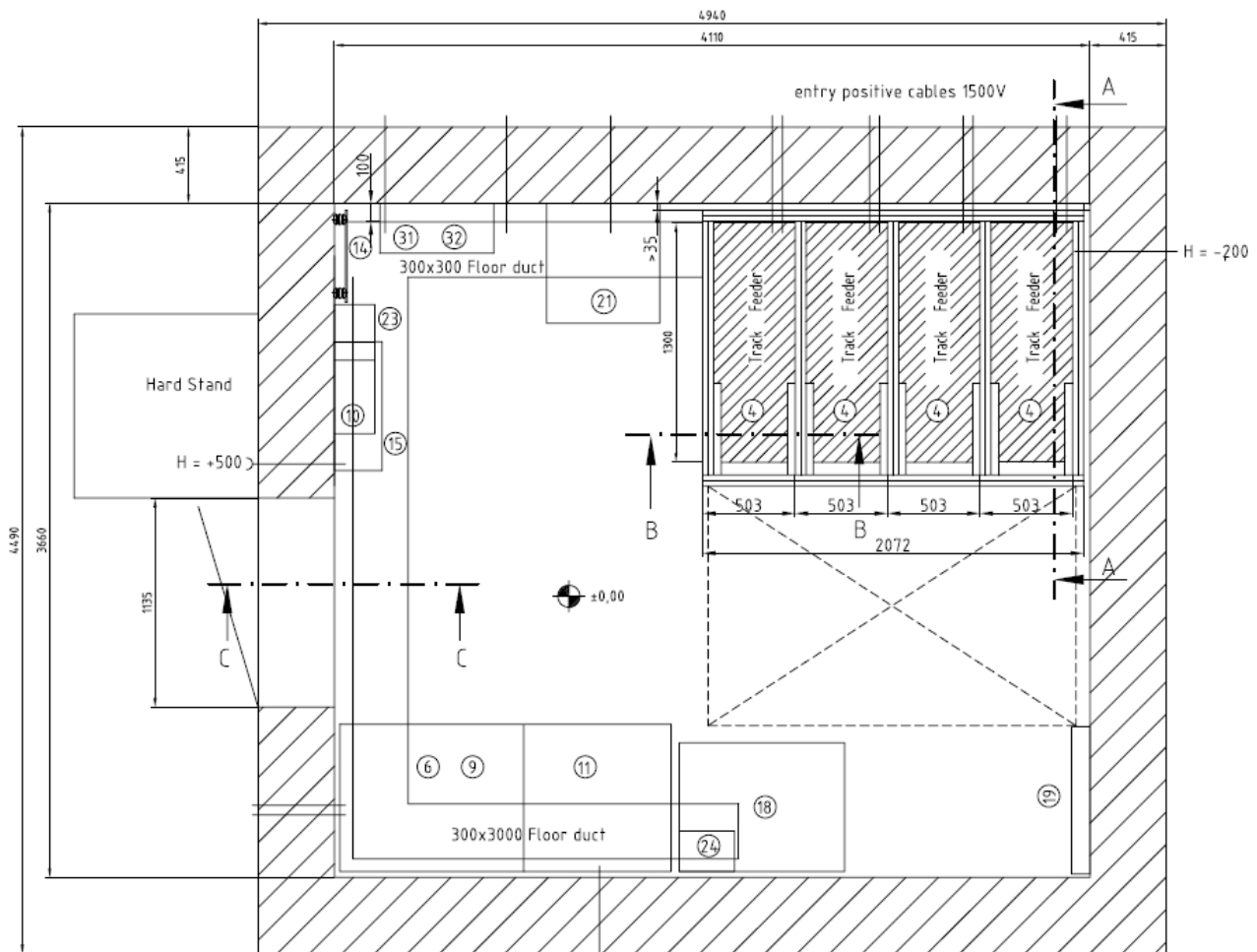


Image 4-10 Typical TPH details

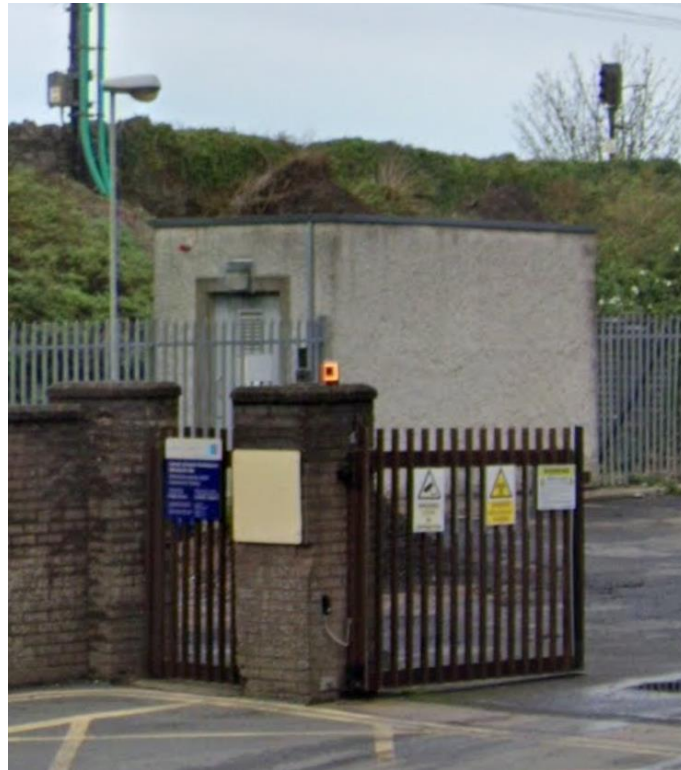


Plate 4-5 Example of Existing TPH at Malahide (Source: Google)

4.5.2.3 LV Distribution Network Operator (DNO)

A Distribution Network Operator (DNO) consists of a cubicle which allocates the incoming power supply from the power distribution company (ESB). Low Voltage DNOs will supply new Distribution Cubicles (DC), and DCs will in turn feed either the Signalling Equipment Buildings (SEB), Principal Supply Point (PSP), lineside SET (Signalling, Electrification and Telecoms) and Points Heating equipment.



Plate 4-6 Typical DNO (Henry Williams)

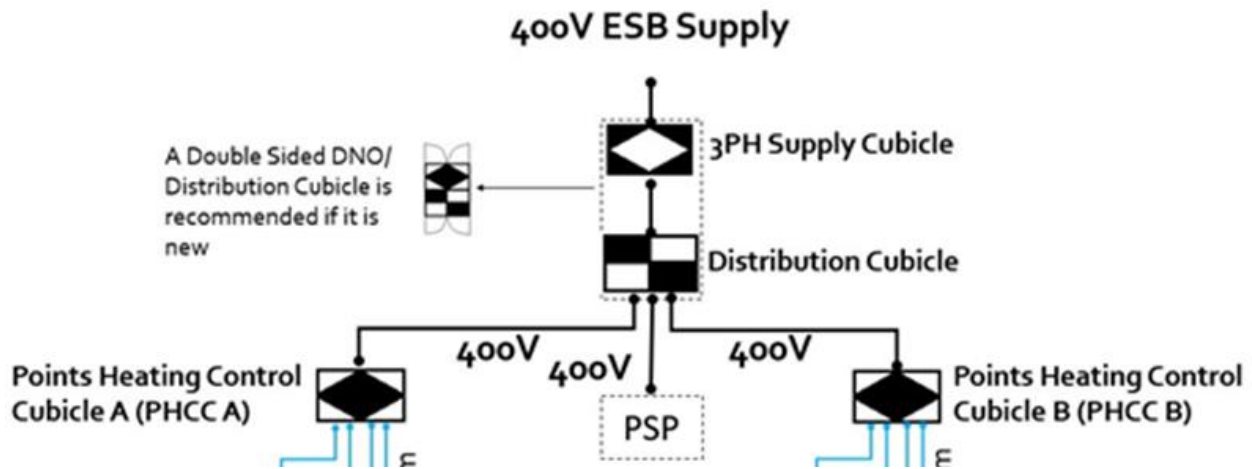


Image 4-11 Electrical supply schematic diagram for points heating

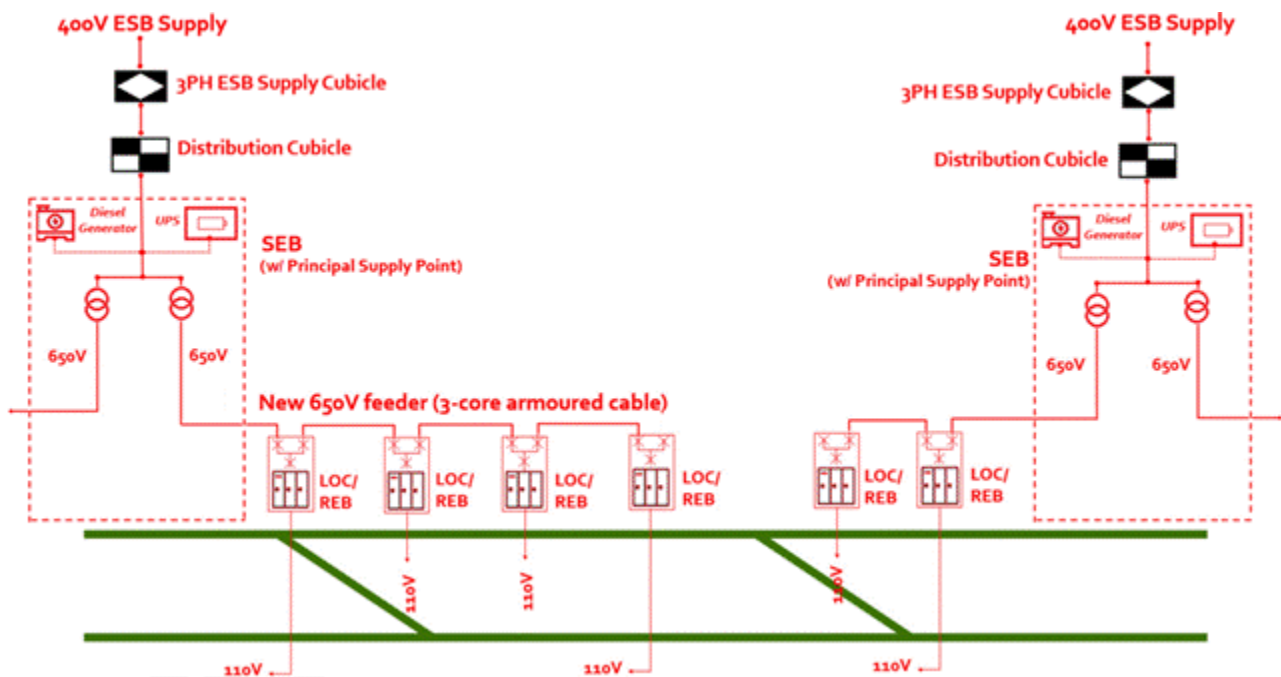


Image 4-12 Electrical supply schematic for signalling equipment

In locations where there is to be a new ESB connection, the solution will be to install an integrated double sided DNO/Distribution Cubicle in the fence line with internal equipment accessible from both sides. This presents the advantage of providing access to ESB without entering IE land, while also providing access to IE from the other side. A padlocked access gate will be located beside the cubicle to enable IE to access either side of the cubicle as required, avoiding the need to walk long distances trackside similar to the arrangement shown in .



Plate 4-7 ESB LV supply point at Gormanston for TER (IE)

4.5.2.3.1 Proposed DNO along DART + Coastal North

Along the DART+ Coastal North line, DNOs will be required to distribute low voltage power to Points Heating, Telecommunications equipment, and Signalling equipment. Existing DNOs will be reused where possible and upgraded when necessary. An assessment has been carried out to determine where DNOs can be retained, reused, removed and where new DNOs will be required. The results of this assessment are depicted in Image 4-13 and Image 4-14. The DNO status is colour coded as below:

- Blue: DNO to be reused;
- Green: DNO to be removed; and
- Red new double sided DNO/Distribution Cubicle.

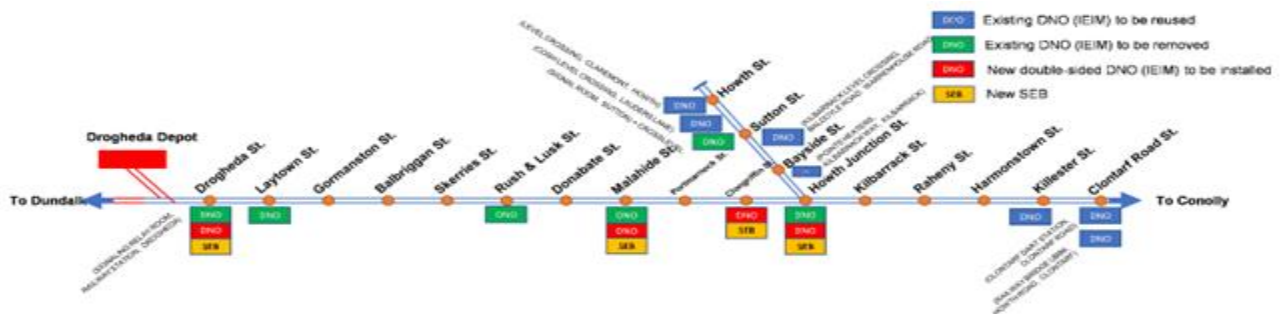


Image 4-13 DNO provision on the DART+ North project for signalling

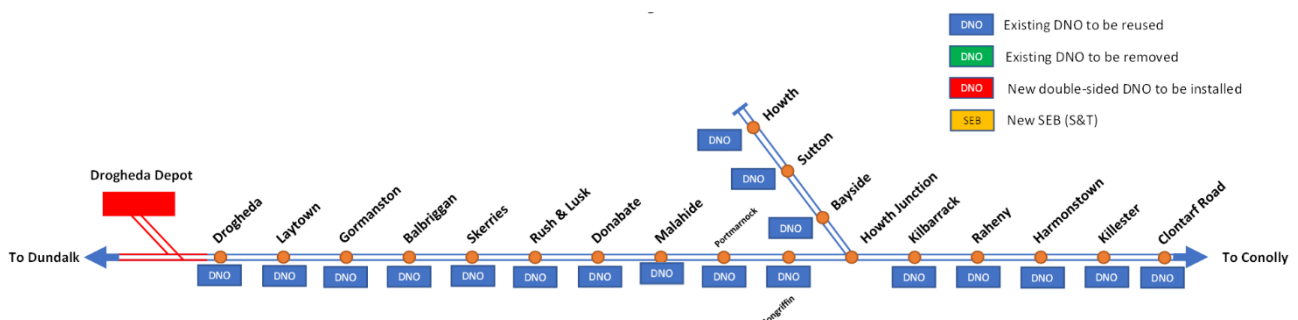


Image 4-14 DNO provision on the DART+ North project for telecommunications

The DNO connections required for the Proposed Development are all, except Clongriffin, located within IÉ lands.

4.5.2.4 Low-Voltage Power Supply Points

A network of new low voltage infrastructure will be installed along the route and will connect the new Signal Equipment Buildings (SEBs), Telecommunications Equipment Rooms (TERs) and location cases (smaller outdoor cabinets) positioned alongside the track.

4.5.3 Signalling System

The signalling system operates to safely control the movement of railway traffic on the railway network. The existing railway incorporates signalling infrastructure along its length which includes underground cables, track level sensors and visible Esignals on posts or gantries that communicate instructions to the train drivers along the route.

As part of the Proposed Development, the majority of the existing signalling system will be progressively replaced with modern technology to achieve the more frequent train service. The proposed signalling system will incorporate similar components to those already in use on the DART network. Examples of typical signal posts and location cases (LOCs) are presented in .

As the Northern Line is currently operating with an existing signalling system, the installation of the new signalling system will occur in parallel to ensure that the current trains remain operational. For this reason, the current signalling system will be retained for the duration of the Construction Phase until the new system has been tested and commissioned and then removed.



Plate 4-8 Example signal post & LOC cabinet (Source: Collis/ RSP)

4.5.3.1 Signal Structures

Signals and signalling equipment are typically mounted on posts and masts, and in some special situations on cantilever or gantry structures. The Proposed Development will replace some of the existing signalling infrastructure and construct one of the following types of structures depending on its location. Details are included in the drawings that accompany the RO application.

- Cantilevers: These structures (see) are used when there is insufficient access to allow a signal mast to be used or when land take issues preclude using a portal gantry. It consists of a single-legged structure erected over one or more railway tracks, carrying one or more signals;

- Gantries: These structures (see) will only be used in stations or in areas with more than two tracks, such as Clongriffin or Malahide; and
- Raised platforms: (see) used in sections of track or on bridges where, due to lack of space or a steep embankment slope, it is necessary to install signalling LOCs or signals.



Plate 4-9 Example of signals on a cantilever in Kildare (Source: Arup)



Plate 4-10 Example portal gantry (Source: Fli Structures)



Plate 4-11 Example signal LOC installed on a platform (Source: Collis)

4.5.4 Telecommunications System

Telecommunications are essential to the safe and efficiently managed operation of the railway. Telecommunications provide the backbone link between the signaller in the control centre, the lineside signal/communications equipment, and the train driver. The telecommunications system also covers the station services: CCTV, public address, passenger information displays, help points, and lineside telephony communication subsystems.

The telecommunications system provides a core network which is vital to support the function of signalling controls, OHLE (overhead line equipment), electrical substations, station services and other electronically controlled infrastructure along the length of the track such as the Global System for Mobile Communications-Railway (GSM-R) radio system. The existing GSM-R) radio system is deployed by several mast base transceiver stations (BTSs) distributed along the route and used to contact train drivers and other operational personnel. The core network connects all the GSM-R masts (maximum height 10m) to their Base Station Controller (BSC).



Plate 4-12 Example GSM Radio mast transceiver station

Railway Telecommunications includes underground cabling, lineside Telecoms Location Cases (LOCs) located trackside and Telecoms Equipment Rooms (TERs) located at stations with the main communication devices. There will also be telecommunications system equipment located at Signalling Equipment Rooms / Buildings (SERs/SEBs) and GSM-R buildings (BTSS).

There is an increased requirement for telecommunications systems capacity as part of the more comprehensive communication needs required for the DART+ Coastal North project, and therefore the existing telecommunications systems backbone must be upgraded as part of the Proposed Development. This will be achieved by the provision of a new set of fibre optic cables stretching the length of the Northern Line. The new fibre optic cables will link the LOCs, TERs, SERs/SEBs and BTSS to the control centre.

The new communications infrastructure will be installed in parallel to the existing, and migration from one system to the other will happen once the new system is commissioned. The existing fibre is shared by a third-party telecommunication company. During the installation and construction phase of the project care must be taken to not disturb the fibre of the third-party telecommunication company which runs lineside parallel to the rail. In certain circumstances it might be necessary to move or relocate the lineside third part telecommunication fibre in which case the appropriate permissions must first be sought as required.

4.5.5 Equipment Cabins

In addition to the electrical buildings, equipment cabins are required to support the signalling and telecommunications infrastructure. These will be located within IE owned lands where possible. For typical examples of the proposed cabins see and . The standard types of cabins required (details are shown in the drawings that accompany the RO application) along the Proposed Development include:

- Signalling Equipment Buildings (SEBs); and
- Telecommunications Equipment Rooms (TERs).



Plate 4-13 Example Signal Equipment Building (SEB)



Plate 4-14 Example TER building (Source: Chemstore)

The equipment cabins are typically fenced-off for security behind standard IÉ green palisade fencing, as shown in the above image. The approximate sizes of the different types of equipment cabins are detailed below:

- SEB size: 25.0m x 5.0m x 4.0m (length x width x height); and
- TER size: 10.0m x 4.0m x 4.0m (length x width x height).

4.5.5.1 Signalling Equipment Buildings (SEBs)

Signalling Equipment Buildings (SEBs) centralise all the necessary electronic equipment in locations with a high density of signalling elements, such as at turnback stations and surrounding areas. SEBs facilitate the link from the field equipment (signals, axle counters, track switches, etc.) and the electronic equipment located within the SEB, which then further ultimately links to the National Train Control Centre (NTCC).

SEBs will be located as close as possible to the existing technical buildings to facilitate migration, reduce the duration of works, and avoid other constraints (access, new compounds, etc.). Details of the SEBs can be found in the drawings that accompany the RO and examples are depicted in Image 4-15 to Plate 4-15.

The locations of the SEBs required for the Proposed Development are listed below:

- Howth Junction & Donaghmede Station;
- Clongriffin Station;
- Malahide Station; and
- Drogheda MacBride Station;

4.5.5.1.1 SEB Characteristics

- SEB size: 25m x 5m x 4m (length x width x height);
- An external lighting system with motion control will be required in addition to those in the building itself;
- No connection to the Irish water network is required;
- The new SEBs will comply with existing regulations and will not be a source of noise or odour;
- Additionally, the new SEBs will not emit more noise than those they are replacing;
- The new SEBs will issue no significant Electric and Magnetic Field (EMF) type emissions;
- The energy demand of these buildings will be approximately 18kW;
- The buildings will only be accessed occasionally for maintenance work; and
- The finish proposed for the SEBs is typically cement plaster finish on all elevations, with profiled metal roof sheeting. They will have a similar appearance to the SEB elevations shown in Image 4-15. However, at Malahide and Drogheda, brick finish is proposed to compliment adjacent station/heritage buildings, on all elevations with pressed metal roof sheeting. Please refer to the sections within the Zone description for further information.

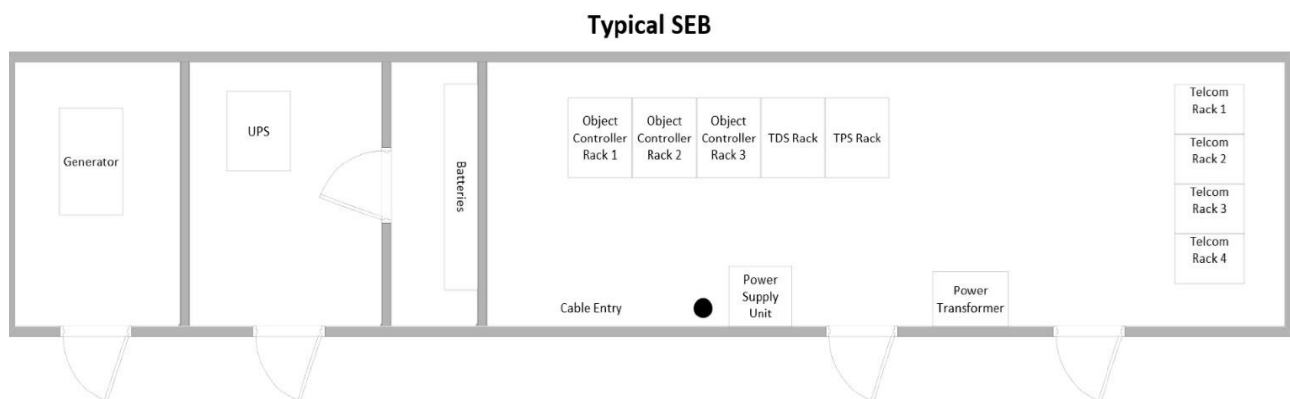


Image 4-15 Typical SEB layout



Plate 4-16 Example of existing SEB (IÉ)



Plate 4-17 Example of existing SEB (Arup)

4.5.5.2 Telecommunications Equipment Rooms (TER)

Telecommunications Equipment Rooms (TERs) house servers, storage devices, switches, routers, cabling patch panels and any additional passive electronics associated with telecoms systems (access control, CCTV, intrusion detection, patch panels, public address system, voice announcement system, distributed antenna systems). This is where the physical connection between the telecoms related field equipment (station CCTV, telephones, etc.) and the electronic equipment occurs. Details of TERs are shown in the drawings that accompany the RO application. Typical details are shown in Image 4-16 and examples are shown in Plate 4-18.

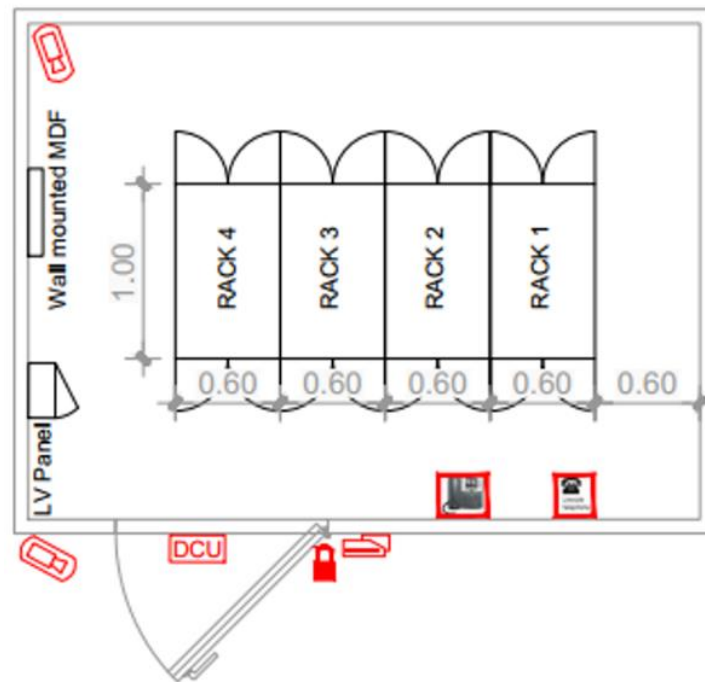


Image 4-16 TER typical details

The locations of the TERs required for the Proposed Development are listed below:

- Howth Junction & Donaghmede Station;
- Clongriffin Station;
- Malahide Station; and
- Drogheda MacBride Station;

4.5.5.2.1 TER Characteristics

- Size (internal dimensions): 10.0m x 4.0m x 2.6m (length x width x height). Requires separate external lighting system with motion control for each TER;
- Should be located as close as possible to the centre of stations;
- No connection to the Irish Water network is required;
- Contains cabling, servers, routers, switches, or recording devices (CCTV);
- It will not contain any active amplification or radiating equipment;
- New TERs will issue no significant EMF type emissions;
- Energy demand of this type of building will be approximately 2kW;
- New buildings will not require vehicular access, only space for parking nearby;
- The TERs will only be accessed occasionally for maintenance or repair activities; and
- The external architectural finish proposed for the new TERs at each location, will have a similar appearance to the TER elevations shown in Plate 4-18. However, each location proposes slightly different finishes to compliment adjacent station/heritage buildings. Please refer to the sections within the Zone description for further information.



Plate 4-18 Existing TERs at Drogheda Station (left) and in Gormanston (right)

It is proposed that all existing TERs and SEBs that are confirmed to be in good condition will be retained and modified to accommodate the additional telecommunications and signalling equipment.

4.5.6 Works to the Permanent Way (or track & railway corridor)

The term 'track work' encompasses the whole track system or 'permanent way' which consists of the rail, componentry, sleepers, ballast track formation, an example of this is shown in Plate 4-18 and associated lineside civil elements such as walkways, retaining walls, drainage, utilities, and fencing.

The Proposed Development requires the following track interventions:

- Four new turnback facility locations (see Section 4.5.6.1 for further details) to satisfy the new operational model (referred to as the Train Service Specification or TSS);
- Associated modifications to the horizontal track geometry as a result of providing the turnback facilities, to provide the required space for the turnback facilities, the addition of new sidings and buffer stops, and to form connections to new platforms (described within each zone in Sections 4.6 to 4.10); and
- Localised interventions at four bridge locations to lower the existing track level (between 0.1 and 0.4 m) to achieve the required safe vertical clearance under the bridges for the Overhead Line Equipment (OHLE); see Table 4-5.

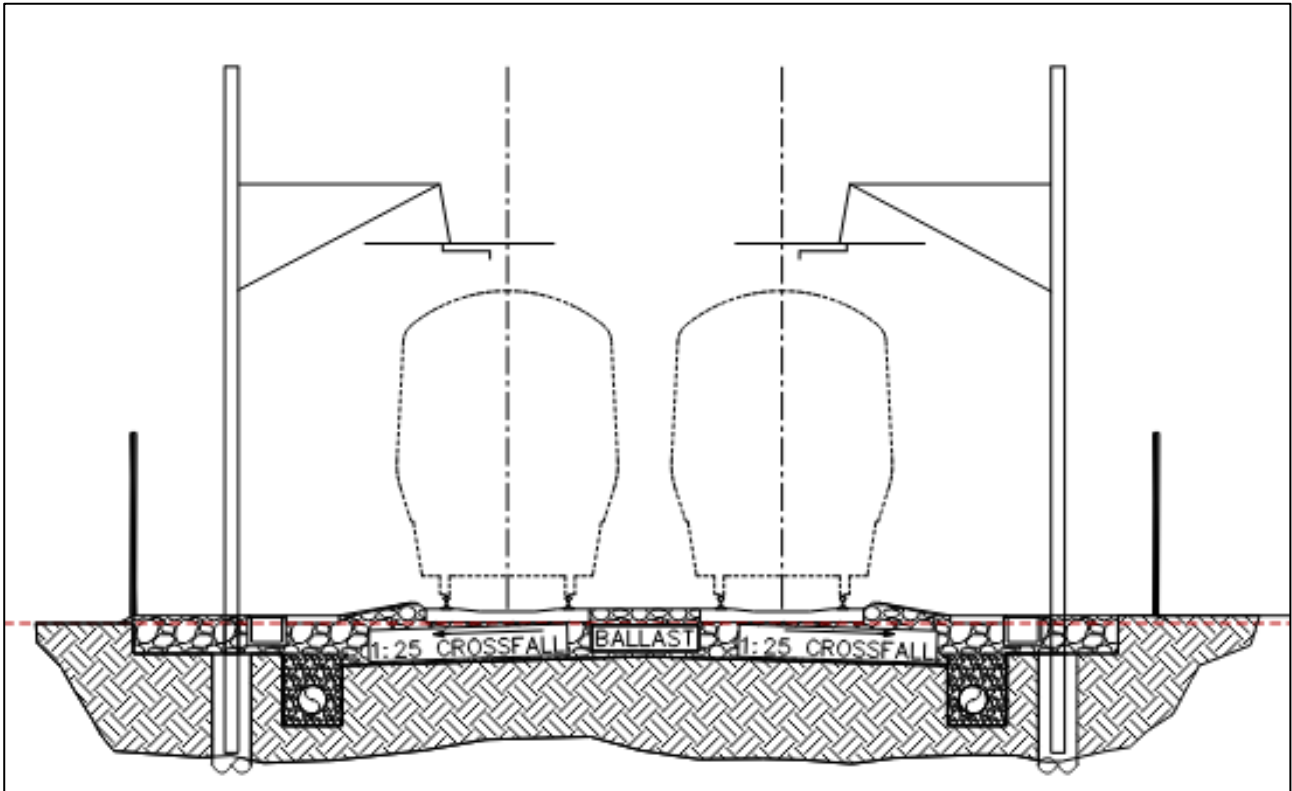


Image 4-17 Example of typical ballast track formation

4.5.6.1 Turnbacks

The proposed track works required include the installation of four new turnback facilities along the route at locations identified in Table 4-5.

Table 4-5 Proposed track turnback facilities.

Zone	Proposed Turnback Facilities
Zone B	Howth – on the Howth Branch Line Clongriffin – on a new loop line through Platform 0 at Clongriffin Station Malahide – between the Up and Down Main, north of Malahide Station and south of Malahide Viaduct
Zone E	Drogheda – on the Drogheda Freight Sidings

A turnback facility on the railway is defined as a piece of rail infrastructure that allows trains to turn back towards the direction they have come from, without the need to travel to the end of the line. The function of the turnback is to control the train frequency and to provide operational flexibility. The turnback facility can take the form of a crossover, passing loop/siding or a pocket track (siding located between the main lines). A typical crossover arrangement is illustrated in Image 4-18.

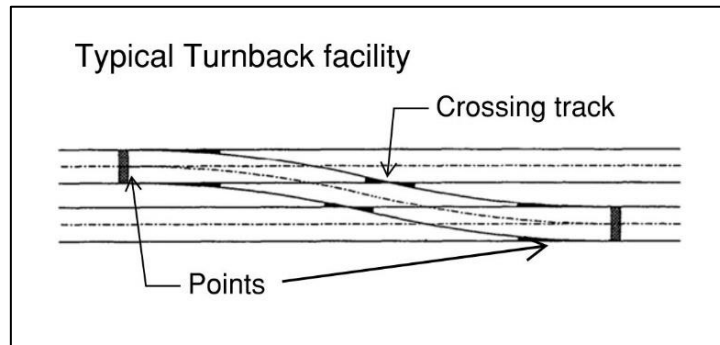


Image 4-18 Typical crossover and turnback facility

4.5.6.2 Track lowering

Electrifying a railway requires sufficient vertical clearance between the top of rail (TOR) and the underside / soffit of any structures located above it, to ensure that the Overhead Line Equipment (OHLE) system can safely be installed through the crossing space in compliance with IÉ and European (EN) standards. The majority of the existing overbridges located along the route achieve the minimum vertical clearance requirements, however there are 4 existing overbridges that require intervention works. Achieving the minimum vertical clearance by way of track lowering has been identified as the preferred option. Table 4-6 highlights the track locations and bridges where track lowering solutions are proposed.

The track lowering is explained in greater detail within the respective zones (see Sections 4.8.1 and 4.10.1).

Table 4-6 Track lowering works.

Zone	Track Lowers under bridges (Road names)
Zone C	OBB39 (carrying Station Road / R128) – Down Main tracks only, max. lowering of 88mm; OBB44 (carrying local road in Tyrrelstown Big) – Up and Down tracks, max. lowering of 380mm; OBB55 (carrying Lawless Terrace / R127) – Up and Down tracks, max. lowering of 321mm.
Zone E	OBB78 (carrying Colpe Road) – Up and Down tracks max. lowering of 129mm

4.5.6.3 Cable management system

The cable management system (CMS) refers to the equipment required to protect and distribute the operational cabling for the signalling, telecommunications, low voltage power and high voltage power feeders. Lineside cable routes are typically formed of the following types:

- Concrete trough route;
- Buried PVC duct route;
- Elevated routes (metal trays);
- Elevated GRP troughing on posts; and
- Under Track Crossings (UTXs).

4.5.6.3.1 Concrete trough route

In most cases the selection of a precast concrete trough solution has been considered as the most appropriate option to route cables within the railway corridor, owing to the ease of construction. This solution will be implemented wherever possible.

4.5.6.3.2 Buried PVC ducts

Buried PVC ducts will be considered at stations and locations where there is insufficient space to place either a concrete trough or a metal cable tray. Ducts will be surrounded by concrete for protection. Items such as catenary feeders will always be placed in buried PVC ducts.

4.5.6.3.3 Metal cable trays

In areas where there is restricted space at ground level, such as at bridge abutments, cables will be clamped to the walls and protected with an insulating cable ladder. Metal cable trays will be drilled and fixed to existing structures using handheld tools.

4.5.6.3.4 Elevated GRP troughing on post

When space does not allow for the installation of a precast concrete trough, or metal cable trays, elevated GRP routes on posts will be proposed.

4.5.6.3.5 Under Track Crossings (UTXs)

In conjunction with modifications to the track works, new cable routes for SET are required to cross under the tracks in specific locations; these are referred to as Under Track Crossings (UTX). A UTX consists of either small diameter individual ducts (PVC) or a combined duct system (GRP) buried beneath the tracks. In addition to the ducts there will be manhole chambers installed at either end of a UTX crossing. Additional deep UTX will be required for the 3rd party diversion of existing overhead power line crossings. Further details are provided in Section 4.5.11.3 on utility diversions.

4.5.7 Bridges & Structures

For the DART+ Coastal North project, a variety of structures and structural interventions are proposed. Works related to the bridge and civil structures can be divided into the following types of intervention:

- Bridge modification/replacement;
- OHLE supports attached to viaducts;
- Bridge parapet modifications;
- Station access and footbridge modifications (at Howth Junction and Donaghmede Station in response to PC1 feedback);
- Station canopy modification (at Drogheda MacBride Station to provide safe electrical clearance); and
- New retaining structures.

Table 4-7 lists the bridge and civil structures that are impacted by the proposed works and a summary of the proposed bridge modifications.

Table 4-7 Summary of Bridge and Civil Structures.

Zone	Structure Name	Mileage from Dublin Connolly (mi / yds)	Proposed Modification
Zone A	No structural interventions within this zone	-	-
Zone B	Howth Junction & Donaghmede Station – Platform 3/4 footbridge (OBB17A) & Platform 1/2 footbridge (OBQ0)	4mi, 1451yds	Bridge modifications
Zone B	Retaining Wall at Clongriffin Station	5mi, 1100yds	New retaining wall
Zone B	UBB18B – Culvert	5mi, 1573yds	Culvert modification
Zone B	New bridge alongside UBB19	5mi, 1670yds	New Bridge
Zone B	Retaining Wall north of Malahide Station	9mi, 500yds	New retaining wall
Zone B	UBB30 – Malahide Viaduct	9mi, 971yds	OHLE support on viaduct
Zone C	New otter crossing south of UBB31	10mi, 880yds	New otter crossing
Zone C	OBB32A – Donabate Distributor Road	11mi, 0yds	Parapet modification
Zone C	OBB33A – Donabate Station footbridge	11mi, 784yds	Parapet modification
Zone C	OBB35 – Access to Beaverstown Golf Club	12mi, 445yds	Parapet modification
Zone C	UBB36 – Rogerstown Viaduct / Estuary	12mi, 998yds	OHLE support on viaduct
Zone C	OBB38 – Rogerstown Lane	13mi, 999yds	Parapet modification
Zone C	OBB38A – Rush & Lusk Station footbridge	13mi, 1564yds	Parapet modification
Zone C	OBB39 – Station Road / R128	13mi, 1644yds	Track lowering
Zone C	OBB41 – Local road in Rathartan	14mi, 438yds	Parapet modification
Zone C	OBB44 – Local road in Tyrrelstown Big	14mi, 1437yds	Track lowering
Zone C	OBB46 – L1285 / Baldongan	16mi, 172yds	Parapet modification
Zone C	OBB47 – Historic access to Skerries Golf Club	16mi, 1038yds	Parapet modification
Zone C	OBB49 – Golf Links Road	16mi, 524yds	Parapet modification
Zone C	OBB51A – Skerries Station footbridge	17mi, 1708yds	Parapet modification
Zone C	OBB54 – The Ladies Stairs	19mi, 1440yds	Parapet modification
Zone C	OBB55 – Lawless Terrace / R127	21mi, 304yds	Parapet modification & Track lower
Zone C	UBB56 – Balbriggan Viaduct	21mi, 1112yds	OHLE support on viaduct
Zone C	OBB57A – Balbriggan Station footbridge	21mi, 1328yds	Parapet modification
Zone D	OBB68 – Local access nr Gormanston Camp	24mi, 1757yds	Parapet modification
Zone D	UBB72 – Laytown Viaduct	26mi, 1328yds	OHLE support on viaduct
Zone D	OBB74A – Laytown Station footbridge	27mi, 186yds	Parapet modification
Zone D	OBB78 – Colpe Road	30mi, 233yds	Parapet modification & Track lower
Zone E	OBB80/80A/80B – Railway Terrace	31mi, 869yds	Bridge replacement
Zone E	OBB81 – Drogheda Station footbridge	31mi, 1259yds	Bridge replacement

Zone	Structure Name	Mileage from Dublin Connolly (mi / yds)	Proposed Modification
Zone E	OBB81C – Drogheda Depot footbridge access	31mi, 1258yds	Parapet modification
Zone E	UBK01 – Dublin Road (R132)	0mi, 112yds	Bridge replacement

4.5.7.1 Bridge Modifications

Clearance at bridges is a critical requirement for DART+ Coastal North, as there needs to be sufficient space between the roof of trains and the underside of the bridge to accommodate the new overhead electrification system. An assessment of the feasible design solutions was undertaken at each bridge identified as having a limited clearance. The feasible solutions typically comprise the following:

- Provision of specially designed OHLE wiring solutions;
- Lowering of the railway track, see Table 4-6; and
- Modification of the bridge (comprising a raising of the superstructure or full reconstruction of the bridge).

The proposed solution depends on the various site constraints and is determined on a case-by-case basis. More detail on specific bridge solutions relevant to geographic zones is provided in Sections 4.6 to 4.10.

4.5.7.2 OHLE Supports on Viaducts

The maximum design spacing of OHLE masts on the DART+ Coastal North project is limited to 63 m, assuming a straight track. In the case of long viaducts which approach or exceed this length, it is not possible to span the structures and hence OHLE masts need to be supported on the existing viaducts.

The longitudinal positioning of the masts is dependent on the structure configuration. Where possible, masts are positioned to align with the bridge piers and are placed to be symmetrical about the bridge elevation.

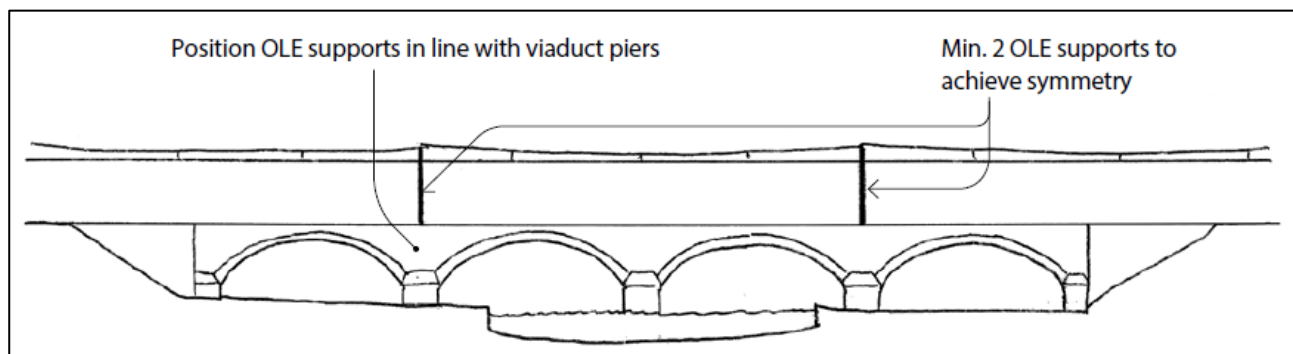


Image 4-19 Longitudinal positioning of masts on viaducts with lengths > 63m

When considering support arrangements, the following options are considered:

- Masts supported on the superstructure (bridge deck);
- Masts supported on the substructure (piers and abutments); and

- Masts supported on independent supports.

The adopted solution is determined on case-by-case basis. The specific arrangements, relevant to geographic zones are described in Sections 4.6 to 4.10.

4.5.7.3 Bridge Parapet Modifications

Existing overbridges between Malahide and Drogheda need to be modified to meet safety requirements for an electrified railway, i.e., to protect the public from direct contact with the live OHLE. As a result, reasonable steps are required to prevent people from accidentally, or otherwise, falling onto or touching the OHLE.

This will be achieved by modifying the composition and height of existing bridge parapets, which are required to be at least 1.8m high. Parapets are also required to be solid for the lower 1.2m. Above this height they can either continue as solid elements or comprise of a panel with openings which are IP2X compliant (meaning a 12.5mm probe cannot penetrate). A variety of options for modifying parapets have been considered on a case-by-case basis for each bridge, these include:

- Demolish and reconstruct the parapet to the correct height;
- Extend the parapet height using similar materials (stone, brick, concrete, etc.);
- Extend the parapet height using a lightweight panel (e.g. mesh, steel plate); and
- Replace existing non-compliant panels (where existing parapets are greater than 1.8m high but do not meet the composition requirements).

Specific solutions applicable to each bridge are described in Sections 4.6 to 4.10 and summarised in Table 4-10 and Table 4-13.



Plate 4-19 Typical bridge parapet wall height extenders

4.5.7.4 New Retaining Wall Structures

The majority of structural works associated with the DART+ Coastal North project involve the modification of existing structures to accommodate the introduction of OHLE. There are, however, situations where new structures are required to facilitate the works. These include new retaining walls at the proposed Clongriffin and Malahide turnbacks. The specific type of retaining wall adopted on these works is determined on a case-by-case basis and is dependent on a number of factors.

The primary factors that impact on the choice of wall include site constraints, applied loads, existing ground conditions, retained wall height, constructability and whether it retains cut or fill. Specific retaining wall solutions are described in Sections 4.6 to 4.10.

4.5.8 Fencing and Boundary Walls

The electrified railway requires additional security measures to protect against trespass onto the Proposed Development. The existing fencing along the route will be assessed to ensure that adequate security measures are put in place to prevent unauthorised access to the railway infrastructure. Typical areas where secure fencing measures will be required are:

- Station modifications;
- SET buildings (Substation, TER; SEB, others);
- Depot locations; and
- Closed level crossings.

The majority of the route to be electrified has been classified as rural, where existing boundaries are often densely vegetated. At each of the urban settings, the railway boundary is predominantly formed of a mixture of either timber, masonry, or palisade fences, backing onto domestic properties. IE green palisade fencing is typically proposed where required for extra security such as around stations and electrical substations.

An assessment of the existing boundary treatment has been completed, to identify locations where the inclusion of the OHLE will warrant a more secure fencing treatment. Consideration of electrical bonding of existing fencing will also be considered with the construction of the OHLE system.

The following section details the types of fencing that will be provided for the Proposed Development.

4.5.8.1 Fencing Types

The following fencing types will be provided as illustrated in to ;

- 2.4m Security Purpose (SP) IE green palisade fencing;
- Concrete post and wire with stock proof mesh (1.5m high);
- IE green paladin fencing (1.8m - 2.4m high); and
- IE green paladin fencing on masonry wall



Plate 4-20 Palisade fencing



Plate 4-21 Concrete post and wire with stock proof mesh



Plate 4-22 **Paladin / rigid mesh fence example (Zaun Ltd.)**



Plate 4-23 **Paladin on masonry wall in Balbriggan (Google Maps)**

4.5.9 Station Modifications

The DART+ Coastal North project requires station modifications at the following existing stations to enhance their accessibility and connectivity, and also to facilitate capacity increases.

- Howth Junction & Donaghmede Station (Zone B); and
- Drogheda MacBride Station (Zone E).

Significant upgrades to Howth Junction & Donaghmede Station are proposed to provide a more accessible, user friendly and customer focused station for all rail users. This includes proposals (see Section 4.7.1.1) to improve the connectivity between platforms between the Northern Line and the Howth Branch platforms to facilitate an increased frequency of stopping services. New and improved access is also to be provided to both the Donaghmede and Kilbarrack entrances and to provide direct access to Platform 4. A new train turnback facility is proposed east of the station along the Howth Branch line and Platform 2 will be extended and widened to accommodate the turning back of trains.

At Drogheda MacBride Station (see Section 4.10.2) it is proposed to install a new platform along the Drogheda Freight Sidings with a new train turnback facility to support the planned increase in train services. Modifications are proposed to the historic platform canopy at the station, and a replacement footbridge between platforms. Depot improvements are also required, along with associated alterations to signalling, electrification, and telecommunications assets and to structures.

4.5.10 Depots

There are two existing depots within the scope of the DART+ Coastal North project located at Fairview and Drogheda. Modifications to the depots are required to provide the infrastructure and servicing facilities necessary to maintain the new DART fleet. At Fairview Depot modifications include provision of additional track cleaning facilities within the sidings and updates to the train servicing facilities within the maintenance building. At Drogheda Depot, modifications include the provision of two additional stabling lines, re-grading the existing earth bund, improvements to train cleaning facilities and the electrification of tracks entering the train maintenance building. The depot modifications are described in more detail within Sections 4.6.5 and 4.10.5.2.

4.5.11 Other Ancillary Infrastructure

In addition to the General Linear Works there are several ancillary elements of infrastructure that enable the development. To avoid repetition, an overview of these ancillary works is described below to include:

- Temporary Construction Compounds;
- Drainage; and
- Utility Diversions.

4.5.11.1 Temporary Construction Compounds

The Proposed Development, stretching over approximately 50 kilometres, will need several temporary worksite Construction Compounds to support the works. The location and function of the temporary Construction Compounds are summarised in Table 4-8. Further detail in respect of Construction Compounds and the construction strategy for the Proposed Development is described in Chapter 5 (Construction Strategy) in Volume 2 of this EIAR.

Table 4-8 Proposed temporary Construction Compounds.

Function	Location of proposed compounds
Line-wide / multi-discipline	Donabate Substation, Donabate Station, Rush and Lusk Station, Skerries, Balbriggan Substation, Laytown Substation, Drogheda OBB80 (North)
Stations	Howth Junction & Donaghmede Station, Clongriffin Station, & Drogheda MacBride Station
Track works	Howth Junction & Donaghmede Station, Malahide Marina Village, Bissett's Strand, Sea Road, Clongriffin Station & Drogheda MacBride Station
Structures / Bridges	Various
Substations / OHLE Compound*	Donabate, Rush and Lusk*, Skerries South, Skerries North, Balbriggan, Gormanston, Bettystown, Drogheda
Level Crossings	Donabate Farm – User worked crossing (XB001)
3 rd Party UTX Compounds	Various
Depots	Drogheda MacBride Station Depot, Fairview Depot

4.5.11.2 Drainage

New sections of track drainage will be provided as required in areas of proposed works along the route. The drainage design has been developed to meet project requirements in relation to trackside areas and areas located adjacent to the railway corridor. These areas will typically be in areas of new low points on the alignment, where retaining structures are to be constructed, and at stations and depots.

Non-lineside drainage will comprise the surface water drainage affecting the new platform and substation buildings, new hardstanding areas and other retaining structures. This will also include any foul drainage which may be required. This drainage and associated outflows will be managed with the use of attenuation structures and infiltration measures to ensure that the existing drainage network or watercourses are not adversely affected at times of peak flow.

4.5.11.3 Utility diversions

Existing 3rd party utilities such as water mains, electricity cables, telecommunication cables and gas mains, both underground and above ground, will require diversion to accommodate the Proposed Development. These diversions will typically involve:

- Relocating existing services along new routes to make space for the new infrastructure;
- Diversion of all existing overhead power line crossings, either over bridge crossings where possible, otherwise through underground track crossing (UTX) to mitigate the maintenance and operational risk associated with working on or near overhead power lines; and
- Diversion of all existing parallel overhead power lines that fall within the risk zone identified for the new railway electrification infrastructure to mitigate the maintenance and operational risk associated with working on or near overhead power lines.

An assessment of the HV electrical infrastructure has been completed to identify the significant main supplies which are impacted, and which will need re-routing, in most cases underground.

The impact of any location-specific utilities clashes and required diversions are detailed in depth in Chapter 18 (Material Assets: Utilities) and the Construction Phase works are described in Chapter 5 (Construction Strategy) in Volume 2 of this EIAR.

4.6 Zone A: North of Connolly Station to south of Howth Junction & Donaghmede Station

Zone A encompasses the area from the start of the Proposed Development, just north of Connolly Station to just south of Howth Junction & Donaghmede Station and includes Fairview Depot. This Zone lies wholly within the Dublin City Council administrative boundary, bordering the Fingal County Council boundary to the north.



Image 4-20 Extents of DART+ Coastal North Zone A

4.6.1 Proposed Development Zone A – Permanent Way (Track)

There are no track modifications proposed within Zone A.

4.6.2 Interventions at Stations

There are no station modifications proposed within Zone A.

4.6.3 Interventions at Bridges and Structures

There are no bridge or civil structure modifications proposed within Zone A.

4.6.4 Proposed Substations

There are no new substations proposed within Zone A; this section of the railway line is already electrified.

4.6.5 Fairview Depot

To provide a greater output of cleaning at Fairview Depot for the fleet of new trains, several minor depot modifications are required. These will include external civils works comprising the provision of new cleaning platforms on the sidings to the east side of the mainline, along with improvements to signalling, telecommunications, walkways, lighting, and drainage. On the west side, modifications are proposed within the existing maintenance building to provide suitable access and services for train cleaning staff. These modifications will include a new localised fixed access maintenance platform and steps. Work will also include the provision of new power and water supply points. The works all occur within the existing IÉ property boundary.



Image 4-21 Fairview Depot works overview

4.7 Zone B: South of Howth Junction & Donaghmede Station to the north of Malahide Viaduct. (Including Howth Branch)

Zone B includes the area from Howth Junction & Donaghmede Station to just north of Malahide Viaduct (including user worked Level Crossing (XB001)) and also the whole of the Howth Branch line.

Zone B includes works within Howth Junction & Donaghmede Station, Clongriffin Station and between Malahide Station and a short distance north of the viaduct. Zone B lies wholly within the Fingal County Council administrative boundary, bordering the Dublin City Council administrative boundary to the south.

Zone B



Image 4-22 Extents of DART+ Coastal North Zone B

4.7.1 Proposed Development Zone B – Permanent Way (Track)

Track modifications within Zone B are required to facilitate an increased frequency of train service, through provision of new turnback facilities with modifications taking place in specific areas as outlined below:

- Works around Howth Junction & Donaghmede Station;
- Works around Clongriffin Station; and
- Works around Malahide Station & Viaduct.

4.7.1.1 Howth Junction & Donaghmede Station proposed track works

Howth Junction & Donaghmede Station is located at the point where the Howth Branch line diverges from the Northern Line. Currently the station has four platforms: Platforms 1 and 2 are located on the Howth Branch and Platforms 3 and 4 are located on the Up and Down Belfast lines (Northern Line). See Image 4-23 and Image 4-24 for details. Access to Platforms 2 and 3 is provided by the existing station pedestrian footbridge (referred to as OBQ0).

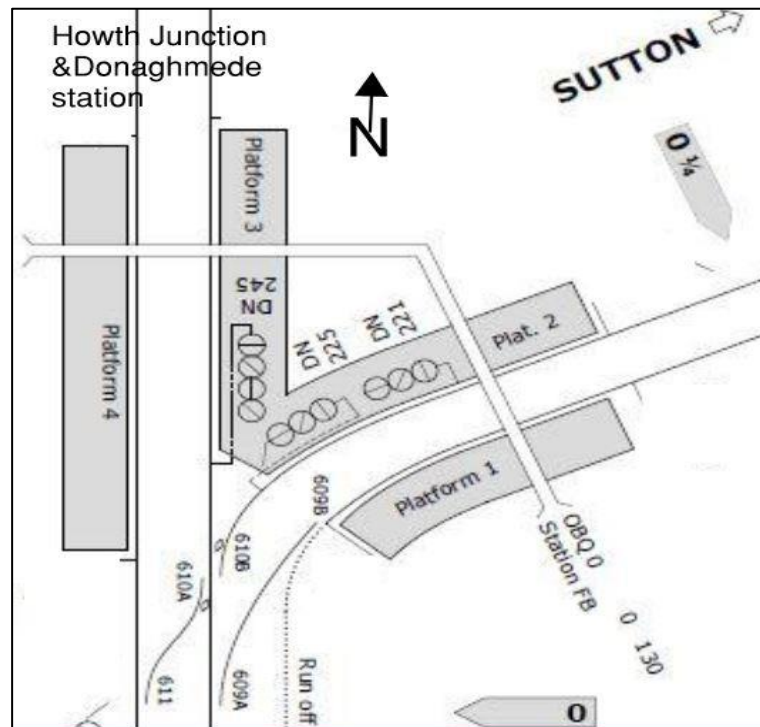


Image 4-23 Route diagram at Howth Junction & Donaghmede Station (Source: Irish Rail)

The proposed track works include the provision of a new turnback facility that is required to meet the increased level of service specified in the Train Service Specification (TSS). The new turnback at Howth Junction & Donaghmede Station consists of a new crossover which is located east along the Howth Branch line between the Up and Down Branch lines as seen in Image 4-30. Minor adjustments to the track geometry along the Branch lines are required to achieve the design speed of the proposed new turnback.



Image 4-24 Howth Junction & Donaghmede Station existing arrangement

4.7.1.2 Clongriffin Station proposed track works.

Clongriffin Station is located on the Dublin to Belfast Line (Northern Line) at approximate mileage 6 miles from Dublin Connolly (approximate chainage 10+200 to 10+440). The station comprises three tracks and four platforms: Platform 1 is located on the Up Line (trains travelling to Dublin), Platform 2 is on the Down Line (trains travelling from Dublin), Platform 3 is located on a passing loop west of the Down Line, and Platform 0 is currently unused.



Image 4-25 Overview of works around Clongriffin Station – Image 1



Image 4-26 Overview of works around Clongriffin Station – Image 2

The current station layout was constructed with 190m long platforms and with a fourth track in mind. The unused platform face (Platform 0) is currently not serviced by any tracks. The west passing loop alongside Platform 3 is accessed from the bi-directional Down Belfast Line via a set of points to the south of Clongriffin, and connection is made back to the Main Line via points to the north of the station. Movements to the Up Main Line from the west loop at present are operationally difficult and achieved only via a double-shunt movement running to Howth Junction & Donaghmede Station, where services are then turned-back.

The proposed track works at Clongriffin Station (see Image 4-25 and Image 4-26) are needed to remove the existing train crossing conflicts, which limit both capacity and frequency of services, and to allow for turning back services to Dublin. To overcome the existing constraints, the proposed track work includes the connection of a new enhanced speed passing loop on the east side of the station, named the 'East Loop' to accommodate the provision of a new turnback facility.

To allow the opening of Platform 0 and provide the required operational speed and train movements, new turnouts will be installed to the south and north of the station to connect the new track ('East Loop') to the Up Main Line.

To enable the new track configuration and railway corridor widening, a new retaining wall. is required along the east side of the new track on Platform 0 as seen in Image 4-44 and described in Section 4.7.4.3.

Further north, a new earthworks embankment is required along the eastern boundary of the railway to accommodate the new track configuration. Additionally, the extension of culvert UBB18B and a new bridge just to the east of UBB19 are required, as seen in Image 4-41 and described in Section 4.7.4.1.1.

4.7.1.3 Malahide Station area proposed track works

Malahide Station is located on the Dublin to Belfast Line at approximate mileage 9 miles from Dublin Connolly (approximate chainage 15+650 to 15+880). As seen in Image 4-27, the station consists of two platforms: Platform 1 on the Up Main line and Platform 2 on the Down Main line. North of Malahide Station is the Malahide Estuary which includes European sites with protections for biodiversity. The railway crosses the estuary by way of a southern and northern causeway, connected by Malahide Viaduct (UBB30) which is a protected structure.

The proposal is for construction of a new turnback facility north of the station, required to improve operational flexibility and support an increase in the frequency of train services.

The works will introduce a new pocket track between the Up and Down Line located along the southern causeway, in the area between the Strand Road underbridge (UBB29) and the Malahide Viaduct (UBB30) (see Image 4-27). To facilitate the new turnback line the existing corridor needs to be widened to the west above the existing embankment. The works will include the construction of a new modular reinforced earth wall, and a modified earthworks embankment alongside the proposed Broadmeadow Way greenway as seen in Image 4-28 and described in Section 4.7.4.3. The existing OHLE and signalling systems will be modified with the installation of new OHLE and signalling assets beginning just south of the viaduct, see Image 4-29.



Image 4-27 Aerial View of current configuration around Malahide Station area



Image 4-28 General overview of works north of Malahide Station – Image 1



Image 4-29 General overview of works north of Malahide Station – Image 2

4.7.2 Proposals for equipment buildings

4.7.2.1 Proposed Howth Junction & Donaghmede Station Equipment Buildings

A new SEB building is proposed to be located in the existing equipment compound within the station. The building will measure 22.5 x 5.0 x 4.0m (length x width x height) and will be located within the existing IE land boundary. Proposed architectural finish to be cement plaster finish on all elevations, to match existing adjacent station buildings, with profiled metal roof sheeting.

A new TER building is proposed to be located in the existing equipment compound within the station. The building will measure 8.0 x 5.0 x 4.0m (length x width x height) and will be located within the existing IE land boundary. Proposed architectural finish to be cement plaster finish on all elevations, to match existing adjacent station buildings, with profiled metal roof sheeting.

4.7.2.2 Proposed Clongriffin Equipment Buildings

A new SEB building is proposed to be located to the south of Clongriffin Station. The building will measure 22.5 x 5.0 x 4.0m (length x width x height) and will be mostly located within the existing IE land boundary. Proposed architectural finish to be cement plaster finish on all elevations, with profiled metal roof sheeting.

A new TER building is proposed to be located in Clongriffin Station. The building will measure 2.0 x 3.0m (length x width) and will be mostly located within the existing IE land boundary. Proposed architectural finish to be sandstone cladding panels to match existing, with profiled metal roof sheeting.

4.7.2.3 Proposed Malahide Equipment Buildings

A new combined SEB and TER building is proposed to be located at Malahide Station. The building will measure 10.0 x 4.0 x 4.0m (length x width x height) and will be mostly located within the existing IÉ land boundary. Proposed architectural finish to be yellow brick polychrome finish on all elevations, complimentary with adjacent station building, with profiled metal roof sheeting, mono pitch.

4.7.3 Interventions at stations

To achieve the peak capacity increases proposed by the DART+ Programme, the DART+ Coastal North project will seek a reconfiguration of Howth Junction & Donaghmede, Clongriffin and Drogheda MacBride Stations. Plans and Elevations, along with details on finishes, etc. of the interventions at both stations are shown in Book 3 Specific Locations Drawings that accompany the RO application.

4.7.3.1 Proposed Howth Junction & Donaghmede Station Modifications

Howth Junction & Donaghmede Station is located on the Dublin to Belfast Line (Northern Line) at approximate mileage 4 3/4 miles at the point where the Northern Line and the Howth Branch line diverge from each other (approximate chainage 8+800 to 9+100). The station comprises four tracks, and four platforms. Platforms 1 and 2 are located on the Howth Branch, and Platforms 3 and 4 are located on the Up and Down Northern Line respectively. To achieve the peak capacity increases, the DART+ Coastal North project is proposing significant modification works to Howth Junction & Donaghmede Station to both improve the passenger experience generally, and to develop the station to better serve as an interchange station.

The project is seeking to deliver new turnback infrastructure at Howth Junction & Donaghmede Station that will enable the operation of shuttle DART services between the station and Howth, and / or a direct through service to/from Dublin City Centre. This facility would allow for capacity and frequency of DART+ services on both the Northern and Howth Branch lines to be maximised and to help future-proof the network. To facilitate safe operational space for these train movements, Platform 2 will need to be extended and then widened to improve passenger flow. A new emergency evacuation route will also be provided as a means of escape for passengers from Platform 2.

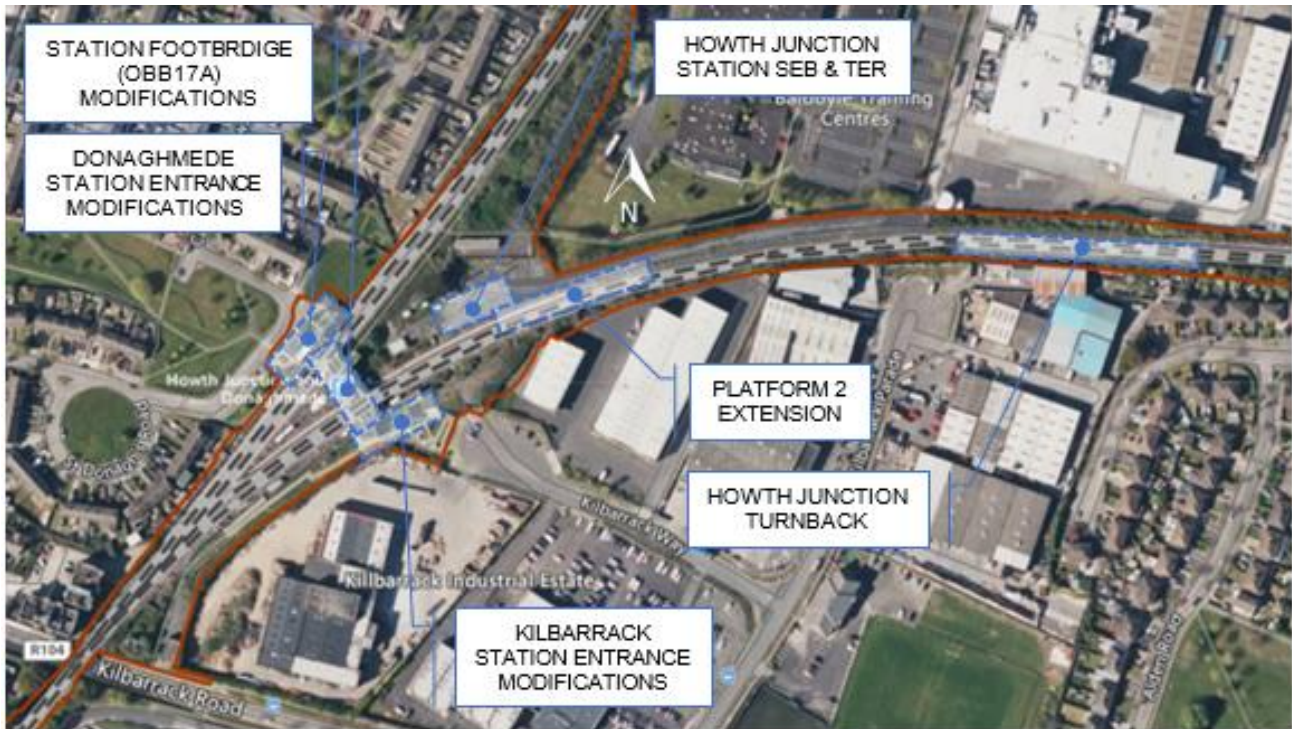


Image 4-30 Overview of works around Howth Junction & Donaghmede Station

The station works will also involve modifications to the station entrances to provide a more accessible, user friendly and customer focused station for Donaghmede and Kilbarrack. Upgrades are proposed to the station footbridge and connections to the centre platforms, as well as to the lighting, CCTV system, signage, and finishes throughout. The improvement at the Donaghmede entrance will also provide direct access to Platform 4 and connectivity via the footbridge.

4.7.3.1.1 Platform 2 Extension

A new platform extension is proposed at Platform 2 to facilitate operational train movements stopping a safe distance from the main line, enabling an enhanced service between Howth and Howth Junction if implemented in the future. The platform is to be lengthened by 64m. It is proposed to also widen the existing portion of platform to provide an overall width of 4.0m and a consistent platform depth to create space for benches and platform furniture without impacting passenger flow.

It is proposed that the existing OHLE masts will be removed and replaced with new headspan masts located beyond the back of the proposed platform in order to maintain the maximum clear width possible. The corresponding headspan masts on Platform 1 are also to be relocated to the back of the platform.

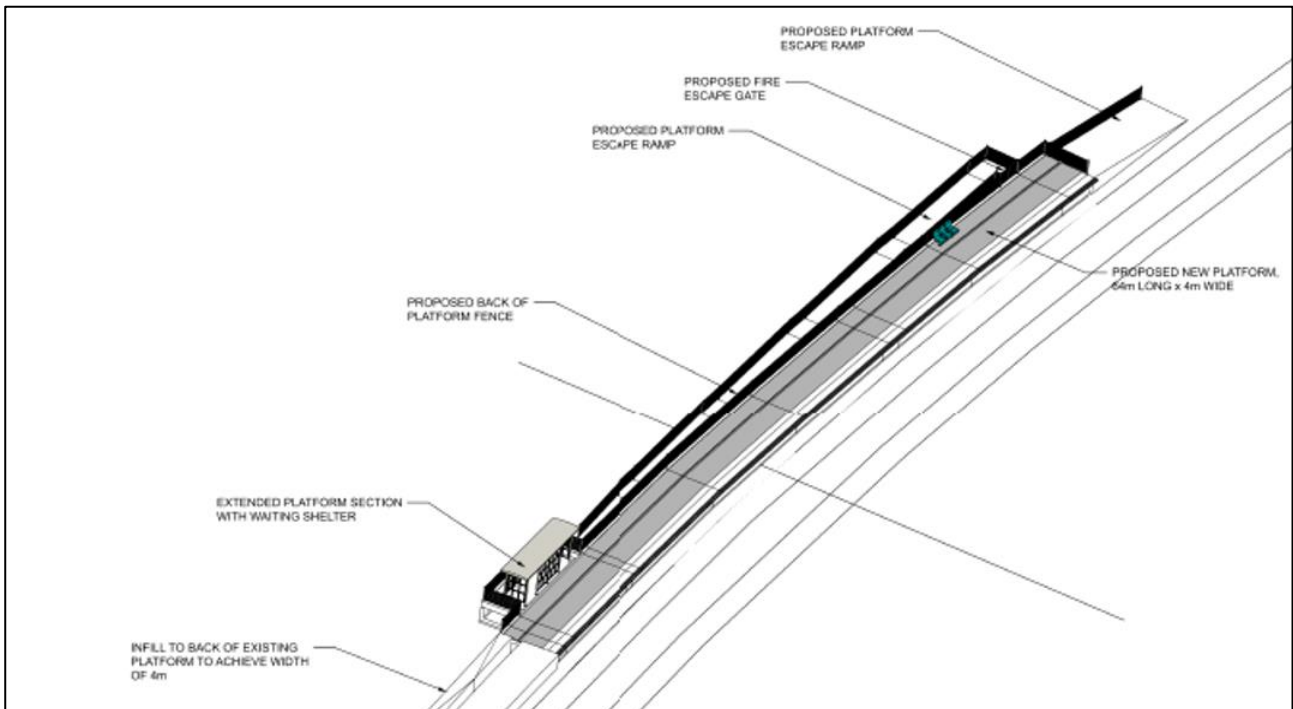


Image 4-31 Howth Junction & Donaghmede Station proposed platform extension

A waiting shelter will be provided, and benches are proposed at regular intervals along the platform. These provide locations for Persons with Reduced Mobility (PRM) passengers to rest without having to travel too great a distance along the platform. Three passenger help points are proposed along the platform together with a customer information screen, which can be read from the waiting shelter.

The platform extension will have a full width ramp at its end to allow maintenance staff access to the tracks. A fire escape will be provided within 20m of the end of the platform which leads to a ramp running parallel to the back of the platform towards the proposed Construction Compound area. At the bottom of the ramp, signage will guide pedestrians to the escape footpath which leads to the public footpath beyond.

4.7.3.1.2 Footbridge

The proposed changes to the footbridge will create an open, light and inviting space by including the following features (as shown in Image 4-32 & Image 4-33):

- The central wall will be removed to brighten and open-up the space;
- The floor finish will be replaced with a new slip-resistant polyurethane-based surfacing system;
- A new feature-profiled clad parapet and chamfered sill up to 1.35 m in height to discourage graffiti and littering; and
- A new architectural stainless steel external mesh finish to maximise natural light and views.



Image 4-32 Howth Junction & Donaghmede Station footbridge proposal (internal view)

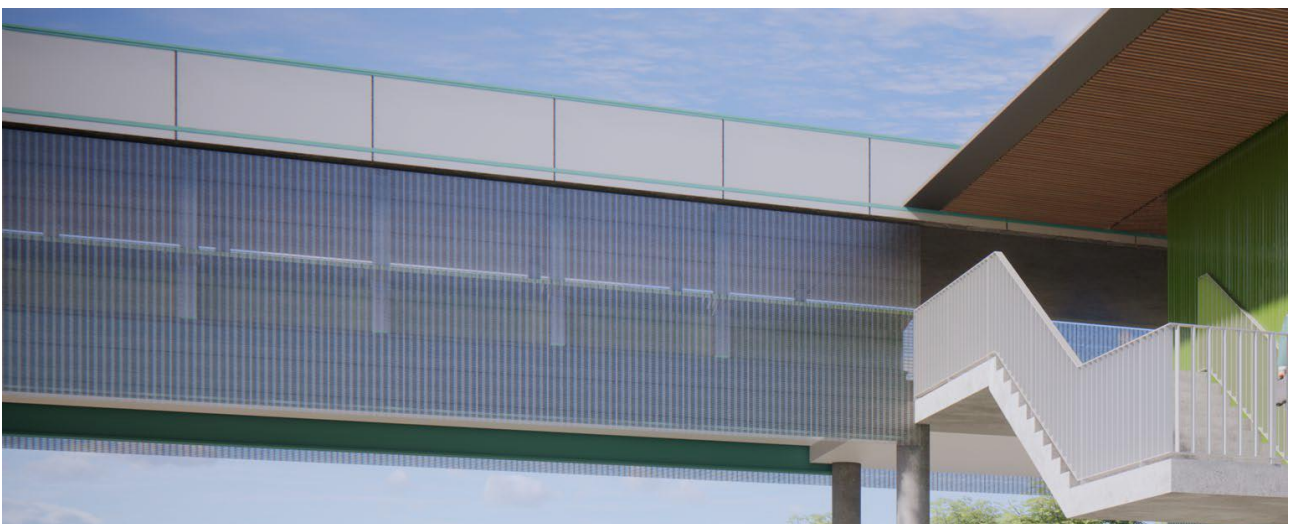


Image 4-33 Howth Junction & Donaghmede Station footbridge proposal (external view)

4.7.3.1.3 Central Connection

The changes to the central connection will include the following:

- Removal of the existing stairs and lift;
- Two new through lifts connected to the northeast side of the footbridge with an ample landing and clearance to provide space for waiting, turning, and seating;
- A straight stairway to be located directly adjacent to the lifts. This will be split into two flights with deep steps (to allow for resting) and a central landing – see Image 4-34;
- An extended area of platform will be created (approximately 240m²) within the existing IÉ boundary, and the fence line adjusted in order to fit the straight stairway – see the new fenceline and areas of platform highlighted in white in Image 4-35;
- A canopy projecting from the lift shaft to provide weather protection and lighting for passengers using the lift and stairs at footbridge level (refer to Image 4-34 below). Handrail lighting will illuminate the stairs at landing and platform level; and

- New entrance 'portal' with accompanying seating signage, ticket vending machine, validator post and lighting where the access route to Baldoyle Industrial Estate meets the new fenceline to Platforms 2 and 3.



Image 4-34 Howth Junction & Donaghmede Station central connection proposal

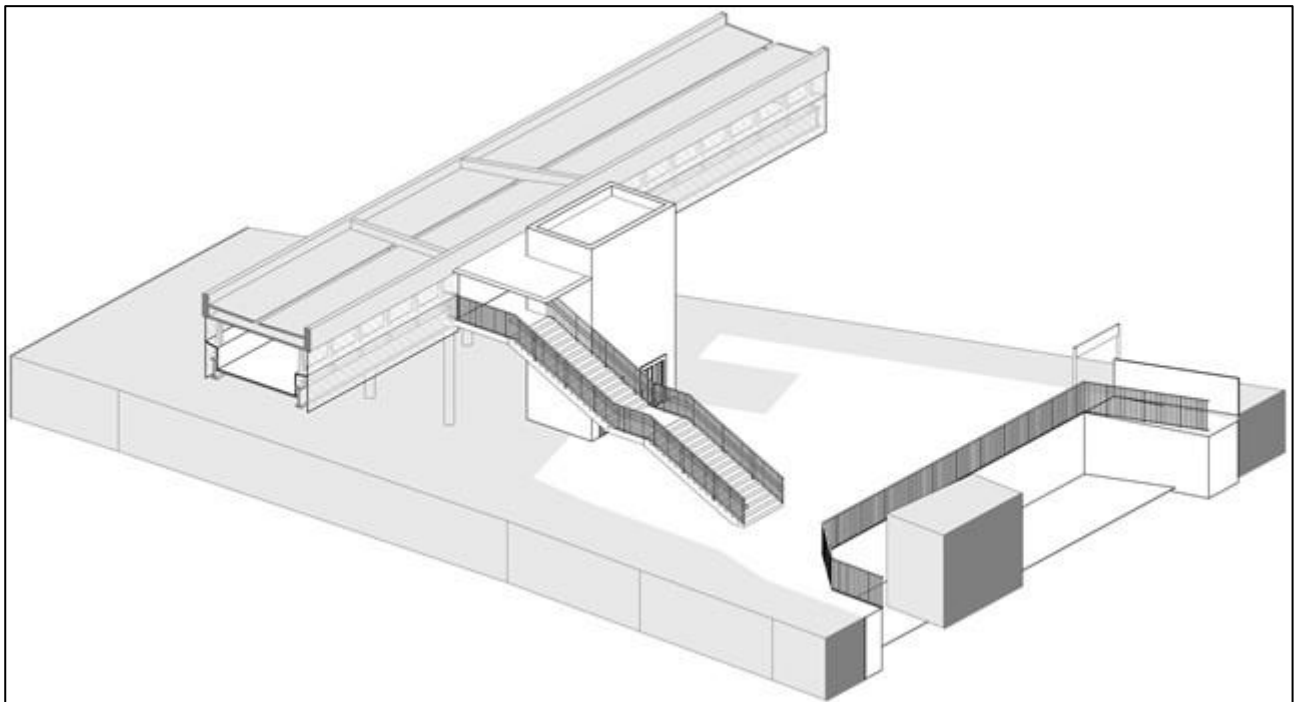


Image 4-35 Howth Junction & Donaghmede Station new platform area and fence line

4.7.3.1.4 Station Ticket Hall

The proposed Ticket Hall door will open up both public facing sides of the ticket hall as far as possible. This will create maximum views into and out of the station, as well as bringing more natural light to the interior during the day. The ticket machines, lifts, and stairs beyond will be immediately visible when passengers enter, providing intuitive wayfinding.



Image 4-36 Howth Junction & Donaghmede Station ticket hall door proposal

4.7.3.1.5 Donaghmede Entrance

The proposed changes to the Donaghmede entrance include the removal of both sets of existing access stairs and their replacement with a new single, covered stair. The existing lift is to remain. The new stair will provide a straight, single flight from ticket hall level up to platform level so that Platform 4 is visible when approaching the base of the stairs. The stair will then continue from the platform up one flight to a landing where the stair will return and continue with two more equal flights to footbridge level. The Proposed Development includes:

- A new entrance door;
- The existing lift;
- A larger lift waiting area and new signage;
- New straight and visible stairs;
- A new slip-resistant floor finish;
- A new, secure bike store; and
- A new external Ticket Vending Machine, validator & shelter.

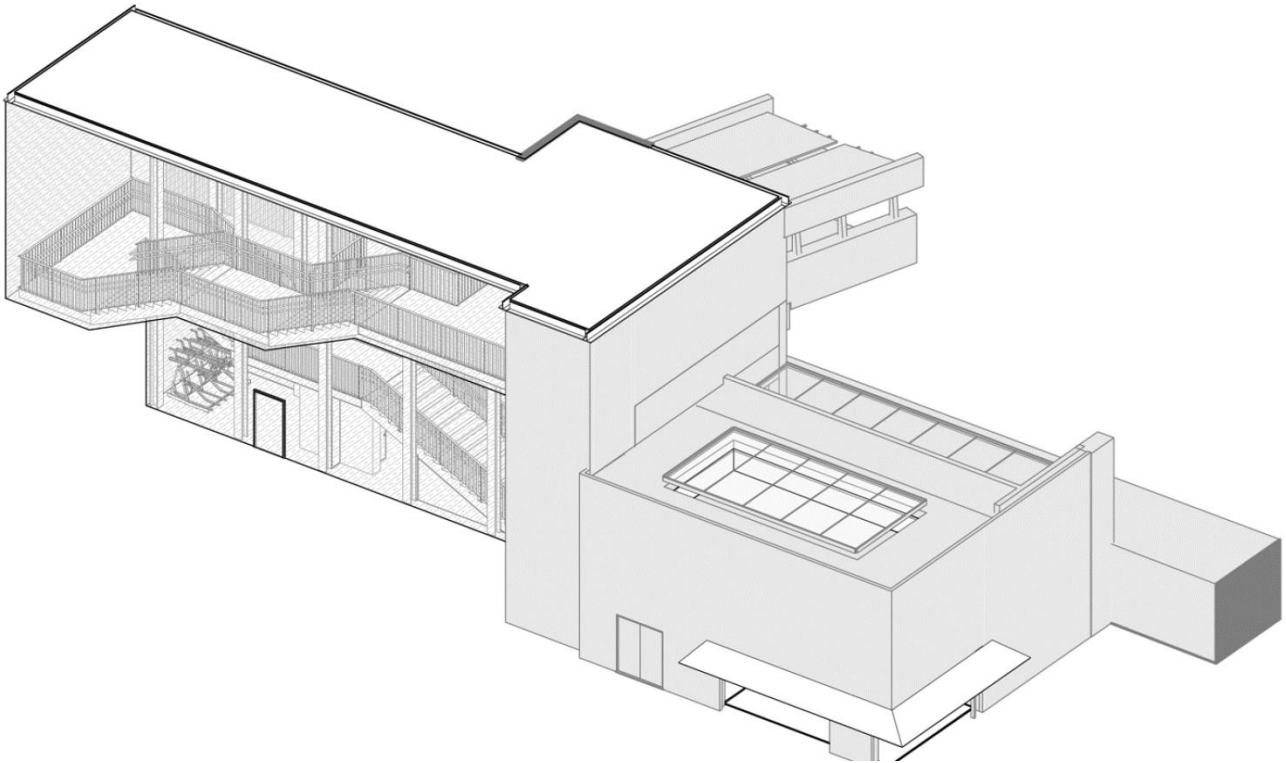


Image 4-37 Howth Junction & Donaghmede Station Donaghmede entrance proposal



Image 4-38 Architectural visual of the proposed entrance hall at the Donaghmede entrance

4.7.3.1.6 Kilbarrack Entrance

The proposed changes to the Kilbarrack entrance include the removal of both sets of existing access stairs and their replacement with a new, single, covered stair. The existing lift is to remain. The new stair will provide a straight single flight from ticket hall level up to platform level so that Platform 1 is visible when approaching the base of the stairs. The stair will then continue from the platform up one flight to a landing where the stair will return and continue with two more equal flights to footbridge level. The proposed changes include:

- A new entrance door;
- The existing lift – made more visible with new signage;
- New straight and visible stairs;
- A new slip-resistant floor finish;
- A new secure bike store; and
- A new external Ticket Vending Machine, validator & shelter.

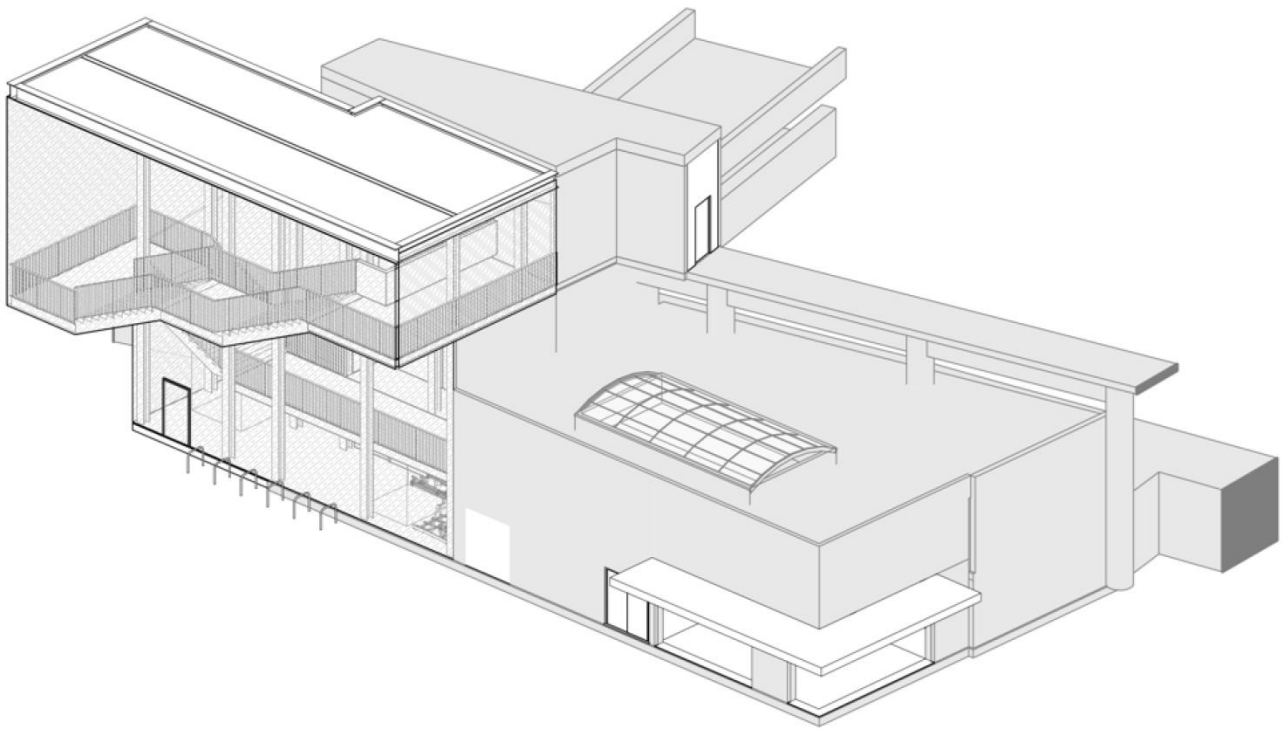


Image 4-39 Howth Junction & Donaghmede Station Kilbarrack entrance proposal



Image 4-40 Architectural visual of the proposed entrance hall at the Kilbarrack entrance

4.7.4 Interventions at Bridges and Structures

Bridge and civil structures are required within Zone B to accommodate the works arising from the proposed DART+ Coastal North development. This includes modifications to the existing station pedestrian bridge at Howth Junction & Donaghmede Station, a new track /passing loop and bridge retaining walls at Clongriffin, Malahide, and supporting of OHLE masts on Malahide Viaduct.

4.7.4.1 Bridge Modifications

Within this section there are proposals for a new bridge east of the existing bridge (UBB19) crossing the River Mayne near Clongriffin as described in Section 4.7.4.1.1 and modifications to the station footbridge at Howth Junction & Donaghmede Station described in Section 4.7.3.1.2.

4.7.4.1.1 UBB19 River Mayne bridge

The works associated with the Clongriffin Turnback require a new loop line to be installed to the east of the existing tracks. This new line extends approximately 500m north of Clongriffin Station before connecting in with the Up Line. The new line crosses over an existing culvert (UBB18B) and the Mayne River and will require the extension of UBB18B and a new bridge adjacent to UBB19 to cross the river and adjacent path.

The existing railway bridge (UBB19-UBB19A) at this location comprises a twin masonry arch structure with a dividing wall between the arches. Either side of UBB19, the existing rail is supported on earthwork embankments. The river Mayne passes between the northern arch, with the southern arch providing dry passage for what was previously referred to as cattle passage. This dry passage is proposed to be revitalised as part of the Finglas Greenway, currently being developed by FCC.

The bridge is flanked by masonry wingwalls which splay out from the main bridge to retain the railway embankment. The bridge is listed as a protected structure in Fingal County Council's Development Plan 2023-2029 (FCC RPS 0919).

The proposed bridge comprises a low profiled reinforced concrete arch structure, with single 17.5 m span. The arch will include precast concrete spandrel walls that run parallel to the alignment of the tracks, With the parapets and arch also of concrete finish. The substructure will comprise reinforced concrete abutments supported on piled foundations. The bridge is set back from the existing structure in plan so as to provide a clear differentiation between the new and existing bridges. The abutments are also set back so as to span the existing wingwalls. The profile of the arch is set in elevation such that it provides an efficient technical solution while also preventing the new structure from obscuring the existing arch barrels.

The existing rail embankment will be widened to support the proposed tracks and will be constructed using earthworks engineering fill materials.

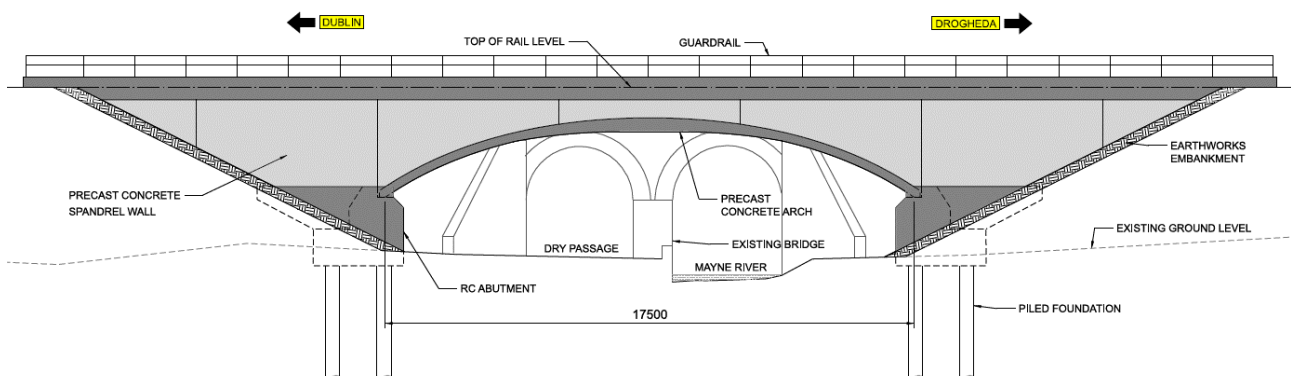


Image 4-41 Elevation of proposed new bridge over the River Mayne

4.7.4.2 OHLE Masts on Viaducts

Underbridge UBB30 – (Malahide Viaduct):

The Malahide Viaduct carries the main Dublin to Belfast railway line across the Malahide Estuary in north County Dublin. The estuary is a protected site and is designated as a Special Area of Conservation (SAC), a Special Protected Area (SPA) and a proposed Natural Heritage Area (pNHA).

Malahide Viaduct, constructed in 1844, is also listed as a protected structure in Fingal County Council's Development Plan 2023-2029 (FCC RPS 0420). Malahide Viaduct is a 176m long viaduct over a tidal estuary and, by 1968, 12 spans of prestressed concrete had replaced the original Victorian iron structure. The deck superstructure now comprises twelve simply supported spans (4 x 12.275m + 8 x 15.860m). The individual spans are simply supported on a series of stone piers and abutments with the remainder of the crossing constructed as an embankment.

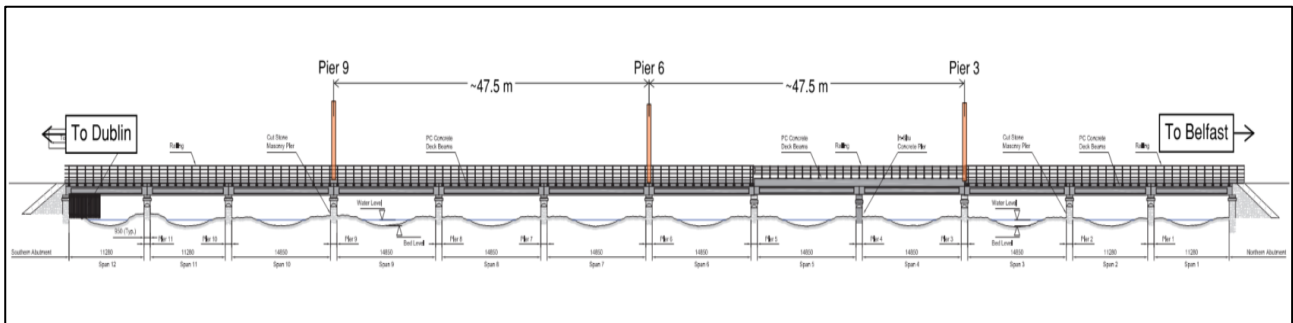


Image 4-42 OHLE masts on Malahide Viaduct

Due to the length of the bridge, OHLE masts need to be placed on the viaduct to support the overhead electrical wires. The proposed solution comprises a minimal intervention for supporting the masts on the bridge. The masts will be supported on concrete gravity slabs placed within the ballast material on the bridge deck at piers 6 & 9. Due to the newer deck composition at Pier 3, the masts will be supported directly from the deck edge beam using a post-fixed bolted connection.

4.7.4.3 New Retaining Walls

4.7.4.3.1 Malahide Turnback – modular reinforced earth wall

The introduction of a turnback north of Malahide Station adjacent to the proposed Broadmeadow Way greenway, necessitates the provision of new retaining structures to the west of the existing rail alignment. The turnback will include the construction of a modular reinforced earth wall, an earthworks embankment between the proposed Broadmeadow Way greenway and the realigned tracks.

At present, the track between Malahide Station and the Malahide Viaduct (UBB30) runs along the top of an embankment. Following the installation of a turnback through this area, a retaining wall will be required to contain the new track works.

It is proposed to provide a modular reinforced earth wall structure, circa 400m long. The height of the wall will vary according to the level of earth retention and will range between 3 meters, in the middle section, and 1 metre (at the northern and southern ends). The remaining height difference will be accommodated by an earthworks embankment at a 1 in 2 (vertical to horizontal) slope behind the top of the wall.

The modular reinforced earth wall is composed of a modular block facing (supported on a small strip footing) and engineering fill materials with geogrid reinforcement placed in horizontal layers. The wall will run along the eastern boundary of the proposed Broadmeadow Way greenway along the length of the southern causeway. The wall and modified embankment will be completed prior to the installation of the additional railway tracks, OHLE and other equipment.

It is proposed that the modular blocks will have a limestone style grey façade finish, in keeping with the existing embankment. Low planting will be provided to the top of the wall and earthwork slope, seeded with a native wildflower/grass seed mix suitable for coastal areas on the slope and native ivy which will grow over the top of the earth retaining wall where reasonably practicable. A typical section is shown in Image 4-43 below.

A dark grey paladin style fence will be provided to prevent trespass onto the railway corridor. A typical photo of this fencing is shown in and . The combined wall and fence will have a minimum height of 2.4m above the greenway's finished level, and along the highest portion of the wall, the fence will have a minimum height of 1.2m above the top of the wall for safety reasons.

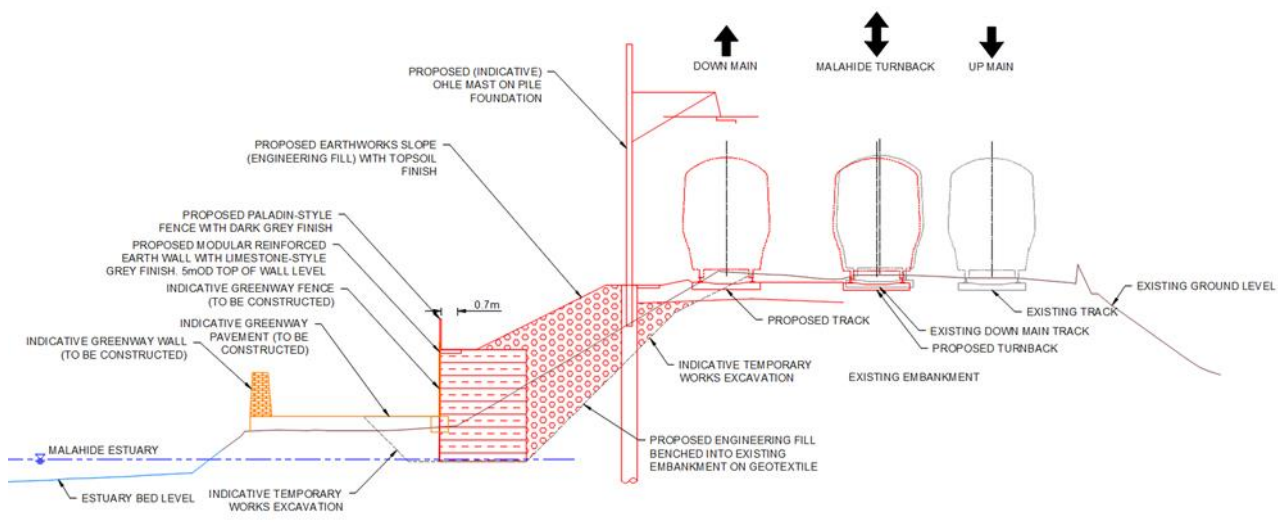


Image 4-43 Typical Section of new Malahide Turnback Modular Reinforced Earth Wall

4.7.4.3.2 Clongriffin Platform 0 – retaining wall

To accommodate the improvements at Clongriffin Station, a retaining wall and earthworks embankments will be required to contain the new track works alongside Platform 0.

It is proposed to provide a reinforced concrete retaining wall structure on earthworks fill, circa 290m in length, retaining up to three metres of material on the eastern side of the station. The stem of the wall will vary in height according to the level of retention required, the majority of the wall will be supported on a pad footing, with a section located adjacent to the existing tower lift and stair access to be piled. It is intended that OHLE foundations will be integrated with the design of this wall, with localised changes in wall profile to accommodate the additional OHLE supports and associated loadings.

A pedestrian guardrail (1.2m high) will be provided along the top of the wall. Where the wall reduces in height, it is proposed to provide a security fence above the wall. The wall will be finished with a stone masonry façade.

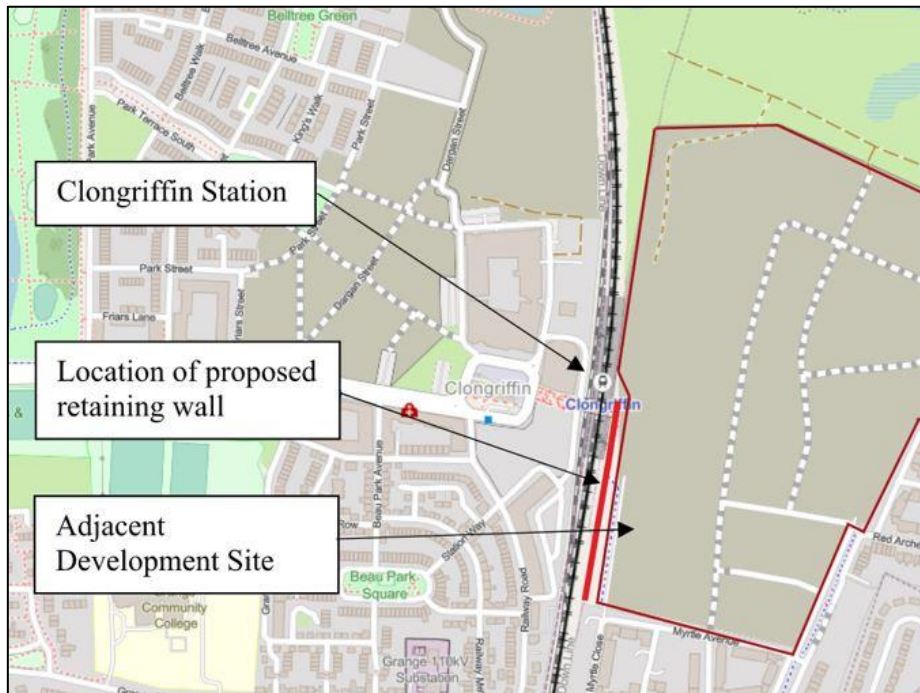


Image 4-44 Proposed location of new retaining wall

4.7.5 Proposed Substations

There are no proposed new substations required within Zone B.

4.7.6 Donabate Level Crossing removal (XB001)

One of the main objectives of the DART+ Coastal North project is to enable an increase in the frequency of train services and a consequent increased number of passengers. Level crossings have therefore been assessed to see if they are an impediment to operationally increasing the required levels of service.

The DART+ Coastal North route has a single user-worked level crossing, located just north of the Malahide estuary and south of Donabate, (user worked level crossing XB001), connecting farmlands either side of the railway (see Image 4-45). Intervention at the current crossing is required as the Proposed Development will result in an increase in risk, both from the electrification of the railway line, as well as the increased frequency of trains.



Image 4-45 Location of existing user worked level crossing (OSI aerial mapping)

It is therefore proposed to close this user worked level crossing. On removal of the level crossing, the boundary of the railway will be secured with IE green palisade fencing (2.4m high). It is proposed to manage the lands to the east of the railway line which are currently in the ownership of Fingal County Council, from a biodiversity enhancement perspective and, as such, these areas will be restricted to being accessed only from the railway. Further detail is provided in Chapter 8 (Biodiversity) in Volume 2 of this EIAR.

4.7.7 Otter Crossing

A new otter crossing is to be provided immediately south of underbridge UBB31 carrying the railway over the River Pill, which will consist of a 600mm internal diameter pipe installed under the track. Otter proof fencing will be provided which will extend 100m beyond the proposed crossing (north and south) on both sides of the railway.

4.8 Zone C: North of Malahide viaduct to south of Gormanston Station (Fingal boundary)

Zone C encompasses the area just south of Donabate Station on the north side of Malahide Viaduct to south of Gormanston Station. The zone includes four stations at Donabate, Rush & Lusk, Skerries and Balbriggan. Zone C lies wholly within the Fingal County Council administrative boundary, bordering the Meath County boundary to the north.

Zone C

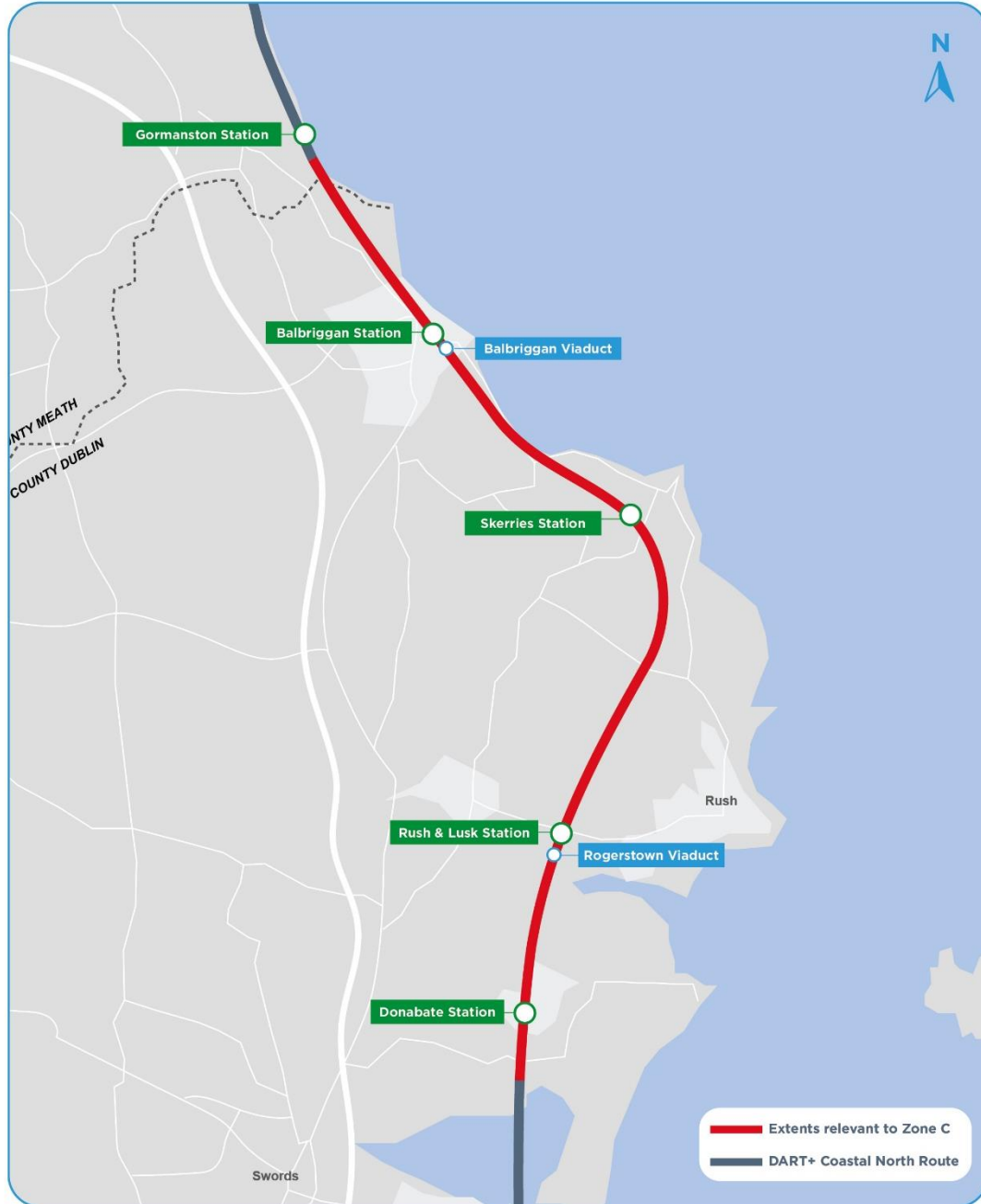


Image 4-46 Extents of DART+ Coastal North Zone C

4.8.1 Proposed Development Zone C – Permanent Way (Track)

Track modifications within Zone C are required only for track lowering solutions. The three locations where track lowering is required, within this zone, are identified in Table 4-9 and explained in more detail in the following sections.

Table 4-9 Track lowering locations in Zone C.

Bridge No.	Mileage (mi yds)	Description
Overbridge OBB39 (carrying Station Road / R128)	13mi, 1644yds	Track lowered (Down Main line only) by 88mm over a length of approximately 140m.
Overbridge OBB44 (carrying local road in Tyrrelstown Big)	14mi, 1437yds	Track lowered (both Up and Down Main line) by 380mm over a length of approximately 450m.
Overbridge OBB55 (carrying Lawless Terrace / R127)	21mi, 305yds	Track lowered (both Up and Down Main line) 321mm over a length of approximately 355m.

4.8.1.1 Track Lowering - Bridge OBB39 (carrying Station Road / R128)

A shallow track lowering (maximum 88mm) over an approximate length of 140m is required at OBB39 which will be achieved via a skim dig of ballast material. The bridge is in the curtilage of Rush and Lusk Station which is not protected but is recognised through inclusion in the NIAH (Ref: NIAH 11323016-8). It will not be impacted in any way by the works on the track.

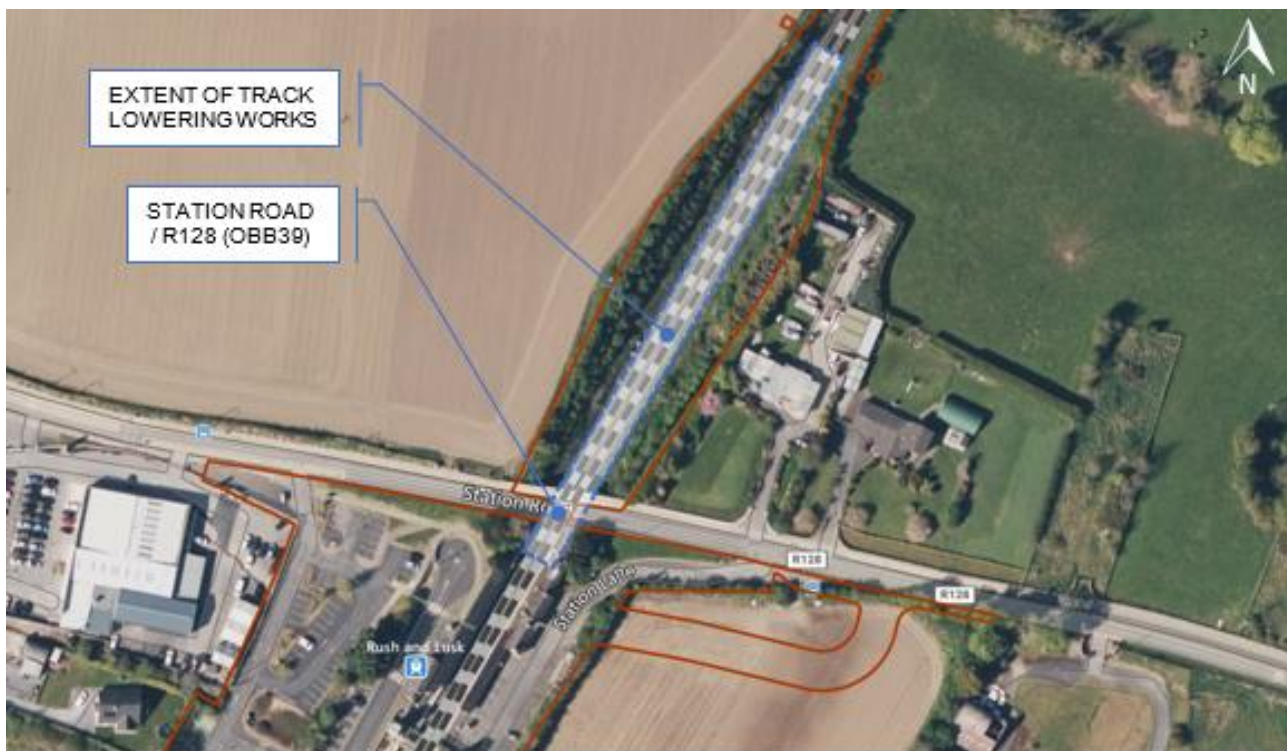


Image 4-47 Extent of track lowering under bridge OBB39 (Google Earth)

4.8.1.2 Track Lowering- Bridge OBB44 (carrying local road in Tyrrelstown Big)

The track under OBB44, will be lowered by a maximum of approximately 380mm over an approximate length of 450m. This track lowering will be achieved via a combination of skim dig and full depth track bed renewal. This bridge is listed as a Protected Structure (FCC RPS 0292). It will not be impacted in any way by the works on the track.



Image 4-48 Extent of track lowering under bridge OBB44 (Google Earth)

4.8.1.3 Track Lowering -Bridge OBB55 (carrying Lawless Terrace / R127)

The track under OBB55 at Balbriggan will be lowered by a maximum of approximately 321 mm over an approximate length of 355m. The track lowering will be achieved via a combination of skim dig and full depth track bed renewal from within the railway. It is noted that this bridge is not protected, nor included in any existing architectural heritage inventories. It will not be impacted in any way by the works on the track.



Image 4-49 Extent of track lowering under bridge OBB55 (Google Earth)

4.8.2 Proposals for equipment buildings

4.8.2.1 Proposed Skerries Equipment Buildings

A new Track Paralleling Hut building is proposed to be located adjacent to Barnageeragh Road in Skerries. The building will measure 4.9 x 5.0 x 4.5m (length x width x height) and will be located within the existing IÉ land boundary. Proposed architectural finish to be cement plaster finish on all elevations, with profiled metal roof sheeting.

4.8.3 Interventions at Stations

There are no station modifications required within Zone C.

4.8.4 Interventions at Bridges and Structures

Zone C requires modification works to bridges in this area to accommodate the introduction of the OHLE equipment. This includes supporting OHLE masts on viaducts, lowering tracks to accommodate the passage of OHLE wires and modification of parapets to protect against electrocution risk. These are described further in the below sections.

4.8.4.1 OHLE Masts Underbridge UBB36 – (Rogerstown Viaduct)

The Rogerstown Estuary is a protected site and is designated as a Special Area of Conservation (SAC), a Special Protected Area (SPA) and a proposed Natural Heritage Area (pNHA).

Rogerstown Viaduct is listed as a protected structure in Fingal County Council's Development Plan 2023-2029 (FCC RPS 0516).

Rogerstown Viaduct is a 60m long viaduct over a tidal estuary. The deck superstructure comprises three simply supported spans of equal length.

The bridge was originally constructed in 1882 as an iron bridge structure supported on masonry piers and abutments. The deck structure was replaced in 1986 with precast concrete beams and concrete parapet edge beams. The bridge abutment wingwalls are gravity retaining walls of masonry construction built on a concrete pad footing.

Since the track has a predominantly straight horizontal alignment at this location, it is possible to position the OHLE masts up to 63m apart. This allows the masts to be placed off the deck superstructure, which measures approximately 60m in length. Hence, it is proposed to place the OHLE masts at the ends of the bridge, supported on the existing masonry wingwalls.

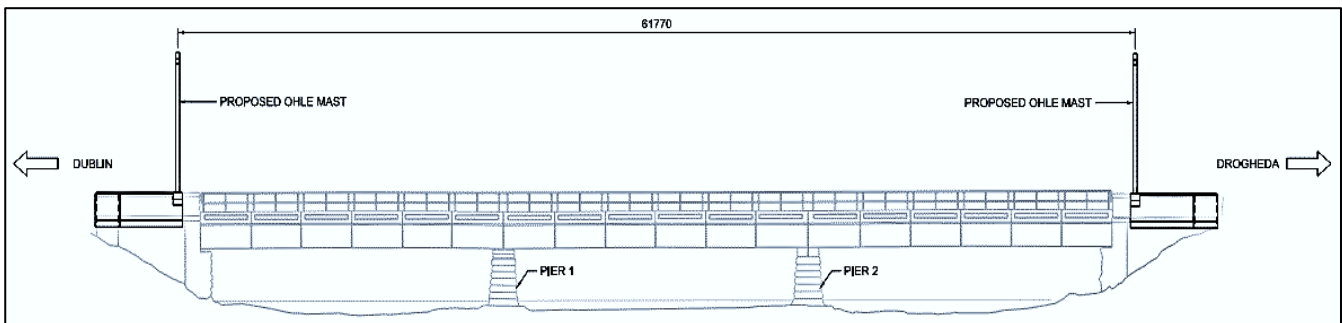


Image 4-50 Positioning of OHLE masts on Rogerstown Viaduct

The existing masonry wingwalls will be demolished down to slab formation level and rebuilt with reinforced concrete walls which will be connected to the existing wingwall substructure using dowel bars drilled to a depth of 2m vertically into the wingwalls below and grouted in place. An exposed concrete corbel will support the post locally with the external face of the proposed reinforced concrete wall clad with stone to match the existing structure.

4.8.4.2 OHLE Masts Underbridge UBB56 – (Balbriggan Viaduct)

Balbriggan Viaduct is included in the National Inventory of Architectural Heritage (NIAH) inventory of Dublin (NIAH 11305021). The NIAH rated the viaduct as being of regional importance for its architectural, social, and technical interest. The bridge is also listed as a protected structure in Fingal County Council's Development Plan 2023-2029 (FCC RPS 0036).

Balbriggan Viaduct is an eleven-span masonry arch viaduct over the river Bracken and several roads in the town of Balbriggan. The spans are of equal length (~11m) with a total bridge span of approximately 125m.

The bridge was originally constructed in 1843-1844 as an arch limestone viaduct with timber walkways for pedestrians. The bridge was renovated in c.1990 and in 2002, with the pedestrian walkways replaced by precast concrete spans with steel pedestrian guardrails.

Due to the length of the bridge, at least two masts are required to be supported on the viaduct. The proposed layout places the masts at the 3rd and 8th pier locations, resulting in a 55m span between masts when viewed in elevation.

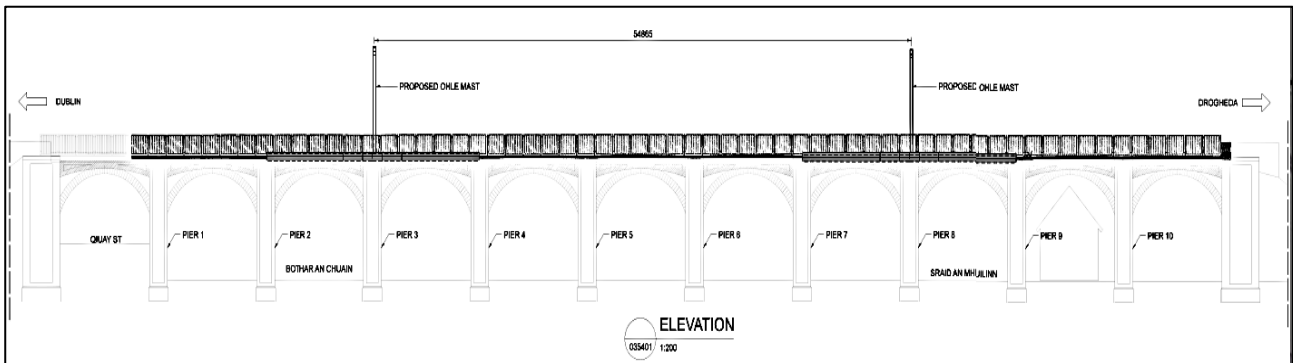


Image 4-51 Positioning of OHLE masts on Balbriggan Viaduct

The proposed solution involves attaching the OHLE posts to the pedestrian walkway outside the existing railway fence line. This requires the pedestrian walkway to be locally widened to provide adequate passage around the OHLE masts at the location of Piers 3 and 8. It is proposed to replace the existing pedestrian walkway spans at these locations with a new precast concrete section, similar to the existing (see Image 4-52).

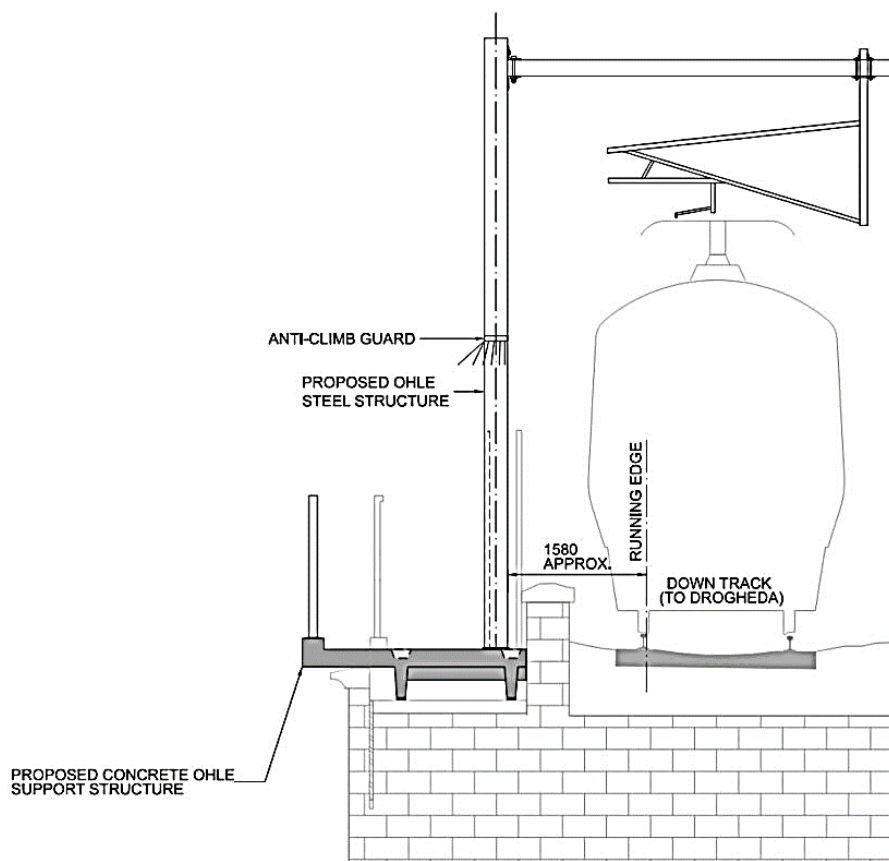









Image 4-52 Walkway and OHLE detail on Balbriggan Viaduct

4.8.4.3 Parapet Modifications

Table 4-10 and Table 4-11 describe bridges (overbridges and footbridges) within Zone C that require modifications to their parapets to protect users from direct contact with the live OHLE.

Table 4-10 Road Overbridges in Zone C requiring parapet modification.

Bridge Name	Parapet Image	Proposed Modification
OBB32A Carrying the Donabate Distributor Road		Stainless-steel plate extension to the top of the parapet. (175mm high x 26m long)
OBB35 Carrying Beaverstown Golf Club		Stainless-steel plate extension to the top of the parapet. (275mm high x 10 m long)
OBB38 Carrying Rogerstown Lane (Protected Structure)		Mesh panel extension to the top of the parapet. (650mm high x 15m long)
OBB41 Carrying local road in Rathartan		Stainless-steel plate extension to the top of the parapet. (325mm high x 12m long)
OBB46 Carrying L1285 Baldongan (Protected Structure)		Stainless-steel plate extension to the top of the parapet. (225mm high x 10m long)
OBB47 Historic access to Skerries Golf Club		Mesh panel extension to the top of the parapet. (550mm high x 15m long)
OBB49 Carrying Golf Links Rd Skerries		Stainless-steel plate extension to the top of the parapet. (175mm high x 11m long)

Bridge Name	Parapet Image	Proposed Modification
OBB55 Carrying Lawless Terrace / R127		Stainless-steel plate extension to the top of the parapet. (375mm high x 11m long)

Table 4-11 Footbridges in Zone C requiring parapet modification.

Bridge Name	Parapet Image	Proposed Modification
OBB33A Donabate Station footbridge		Replace existing infill panels with compliant system (lower 1.2m solid and upper portion with IP2X 12.5mm openings). No extension to parapet height required.
OBB38A Rush & Lusk Station footbridge		Replace existing infill panels with compliant system (lower 1.2m solid and upper portion with IP2X 12.5mm openings). No extension to parapet height required.
OBB51A Skerries Station footbridge		Replace existing infill panels with compliant system (lower 1.2m solid and upper portion with IP2X openings). Where the parapet dips below 1.8 m in height, a steel plate will be welded to the angled steel coping on the top chord to achieve a minimum parapet height of 1.8m throughout.
OBB54 The Ladies Stairs		Replace existing infill panels with compliant system (lower 1.2m solid and upper portion with IP2X openings). No extension to parapet height required.
OBB57A Balbriggan Station footbridge		Replace existing infill panels with compliant system (lower 1.2m solid and upper portion with IP2X openings). Where the parapet dips below 1.8m in height, a steel plate will be welded to the angled steel coping on the top chord to achieve a minimum parapet height of 1.8m throughout.

4.8.5 Proposed Substations

In Zone C there five substations proposed with compounds to provide power to the network. Section 4.5.2.1 provides many of the general details of the substations as part of the general linear works. The following sections describe the more site-specific arrangements for these substation locations:

- Donabate;
- Rush and Lusk;
- Skerries South;
- Skerries North; and
- Balbriggan;

While every effort has been made to contain the necessary works, including the provision of these substations, within existing IÉ owned lands, this has not always been possible. Where works are required outside of IÉ lands, engagement with impacted landowners has commenced and will continue through the remainder of the design and statutory processes.

Plans and elevations are shown in Book 3 Specific Locations Drawings that accompany the RO application.

4.8.5.1 *Donabate Substation*

The proposed substation at Donabate will be located to the west of the railway approximately 0.75km south of Donabate town. The proposed site is located just to the south of the two-lane road (R126) which is elevated on an embankment at this location, as it crosses the railway in an east-west direction. The site itself is located within a gently sloping field of grassland, which gives way to other grazing and arable land in the fields leading down towards the estuary.

The area is outside of the IÉ land ownership boundary and hence property rights will be affected by the permanent works and permanent land acquisition will be required.



Image 4-53 Donabate Substation location

Access will be provided by a 5m wide road which will be provided from the existing Kilcrea local road (L6165) to the south of the site. The proposed substation building will be located at the bottom of the existing embankment of the R126 at a level of +7.00mOD. The finish proposed for the substation is a cement rendered finish on all elevations with pressed metal roof sheeting, keeping the same architectural finishes as the existing Iarnród Éireann substations. IE green palisade fencing will surround the site, providing security with the aid of a security gate at the entrance. A proposed hedgerow will provide screening for the fencing and building.

Vehicular access to the site will be provided through the existing hedgerow which bounds the railway line and the substation site. This will require the removal of a section of hedgerow and the provision of a security gate. In respect of services, municipal watermain are available in close vicinity to the site. There is no requirement for a foul wastewater connection at this location. The surface water run-off from the buildings will be gathered by infiltration basins designed to release water back into the soils beneath.

Lighting for the site will be provided by lighting fixed to the building. This lighting will be sensor operated and will only be activated when the building is in use.

4.8.5.2 Rush & Lusk Substation & OHLE maintenance compound

The proposed substation will be located to the east of the railway and south-east of the car park for Rush and Lusk station. This substation site will also include an OHLE maintenance compound, which will comprise office space and welfare facilities, as well as external equipment storage areas. A new access road to the east side of the Rush and Lusk station is proposed. The substation will be accessed via a new 5m wide road from the existing station car park. An entrance gate will be provided at the junction with the station car park, to provide appropriate security.

Existing vegetation will be retained and utilised to screen both the proposed IÉ green palisade fencing and the substation building.

The proposed substation site location is within the existing IÉ property boundary and therefore no additional permanent land acquisition is required. The site is bounded by the car park and railway to the west and by agricultural land to the north, south and east. A plot of land east of the substation will house the OHLE maintenance compound which will comprise office space and welfare facilities, as well as external equipment storage areas. The site has relatively flat topography, with the proposed substation to be located at a ground level of +19.5mOD. The finish proposed for the compounds is a cement rendered finish on all elevations with pressed metal roof sheeting, keeping the same architectural finishes as the existing Iarnród Éireann substations. An infiltration basin will aid surface water drainage, by allowing the water to infiltrate through to the soils below. Lighting for the site will be provided by lighting fixed to the building. This will only be activated when the building is in use.

As part of the works to improve the entrance to the station, the existing junction is improved and a new access road connecting to the station is proposed set back approx. 20m from Station Road to provide space for potential active travel corridor between Rush and Lusk to be delivered by FCC in the future. The existing bus stop will remain in its current location set back from the road to improve sightlines at the junction. This will require permanent land take outside IÉ land boundary.



Image 4-54 Rush and Lusk Substation and OHLE Maintenance Compound location

4.8.5.3 South Skerries Substation

The proposed South Skerries Substation is located east of the railway, approximately 1.1km south of Skerries Station (see Image 4-55). The bridge (OBB49) is located west of the proposed access point to the substation. The railway line in this location runs in a north-south direction.

Access to the proposed substation will be provided via a 45m long road from the Golf Links Road north of the site. The access road will be 5m wide.

The site will be surrounded by fencing which will provide a security barrier. The site perimeter will also be planted with a new hedgerow to provide appropriate screening.

Permanent acquisition of third-party land will be required for the proposed substation as the proposed site does not sit within the existing IÉ property boundary. The site is bounded to the west by the golf course and railway, to the north by the Golf Links Road, and agricultural land with some residential land use to the south and east.

The existing terrain at the proposed site is at ground levels of approximately +23.72mOD and will require earthworks to raise the ground level to approximately +25.5mOD, which is the proposed finished ground level for the substation. The raise in ground level is to accommodate the rise in the site level towards the road of +27.65mOD and to balance the required earthwork embankments for the new access road. The finish proposed for the substation is a cement rendered finish on all elevations with pressed metal roof sheeting, keeping the same architectural finishes as the existing Iarnród Éireann substations.

Infiltration basins will aid surface water drainage by allowing the surface water to drain into the soils below. It should be noted there is no requirement for a foul wastewater connection at this location.

Lighting for the site will be provided by lighting fixed to the building. This will only be activated when the building is in use.



Image 4-55 South Skerries Substation location plan

4.8.5.4 North Skerries Substation

The proposed North Skerries Substation will be located south of the railway which runs in a northwest southeast direction in this location. The site is located approximately 2km northwest of Skerries Station (see Image 4-56).

Access will share the existing farm access lane adjacent to the garden centre from Barnageeragh Road which runs along the north of the site. Existing landowners east of the site will continue to make use of this road to access the fields adjacent to the site. A new road pavement will replace the existing access lane and a security gate will be placed at the entrance of the substation to provide appropriate security.

The site is bounded by the railway to the north, a garden center to the west and agricultural land to the south and west. IÉ green palisade fencing and a planted hedgerow will surround the site, providing security and screening. The site is set back from the existing yard in the northwest corner to enable continued access for the landowner from the field.

As the proposed site location does not sit within the existing IÉ property boundary, permanent land acquisition is required to accommodate the new substation. The finish proposed for the substation is a cement rendered finish on all elevations with pressed metal roof sheeting, keeping the same architectural finishes as the existing Iarnród Éireann substations.

Earthworks will be required to raise the existing terrain, providing a substation ground level of approximately +18.75mOD. The existing level varies from approximately +16.8m to +18.5mOD.

Surface water drainage will consist of infiltration basins. Welfare facilities will be provided, and foul wastewater will discharge to the existing foul sewer line which runs through the proposed site.

Water will be supplied via a new connection to an existing public water main at the main road.

Lighting for the site will be provided by lighting fixed to the building. This will only be activated when the building is in use.



Image 4-56 North Skerries Substation location plan

4.8.5.5 Balbriggan Substation

Balbriggan Substation is proposed to be located 1.48km west of Balbriggan Station. The railway line runs in an east-west direction to the north of the site at this location (see Image 4-57).

A new vehicular access road is proposed from the R132 road which runs south of the site. This will measure 350m in length.

Permanent acquisition of third-party party lands will be required as the proposed site is not within the existing IÉ property boundary. The finish proposed for the substation is a cement rendered finish on all elevations with pressed metal roof sheeting, keeping the same architectural finishes as the existing larnród Éireann substations. The site is bounded by the railway at the northeast of the site, with agricultural land south and west. It is proposed that IÉ green palisade fencing, along with a new planted hedgerow, will provide appropriate security and screening. Existing vegetation along the access road will also be retained.

The existing terrain at the site slopes down towards the railway line. Earthworks will therefore be required to enable the substation to be raised to a ground level of approximately +12.00mOD. The existing ground level at the foot of the embankment is approximately +11.00mOD.

Infiltration basins will provide surface water drainage by allowing the water to infiltrate into the soils below. It should be noted there is no requirement for a foul wastewater connection at this location.

Lighting for the site will be provided by lighting fixed to the building. This will only be activated when the building is in use.

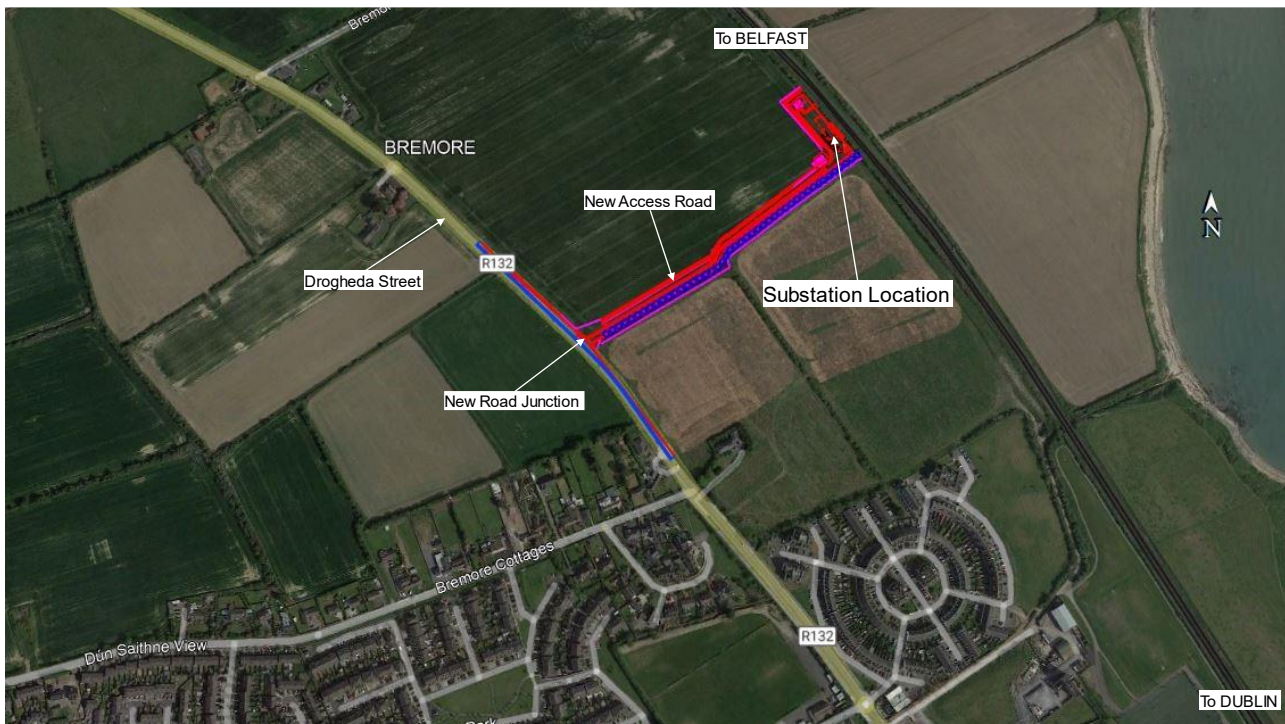


Image 4-57 Balbriggan Substation location

4.9 Zone D: South of Gormanston Station (Fingal border) to Louth/Meath border

Zone D encompasses the area between Gormanston Station and the Louth / Meath border (the Louth boundary is approximately 1.5km south of Drogheda MacBride Station). This zone includes Gormanston and Laytown Stations. Zone D lies wholly within the Meath County boundary, bordering Fingal to the south and Louth to the north, as seen in Image 4-58.

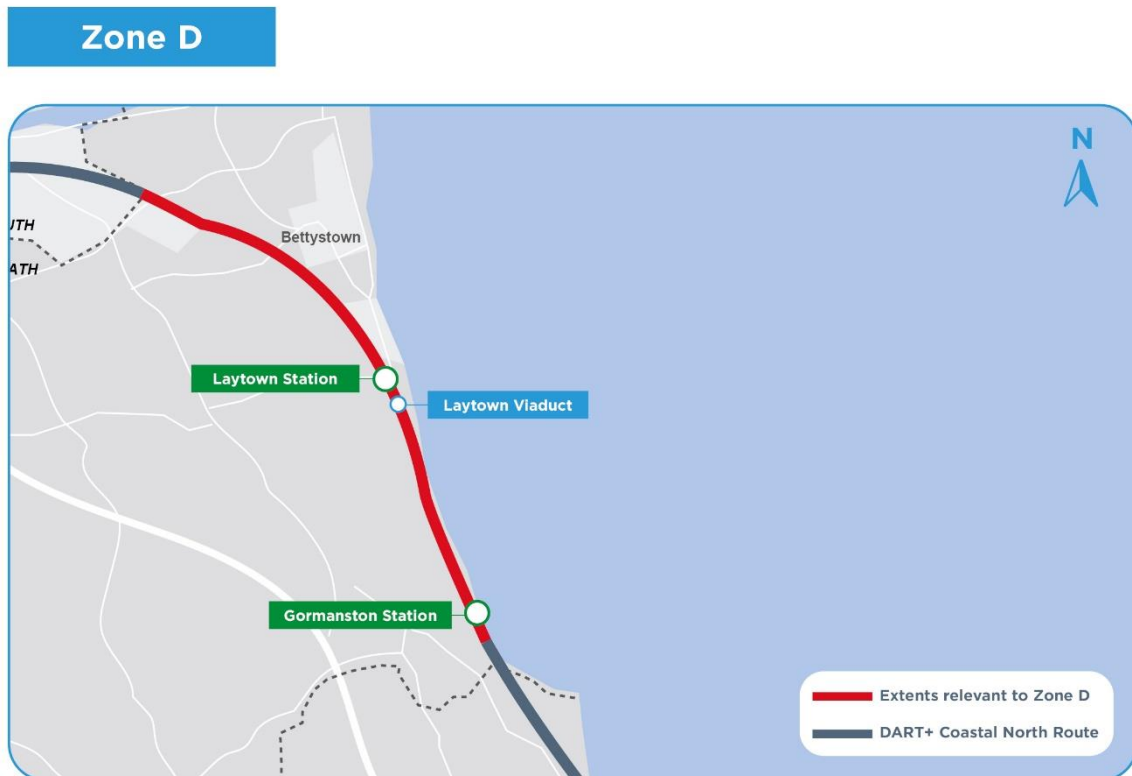


Image 4-58 Extents of DART+ Coastal North Zone D

4.9.1 Proposed Development Zone D – Permanent Way (Track)

Track modifications within Zone C are required in specific areas as outlined below.

- Changes to the track vertical alignment (track lowering) under one road bridge (OBB78) to achieve safe OHLE wire clearance.

4.9.1.1 Track Lowering

A small track lowering of the railway lines under Colpe Road is required to accommodate the safe passage of OHLE wires beneath the bridge location and as per the detail shown in Table 4-12 below. The extent of the works to the track are over a 200m length and will be achieved through a shallow excavation and reinstatement of the ballasted track formation.

Table 4-12 Track lowering locations in Zone D.

Bridge No.	Mileage	Description
OBB78 Carrying Colpe Road (Overbridge)	30mi, 233yds	Track lowered (both Up and Down Main line) by approximately 129mm over a length of c.220m. Track lowering achieved via a combination of skim dig and full depth track bed renewal. This bridge is not protected or included in any existing inventories.

4.9.2 Interventions at stations

The are no station modifications required within Zone D.

4.9.3 Interventions at Bridges and Structures

Interventions to bridges and civil structures are required within Zone D to accommodate the works arising from the proposed DART+ Coastal North development. This includes the support of OHLE masts on Laytown Viaduct, track lowering at Overbridge OBB78 (carrying Colpe Road - as detailed above) and a number of parapet modifications to existing bridges.

4.9.3.1 OHLE Masts on Viaducts

4.9.3.1.1 Underbridge UBB72 – (Laytown Viaduct)

The Nanny River and Estuary is a protected site and is designated as a Special Protection Area (SPA) and Proposed Natural Heritage Area (pNHA). The lands on the south side of the viaduct are zoned in the East Meath Local Area Plan (LAP) 2014-2020 as Community Infrastructure, while the lands on the northern side are zoned High Amenity.

Laytown Viaduct is a protected structure, built in circa 1844, and listed in Meath County Council's Record of Protected Structures (MH028-303). It is included in the NIAH (11402801) where it is rated of regional importance for reasons of architectural and technical interest.

The viaduct is a five-span structure, with an overall length of 76m. The individual spans are simply supported on stone abutments at the ends with intermediate piers between. The intermediate piers comprise wrought iron cylinders filled with concrete and braced with plate girders.

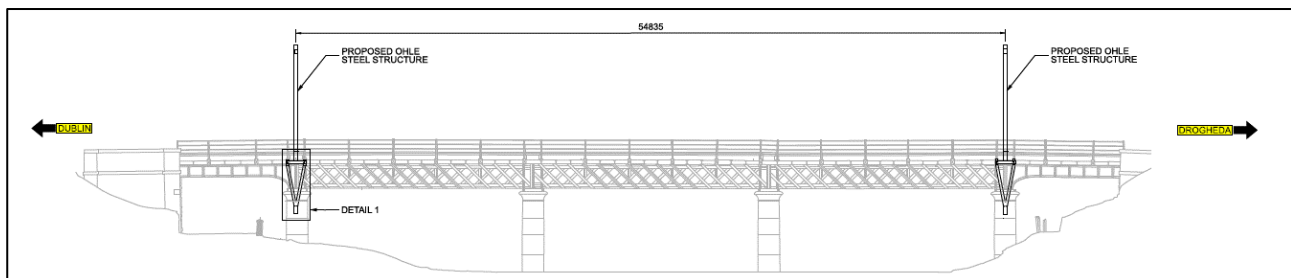


Image 4-59 Positioning of OHLE masts on Laytown Viaduct

The proposed arrangement will place two OHLE masts on the viaduct to align with the outer piers. A minimal amount of new steelwork will be added to transfer the loads into the existing piers. Diagonal strut elements will carry the vertical load down to the piers. These strut members will be braced against the existing transverse deck beams to enhance the stability of the proposed system.

4.9.3.2 Parapet Modifications

The following bridges within Zone D require modifications to their parapets to protect users from direct contact with the live OHLE.

Table 4-13 Road overbridges in Zone D requiring parapet modification.




Bridge Name	Parapet Image	Proposed Modification
OBB68 Local access adjacent Gormanston Camp		Mesh panel extension to the top of the parapet. (475mm high x 10m long)
OBB78 Carrying Colpe Road		Stainless-steel plate extension to the top of the parapet. (225mm high x 10m long)

Table 4-14 Footbridges in Zone D requiring parapet modification.

Bridge Name	Parapet Image	Proposed Modification
OBB74A Laytown Station footbridge		Replace existing infill panels with compliant system (lower 1.2m solid and upper portion with IP2X 12.5mm openings). Where parapet dips below 1.8m in height, a steel plate will be welded to the angled steel coping on the top chord to achieve a minimum parapet height of 1.8m throughout.

4.9.4 Proposed Substations

4.9.4.1 Gormanston Substation

The proposed site for Gormanston Substation is located within, and at the northeast corner of Gormanston Camp airfield, which is located between the public road (Irishtown Road) and the camp wastewater treatment plant. The railway lines run in a north south direction to the east of the site in this location. There is a single carriageway road which runs in an east west direction immediately north of the site.

There is an existing bridge for the road over the railway (OBB68) to the northeast of the proposed site. The road is located on an embankment. The wider area generally comprises agricultural fields with a road and farmhouse to the north, and a shooting range to the east of the railway.

To the north of the site there is a farmhouse with farm buildings, while to the west, the military camp and airfield buildings are located. The proposed site location does not sit within the existing IÉ property boundary, permanent land acquisition is required to accommodate the new substation. The finish proposed for the substation is a cement rendered finish on all elevations with pressed metal roof sheeting, keeping the same architectural finishes as the existing Iarnród Éireann substations.

Some earthworks will be required to raise the level of the substation and access road from approximately +15.8mOD at the public road to approximately +17.0mOD at the substation hard standing. The existing levels vary from approximately +15.8mOD to +16.5mOD.



Image 4-60 Gormanston Substation location

A new vehicular access is proposed from the minor public road (Irishtown Road). This new access road will be typically 5m wide, with shared access gates to allow the Department of Defence to make use of the existing track. A second set of security gates will control access into the substation compound. IÉ green palisade fencing will secure the substation and a newly planted hedgerow will screen the fencing and substation building.

Surface water drainage will consist of infiltration basins, which will allow the surface water to infiltrate to the soils below. Welfare facilities will be provided, and foul wastewater will discharge through a new wastewater connection to the existing treatment plant to the immediate south. Water supply will be from the existing water mains in the public road.

Lighting for the site will be provided by lighting fixed to the building. This will only be activated when the building is in use.

4.9.4.2 Bettystown Substation

The proposed Bettystown Substation will be located to the north-east of the existing railway line, near the residential Ardmore Estate, approximately 2.12km north-west of Laytown Station. The railway line runs in a north-west south-east direction to the south-west of the site in this location.

Access to the substation will be provided from the existing Narrowways Road to the north-west of the site, with a new 5m wide access road provided from the entrance off Narrowways Road.

IÉ green palisade fencing around the site and a security gate at the site entrance will provide appropriate security for the site. A proposed hedgerow will screen the fencing, building and access road boundary to Ardmore Estate.

The proposed site location is not within the existing IÉ boundary. Permanent acquisition of third-party lands will be required for the substation. The site is bounded by the railway to the south-east, low density residential development to the north and agricultural land to the south-east. At this location, there is an existing 2.5m high soil bund which will require earthworks regrading to level the terrain. The proposed ground level for the substation is approximately +18.00mOD, and the existing Ardmore Avenue has a level of approximately +17.41mOD. The finish proposed for the substation is a cement rendered finish on all elevations with pressed metal roof sheeting, keeping the same architectural finishes as the existing Iarnród Éireann substations.

Welfare facilities will be provided at the substation and foul wastewater and water supply connections will be made to the existing foul sewer and water main services available from the existing housing development on Ardmore Avenue. Infiltration basins will aid surface water drainage from the building by allowing the water to dissipate into the soils below.

Lighting for the site will be provided by lighting fixed to the building. This will only be activated when the building is in use.



Image 4-61 Bettystown Substation Location (Source: ESRI)

4.10 Zone E: Drogheda Station and surrounds (boundary of Louth approx. 1.5km southeast of Drogheda Station)

Zone E extends from the Louth/Meath border, approximately 1.5km south of Drogheda MacBride Station, to the end of the Proposed Development and encompasses Drogheda MacBride Station, including along the Drogheda Freight Sidings and the station surrounds. This zone lies wholly within the Louth County administrative boundary, bordering the Meath County administrative boundary to the south.

Zone E

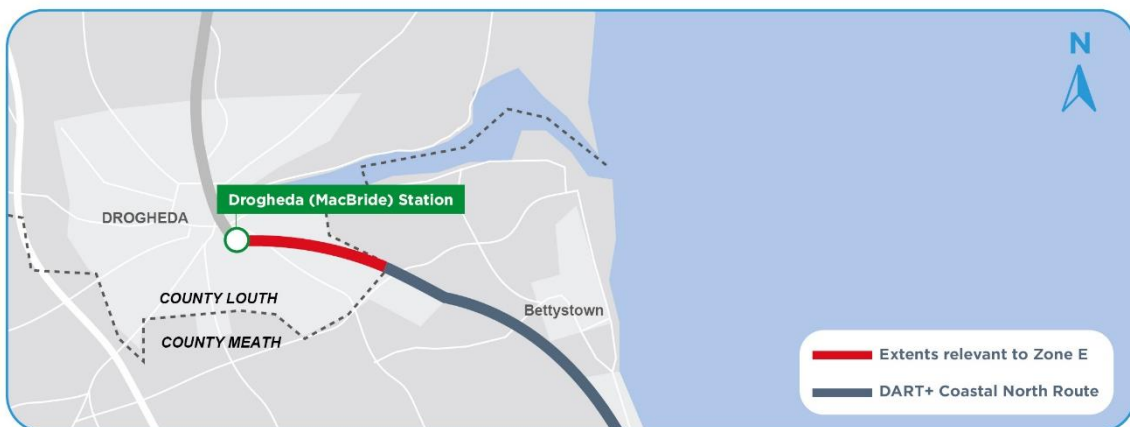


Image 4-62 Extents of DART+ Coastal North Zone D

4.10.1 Proposed Development Zone E – Permanent Way (Track)

Track modifications within Zone E are required in specific areas as outlined below.

- To connect to the new Drogheda MacBride Station Platform 4 (located on old freight sidings);
- New stabling sidings (7A & 7B) within the depot;
- Along the Drogheda Freight Sidings to create a new turnback facility;
- New stabling siding over UBK01 (located on the Drogheda Freight Sidings); and
- Under bridge OBB78 (track lowering).

4.10.1.1 Drogheda MacBride Station proposed Track works

Drogheda MacBride Station is located on the Dublin to Belfast railway line at approximate mileage 31 $\frac{3}{4}$ miles (approximate chainage 51+800 to 52+550). The station consists of three platforms: Platform 1 on the Down Main line, Platform 2 on the Up Main line, and Platform 3 on the terminating platform at the station (see Image 4-63).

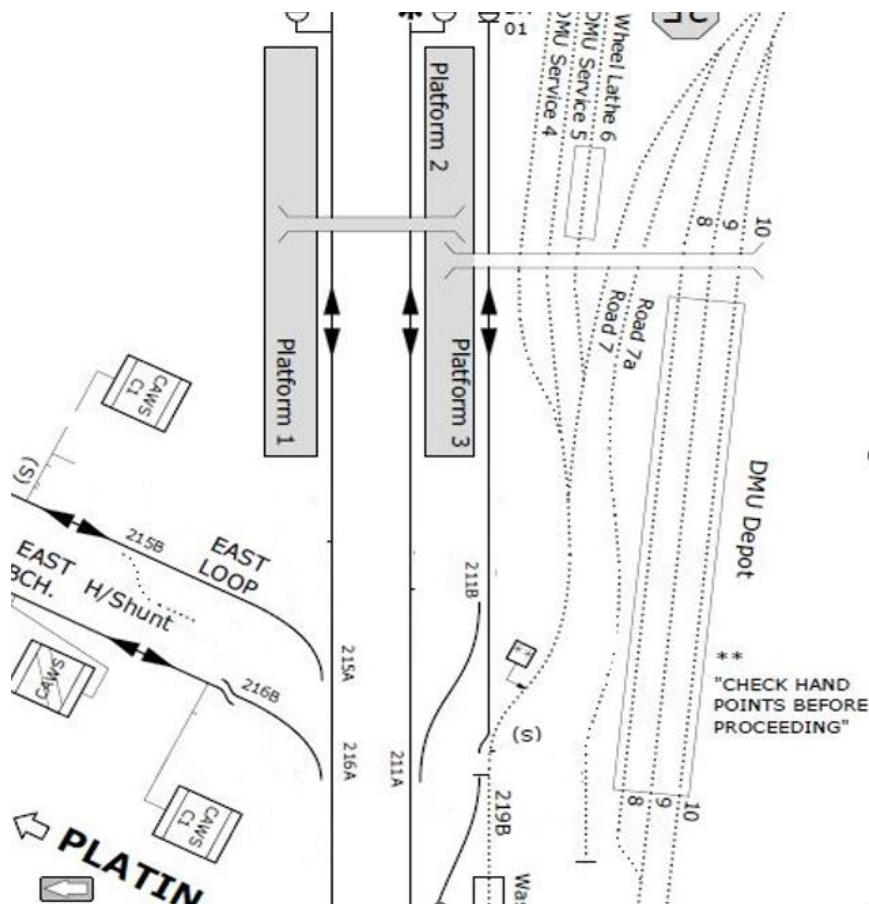


Image 4-63 Drogheda MacBride Station route diagram Zone E

The station opened on 25 May 1844, and is located on a tight curve which creates a constraint to the overall layout of the track in the area to the south of the Boyne Viaduct. The original station was re-sited to its present location only once the Boyne Viaduct construction was completed. The station previously had a third platform which was removed in 1997 to allow widening of Platforms 1 and 2.

To the south of the main station are two crossovers connecting the Up and Down Main lines, and in close proximity is the junction for the Drogheda Freight Sidings. The branch lines diverge from the Down Main line, with two tracks going southwest towards Navan which serve the Irish Cement works (Platin) and Tara Mines. To the north of the existing station is the Boyne Viaduct which accommodates a single bi-directional track. Image 4-63 and Image 4-64 provide an overview of the existing Drogheda MacBride Station arrangement.

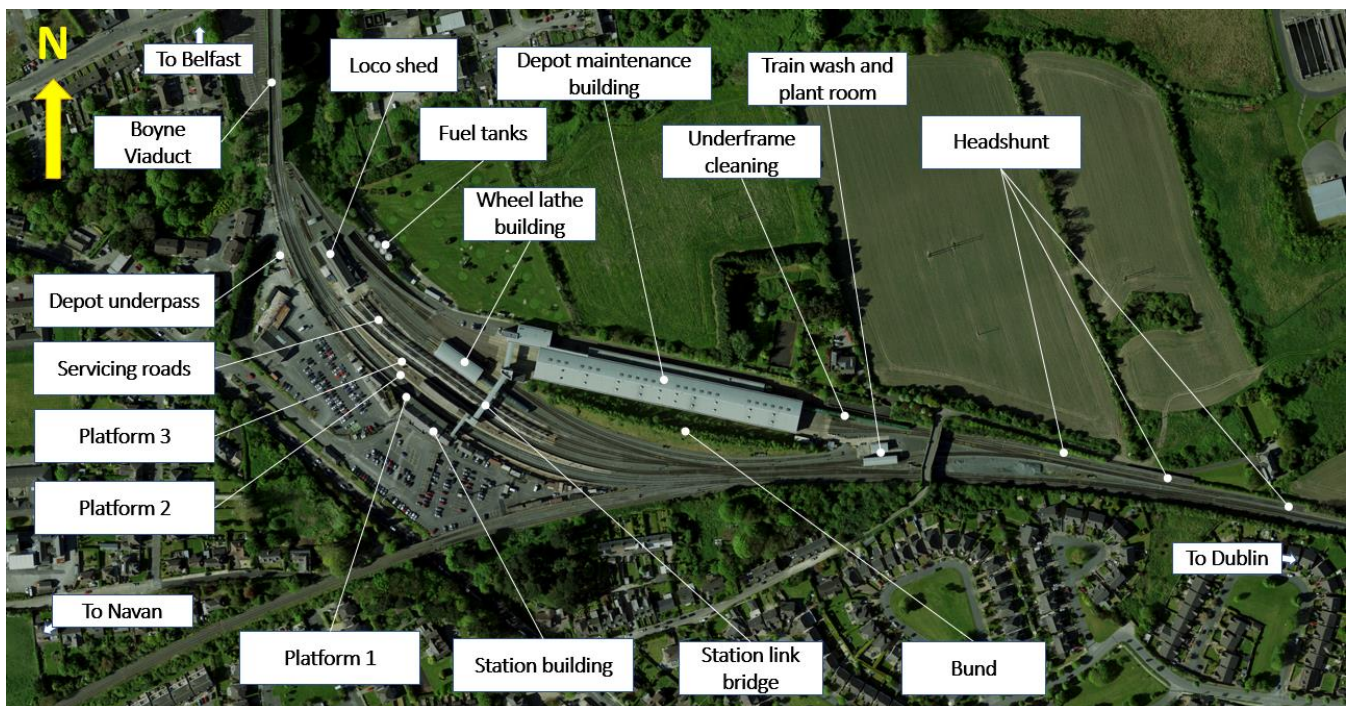


Image 4-64 Overview of Drogheda MacBride Station

4.10.1.1.1 Drogheda Station Platform 4

At Drogheda MacBride Station the existing track and depot layout does not provide adequate platform capacity to meet the planned increase in the number of train services. Consequently, track modifications are necessary to provide a new single platform (referred to as new Platform 4) that will be located along the Drogheda Freight Sidings. This is presented in Image 4-65.

4.10.1.1.2 New stabling roads within the depot

Drogheda Depot is on the north side of the station and on the inside of the tight curve. Rail access to the depot is via one of the two mainline connections to the depot directly to the south-east of the station. The DART+ Stabling Strategy is to provide additional rolling stock stabling within the Drogheda area, with new stabling tracks proposed adjacent to the depot buildings. One additional stabling line will be created, by re-positioning existing stabling Road 7A to provide sufficient space for new stabling road 7B, with enough length to accommodate the full-length trains. This is described in more detail in Section 4.10.5.2.



Image 4-65 Overview of works around Drogheda MacBride Station

4.10.1.1.3 New Drogheda Platform 4 Turnback Facility

The purpose of the scheme is to realign both existing tracks towards the south of the site so that an additional station platform and stabling line can be provided. Additional turnback infrastructure is also proposed to provide the necessary operational flexibility to turn trains back from Platform 4 and ultimately support a more intensive passenger train service.

The introduction of the new platform, stabling line and turnback facility requires a realignment of the tracks towards the south and necessitates the replacement of the existing UBK01 bridge deck with a wider structure. The proposed turnback works are located along the Drogheda Freight Sidings, extending to the west past the UBK01 Dublin Road underbridge by 200m. Further detail is provided in Section 4.10.4.3 and an image of the existing underbridge is presented in .



Plate 4-24 Northern elevation of underbridge UBK01 (Dublin Road R132)

4.10.1.1.4 New Stabling Road on the Drogheda Freight Sidings

Along the Drogheda Freight Sidings the northernmost line will connect to the proposed new Platform 4 and the southern line will be realigned to the south to make space for a new stabling line. The extent of the proposed works to the stabling line are 388m in length. At the eastern end of this site, a section of wall is required to retain the cutting slope that falls steeply towards the railway.

4.10.1.1.5 Track Lowering Under OBB78

To enable the electrification of the railway line beneath this bridge, where there is reduced vertical clearance to accommodate the electrical wiring, a track lowering is proposed. Both tracks under OBB78 (Céide Na Páirce), will be lowered by approximately 130mm. This shallow track lowering will be achieved via a combination of skim dig and full depth track bed renewal over an approximate length of 225m.

4.10.2 Interventions at Drogheda MacBride Station

Station improvement works are proposed to provide the new Platform 4 to be located west of the main platforms on the site of the old freight siding, along the Drogheda Freight Sidings. The new station platform (approximately 175m in length) will connect to the north side of the railway lines and has been positioned as close to the existing Drogheda MacBride Station as possible. The location is constrained with track geometry such that the platform will be located on a gradient (approximately 1 in 120), ensuring the alignment follows the ground profile within the rail corridor.

The new platform will extend over Dublin Road (R132); hence the existing Dublin Road Underbridge (UBK01) is proposed to be replaced with a widened deck structure. The new platform will be interconnected with the existing Platform 1 which will be modified to allow for pedestrian movements.

A new emergency evacuation route is to be provided off the end of Platform 4, ramping down to a new exit onto St. Mary's Terrace. Paladin fencing will be provided along the boundary of the road to guide passengers to the public footpath area.

4.10.2.1 Platform 1 Station Canopy works

The Drogheda MacBride Station building is a historic detached five-bay single-storey brick railway structure that was constructed c. 1853. The special nature of the railway station and canopies stems from the fact that Drogheda MacBride Railway Station, including the canopies, are listed under Record of Protected Structures, and are listed under the National Inventory of Architectural Heritage. The canopy consists of wrought-iron lean-to trusses, columns, and lattice work with decorative spandrels (see).



Plate 4-25 Platform 1 Canopies

The station canopies on Platform 1 will clash with the proposed overhead line equipment, with the canopy trusses conflicting with the exclusion zone of the train. (Platform 2 is unaffected). As a result, works are required to the canopy to provide the necessary clearances and these proposed works include sensitive restoration works to the structure and cutbacks for the roof trusses supporting the canopy at Platform 1 (See Image 4-66). Chapter 21 (Architectural Heritage) in Volume 2 of this EIAR includes the assessment of architectural heritage features potentially impacted by the Proposed Development.

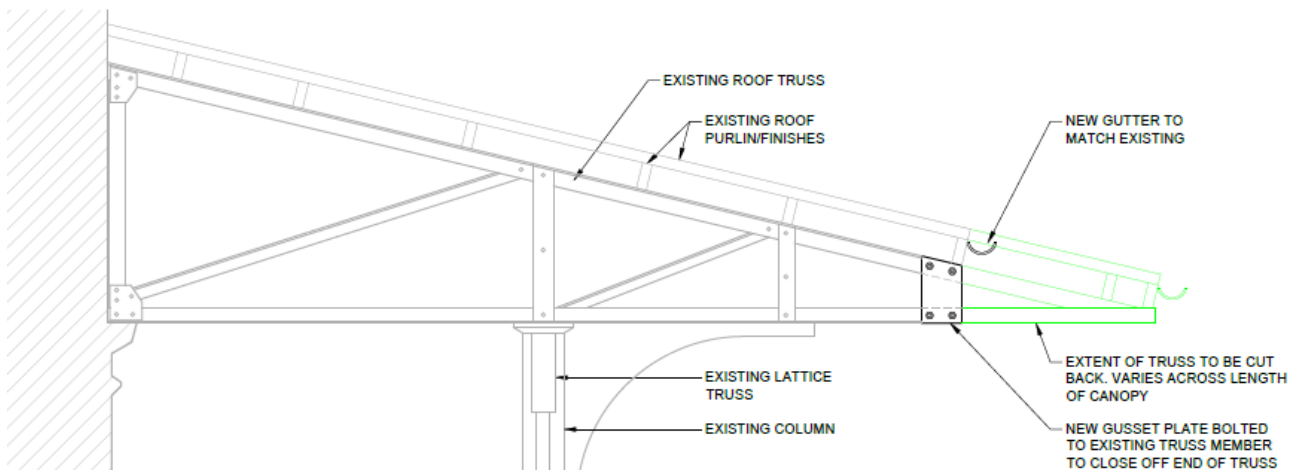


Image 4-66 Platform 1 proposed canopy cutbacks

4.10.3 Proposed Drogheda Equipment Buildings

A new SEB building is proposed to be located to the east of Drogheda Station. The building will measure 22.5 x 5.0 x 4.0m (length x width x height) and will be located within the existing IÉ land boundary. Proposed architectural finish to be red brick finish on all elevations, complimentary with adjacent heritage structures, with profiled metal roof sheeting, mono pitch. The building will have a new access road from off Railway Terrace and an access path to the tracks. A new TER building is proposed to be located within the car park of Drogheda Station. The building will measure 10.0 x 4.0 x 4.0m (length x width x height) and will be located within the IE land boundary. Proposed architectural finish to be red brick finish on all elevations, complimentary with adjacent heritage structures, with profiled metal roof sheeting, mono pitch.

4.10.4 Interventions at Bridges and Structures

Modifications to bridge and civil structures are required within Zone E to accommodate the works arising from the Proposed Development. This includes modifying a number of the bridges in the Drogheda MacBride Station area: Overbridge OBB80/80A/80B (carrying Railway Terrace), OBB81, (Drogheda Station footbridge), and Underbridge UBK01 (Dublin Road R132) as well as parapet modifications to Overbridge OBB81C (Drogheda Depot footbridge access).

4.10.4.1 Overbridge OBB80/80A/80B Modifications (carrying Railway Terrace)

The existing bridges (IÉ reference OBB80/80A/80B) are located on the southern approach to Drogheda MacBride Station (approximate chainage 51+880). The bridges are aligned to form a three-span crossing of the railway and provide vehicular access from Railway Terrace to McGrath's Lane.



Image 4-67 Overbridge OBB80/80A/80B Location plan

Overbridges OBB80 and OBB80A are stone masonry arch structures with single 9.1m spans built in the late 1800s as a pair, with an earth embankment between them. The structures are not protected structures; however, they are historic structures which contribute to the character and special interest of the station, and which are protected within the curtilage of the station complex.

OBB80B was constructed in 2003, removing this original embankment, to facilitate access to the train wash. The bridge comprises an 8.2m span, with a reinforced concrete structure supported on piled abutment walls built between OBB80 and OBB80A.

The existing bridges have insufficient clearance to facilitate the overhead wiring required to electrify the line. The bridge location is constrained by the road approaches either side, particularly the approach of Railway Terrace to the south and property boundaries to the eastern approach.



Plate 4-26 Overbridge(s) OBB80 seen from track level (Arup)

In addition to this, the requirements for the train wash, directly to the north of the central span, impose a further constraint on the contact wire heights beneath the bridge, with the need to raise wire heights to achieve safe clearances at the train wash and the maximum wire gradients that can be used.

It is proposed to demolish and replace these bridges (OBB80/80A/80B) with a new higher three-span bridge. (see Image 4-68). The bridge will be 5.8m wide, measured between parapet faces and will have an overall length of approximately 48m. The superstructure will comprise prestressed concrete beams with a cast-in-situ deck slab, and will be made integral with the substructure below, avoiding the need for bearings. The bridge will be supported on piled foundations at each of the piers. The wingwalls on approach to the bridge on either side require retaining walls.

Temporary access will be required to maintain access to the residential properties during construction, this is further detailed in Chapter 5 (Construction Strategy) in Volume 2 of this EIAR.

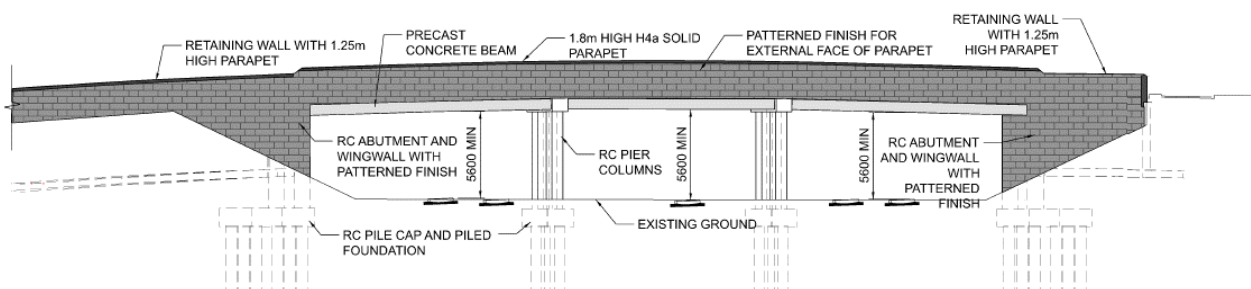


Image 4-68 Elevation of proposed OBB80 replacement bridge

The existing bridge width measures approximately 5.8m between parapets. It is proposed to provide a similar width passage while complying with design standards and catering for pedestrian and cycle passage. Hence, the proposed new bridge cross section provides a 4.8m shared carriageway with a 0.5m raised verge on either side. The new bridge will have raised parapet walls with a minimum height of 1.8m above the adjacent footway. In addition, retaining walls are required at the run-off of each span and either side of the bridge (see Image 4-69). These reinforced concrete walls will run either side of the bridge on the South side of the McGrath's Lane (rail side), and either side of the Railway Terrace on the approach to the bridge. Along the north side of McGraths Lane, an earthworks embankment will support the revised road.

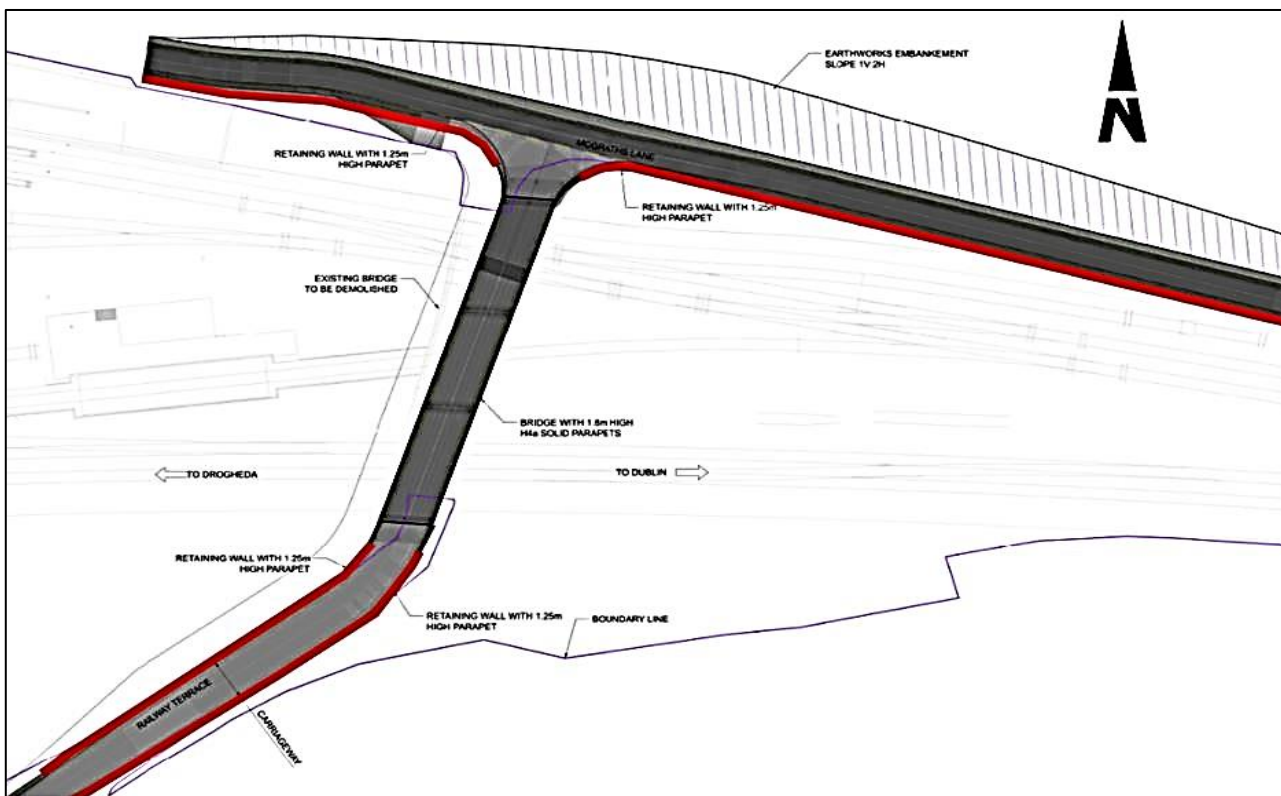


Image 4-69 Overbridge OBB80 Extents of retaining walls (red lines)

To achieve the necessary vertical clearance for the electrification of the track, the level of the new bridge (+37.10mOD) will be set up to 1.2m higher compared to the exiting bridge (+35.93mOD). This will require the approach roads to be re-graded to meet the new bridge levels. Road works to the southern approach will extend approximately 70m to tie in with Railway Terrace, raising the road level at the interface with the bridge 1.17m and increasing the road gradient by 1%. The northern extent of regrade will require roadworks to McGrath's Lane for approximately 160m, with the level of the new road (+36.43mOD) being set 2.75m higher compared to the existing levels (+33.68mOD), located at the interface with the new bridge. To limit the extent of retaining wall structures, an earthworks embankment is proposed to the north. Elsewhere, retaining walls will contain the road approaches. Appropriate landscaping will be provided following the regrading of the road.

4.10.4.2 Overbridge OBB81 Bridge Modifications

The footbridge at Drogheda MacBride Station (IÉ reference OBB81) is located within the confines of Drogheda MacBride Station (approximate chainage 52+540, see Image 4-70). The existing footbridge is a steel girder bridge with a 17m single span, which was constructed in 1953, replacing the original arched iron structure that was built c.1855. The superstructure comprises two steel plated girders supporting a concrete deck slab. The original stairs leading up to this bridge appear to have been retained and extended to form the current bridge arrangement. The bridge provides pedestrian access between Platform 1 and Platforms 2/3, with stairs and lift access at both ends (see).

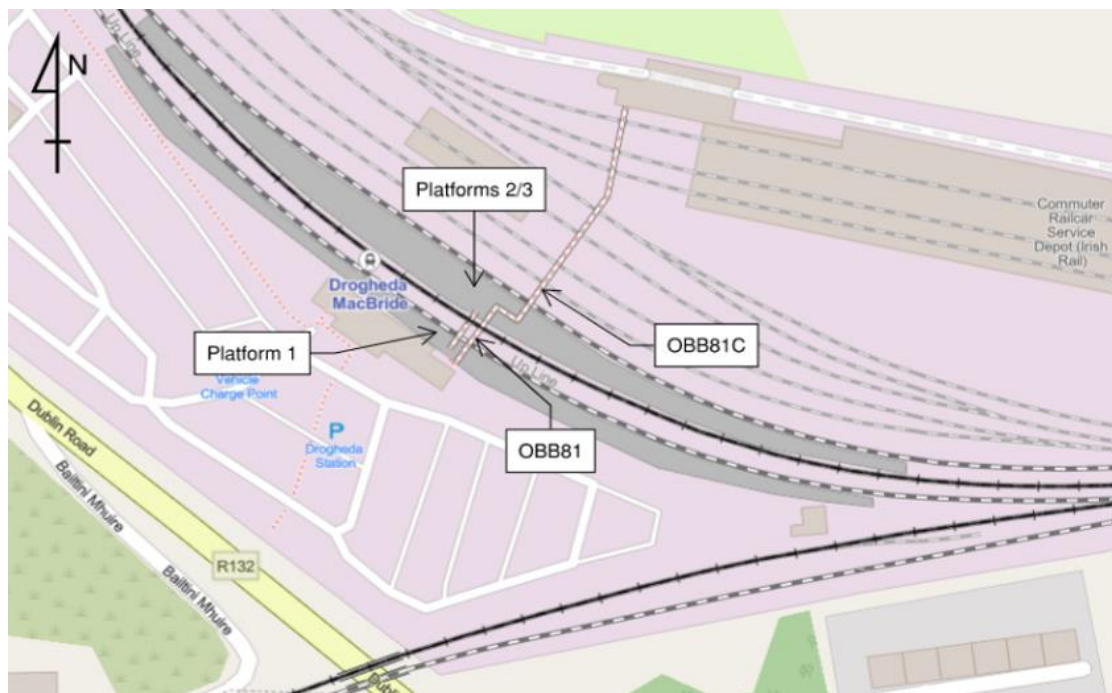


Image 4-70 Overbridge OBB81 (Drogheda Station footbridge) Location plan

The stairs and lift at Platform 2/3 also provide maintenance access to the depot via the extended footbridge (OBB81C). This bridge was constructed in circa 2000 to provide access to the newly built depot building to the north-east of the station. This depot access footbridge (OBB81C) was aligned to utilise the stair and lifts of the station footbridge (OBB81).



Plate 4-27 Footbridge OBB81 (Source: Arup)

The existing footbridge has insufficient vertical clearance to facilitate the overhead wiring required to electrify the line through the station. It is therefore proposed to replace the bridge superstructure with a contemporary stainless steel style bridge. The proposed solution comprises replacing the superstructure with a profiled soffit to provide the additional clearance necessary to accommodate a compliant electrical solution. This will involve lifting out the existing superstructure and replacing it with a new superstructure. The proposal will retain the level of the landings at the top of the stairs and utilise the existing support columns and foundations.

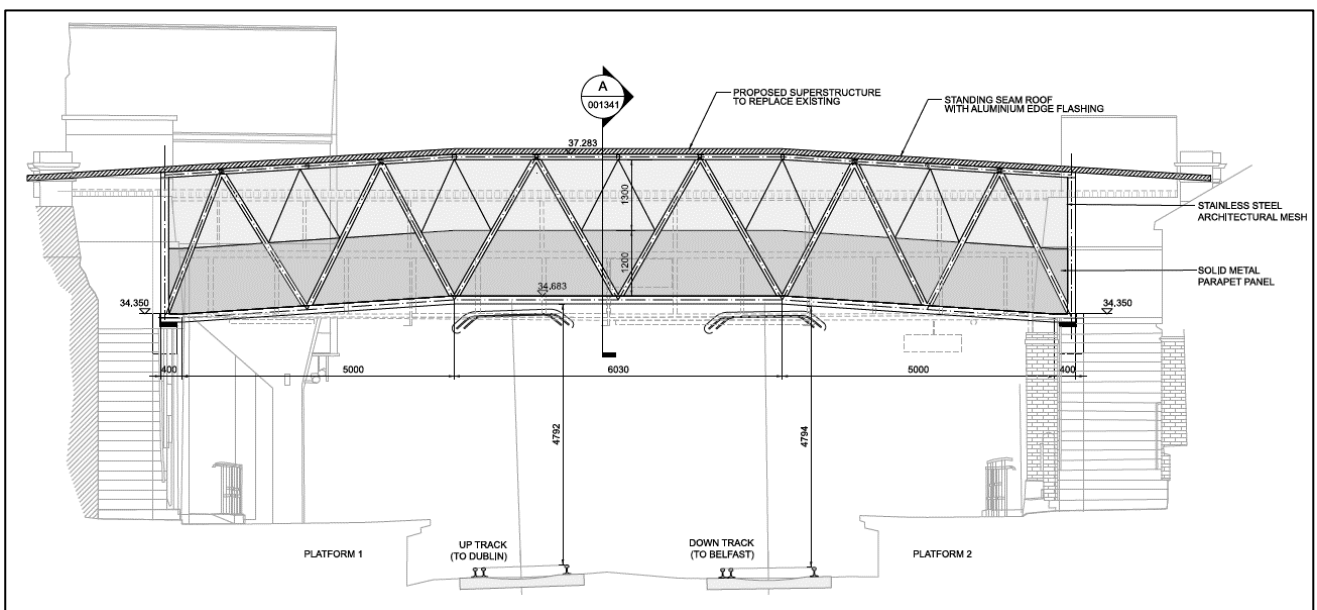


Image 4-71 Elevation of proposed replacement bridge

The proposed bridge superstructure comprises a steel warren truss utilising square hollow sections as the structural members. The floor will comprise a reinforced concrete deck slab, finished with a slip resistant surfacing. To provide the necessary clearance over the railway, the bridge deck will be sloped either side. The inclination of the bridge walkway has been limited to a 1:15 slope for a maximum length of 5m to comply with the accessibility requirements in Part M of the Building Regulations. The height of the new bridge will be raised relative to the existing by approximately 0.8 m overall to ensure safe and compliant pedestrian passage over the electrified lines. The existing substructure supports will be retained; however, some localised modification to the top of the supports will be required to accommodate the new superstructure.

While the bridge itself is not identified as a protected structure, it falls within the curtilage of the station, which is included in the Record of Protected Structures (RPS) in the Louth County Development Plan 2021-2027 (RPS ID DB-055). The existing bridge, though in the curtilage of a protected structure is not in itself of historic or architectural heritage interest so its proposed replacement does not represent a loss of historic fabric. Chapter 21 (Architectural Heritage) in Volume 2 of this EIAR includes the assessment of architectural heritage features potentially impacted by the Proposed Development. There will be no direct impact on the associated historic brick stairs except where previous concrete interventions have been made to the east and top of the steps. The brick structure of the stems will not be impacted by the proposal.

4.10.4.3 Underbridge UBK01 - Bridge Modifications

The Dublin Road underbridge (UBK01) is located to the west of Drogheda MacBride Station. The bridge carries the Drogheda Freight Sidings over the R132 single carriageway below. The existing bridge comprises a single span steel superstructure simply supported on masonry wall abutments. The carriageway below comprises a 1.8m hard strip on the western side, two 3.6m wide traffic lanes and a 1.6m wide raised footpath on the eastern side (including kerb and handrail). The bridge, (see) is signposted with a limited vertical clearance sign of 4.78m. The road slopes down towards the bridge from the south. The railway bridge crosses on a 30-degree skew to the road alignment below.

The original bridge was constructed circa 1850 as part of the construction of the Oldcastle Branch Line (Drogheda Freight Sidings). The current bridge superstructure was constructed in the early 1980s, replacing an older iron superstructure of similar form (plated girders). Following this, the northern bridge beam was replaced in circa 2004 (see). The existing masonry abutment walls date back to the original bridge construction in circa 1850. Whilst these walls are of heritage value, they are not listed as a protected structure in any of the heritage inventories.



Plate 4-28 UBK01 (Dublin Road R132) existing overbridge at track level

The introduction of a new platform to service Drogheda MacBride Station along this extent of the railway line and the resulting slewing of the tracks to the south requires the existing bridge superstructure to be replaced with a wider deck. It is therefore proposed to replace the existing steel superstructure with a wider reinforced concrete deck solution.

The proposed bridge replacement solution is driven by several competing constraints;

- Introduction of a platform;
- Limiting longitudinal gradient for the track and platform (use of 1:120 with approval);
- Maintaining existing headroom to the road below (minimum vertical clearance of 4.78m);
- Spatial offset from the track to the platform edge and bridge girders; and
- A requirement for maintenance walkways and a driver's platform.

The proposed superstructure utilises a precast concrete trough section, with each track supported on an independent deck (i.e., two separate superstructures supporting each railway line). To minimise the structural depth, it is proposed to directly fix the rails to the concrete deck slab (no ballast) and maintain existing clearances to the soffit of the bridge.

The decks span approximately 14m and are supported on unreinforced elastomeric strip bearings at their ends. The rail platform will run parallel to the bridge supported on prestressed concrete beams with a cast in-situ concrete slab on top. The proposed structural arrangement allows for the use of precast structural elements to be lifted into place, increasing the speed of construction and minimising impact on road and rail services. The overall width of the replacement bridge, including the adjacent platform, measures approximately 13.3m.

The existing abutments will need to be widened to accommodate the wider deck structure above. The proposed superstructure will be supported on the existing masonry abutments and on a new concrete abutment extension to the south. The abutment extension will run flush and parallel with the existing masonry abutment so that the existing carriageway width beneath the bridge is maintained. The widened portion of the bridge will be supported on piled foundations. The new extension will be clad in a stone masonry façade to complement the existing abutment.

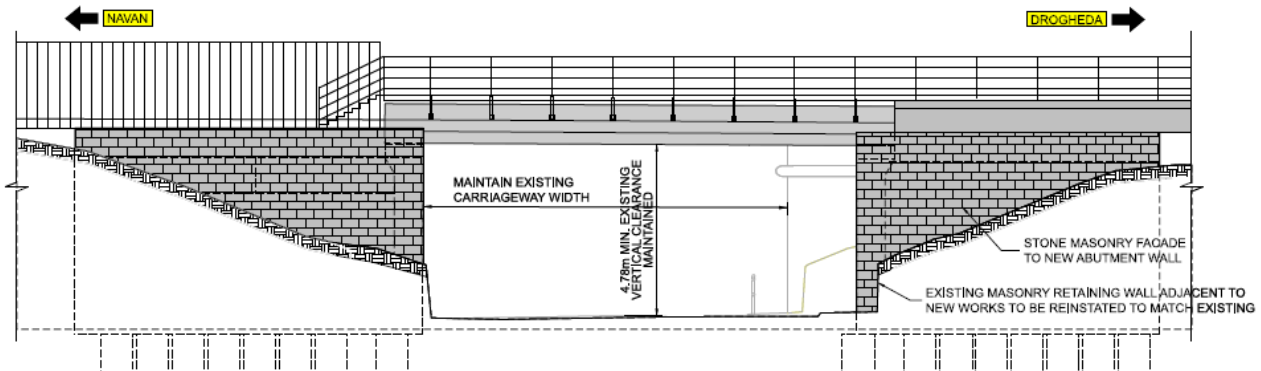


Image 4-72 Elevation of proposed replacement bridge

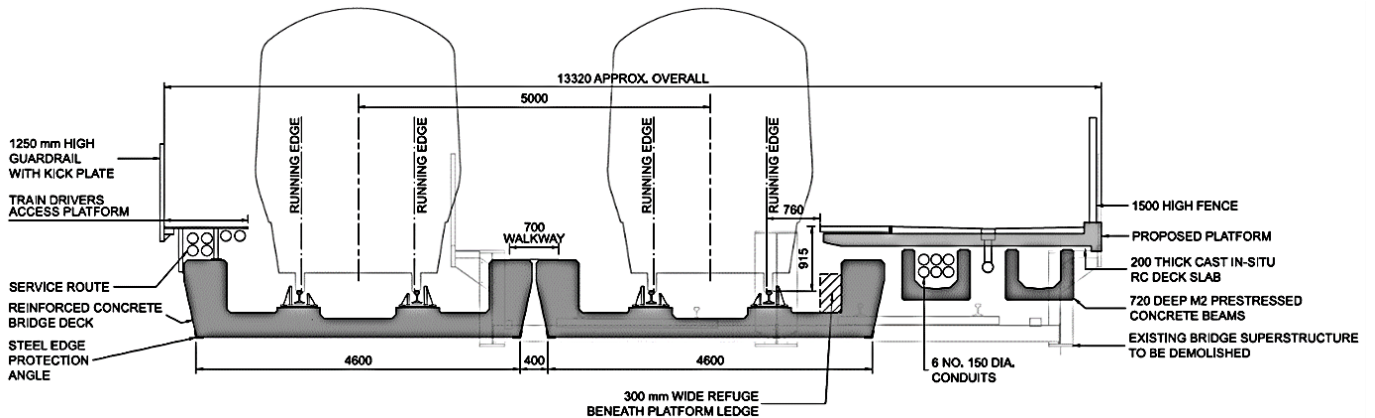


Image 4-73 Cross section of proposed replacement bridge

4.10.4.4 Parapet Modifications

One additional overbridge (OBB81C) within Zone E requires modifications to its parapets to protect users from direct contact with the live OHLE, as detailed in Table 4-15. This overbridge is not a protected structure. Works to the bridge involve replacing the existing mesh with IP2X rated mesh panels.

Table 4-15 Footbridge in Zone E requiring parapet modification.

Bridge Name	Parapet Image	Proposed Modification
OBB81C Drogheda MacBride Station footbridge (staff access to depot building)		Replace existing mesh with IP2X rated mesh panels

4.10.5 Proposed substations and equipment buildings

4.10.5.1 Drogheda Substation

The location of the proposed Drogheda Substation is immediately north of the existing Drogheda Depot and within 0.2km of Drogheda MacBride Station. Access will be provided via a 5m wide road which will connect to the existing Drogheda Depot access road.

The finish proposed for the substation is a cement rendered finish on all elevations with pressed metal roof sheeting, keeping the same architectural finishes as the existing Iarnród Éireann substations. IE green palisade fencing will surround the site providing security, with a planted hedgerow providing screening from the north and west side of the site.

The proposed site location is not within the existing IE property boundary and therefore acquisition of third-party land will be necessary to accommodate the substation. The site is bounded by Drogheda Depot access road to the south and agricultural land to the north, east and west.

The existing terrain is uneven and will require earthworks, including a section of the existing gabion wall (which runs alongside the existing access road at the side of the depot supporting a 2-3m level difference) to be removed, to create an entrance point for the proposed access road. A concrete retaining wall, up to 3.5m in height is proposed to support the terrain between the access road and proposed surface water infiltration pond (soakaway). The substation will sit at a ground level of approximately +33.00mOD with the entrance to the connecting road at a level of approximately +29.70mOD.

An assessment of the soil maps of the area and geotechnical investigations suggest the soils are suitable for infiltration into the sub-soils. The design for surface water drainage therefore proposes that run-off will dissipate through infiltration ponds into the soils below.

A very small area of the site will discharge into the existing surface water drainage present in the depot. There is no new foul drainage proposed for the site, given the proximity of welfare facilities within the current depot.

Lighting for the site will be provided by lighting fixed to the building. This will only be activated when the building is in use.



Image 4-74 Drogheda Substation location

4.10.5.2 Drogheda Signalling Equipment Building

The location of the Drogheda Signalling Equipment Building (SEB) is to the east of the station, off Railway Terrace, adjacent to the over bridge OBB80. The building will be located in a cutting adjacent to the tracks. Access will be off Railway Terrace via a 5m wide road. The finish of the SEB shall be a red brick finish, similar to that of the heritage buildings within the station. The roof shall comprise profiled metal roof sheeting. The location sits within current Irish Rail land. The land currently comprises woodland and scrubland within a cutting.

4.10.5.3 Drogheda Telecoms Equipment Building

Drogheda Telecoms Equipment Building (TER) is proposed to be located within the existing Drogheda Station car park. It will be located to the north of the car park adjacent to the rear of Platform 1. The finish of the TER shall be a red brick finish, similar to that of the heritage buildings within the station. The roof shall comprise profiled metal roof sheeting. There will be bollards to the front of the building to provide a safe walkway from passing vehicles.

4.10.6 Drogheda MacBride Depot

Drogheda MacBride Depot is located to the north-east of the station buildings. Lying directly to the north-west of the depot is the Boyne Viaduct (Underbridge UBB82) which creates a constraint to the overall curved layout of the track and depot in this area. Road access to the depot is through the road underpass at the northern end of the depot. A secondary access, restricted in width is provided to the depot over Railway terrace / McGrath's Lane Bridge (OBB80/80A/80B). Pedestrian access is available to the depot buildings from the station via the pedestrian overbridge (OBB81).

Rail access to the depot is via one of the two mainline connections directly to the south-east of the station.

4.10.6.1 Proposed Depot Modifications

The significant modifications proposed within the depot site include:

- Additional Stabling lines 7A & 7B including provision for driver walkways and train cleaning;
- Modifications to the Under Train (Frame) Cleaning facility;
- Maintenance Building Door Modifications; and
- OHLE Fixings within and on the Maintenance Building.

4.10.6.1.1 Additional sidings on Lines 7A & 7B

To make space for an additional siding, it is proposed to realign and move existing siding 7A to create sufficient space for a new stabling siding 7B. The new siding will be constructed with enough length to accommodate the full-length trains and will be located in the area alongside the existing train shed currently occupied by a large earth bund.

The earth bund alongside the depot train shed is believed to have originated from the construction of the railway line and associated depot excavations. The proposed works will require excavations and regrading of the earth bund, reducing the height of the bund up to 1.5m, to accommodate the additional space required for two new stabling roads with associated provision for train drivers' walkways, lighting, water, and power supply points. The reprofiled bund will be replanted.

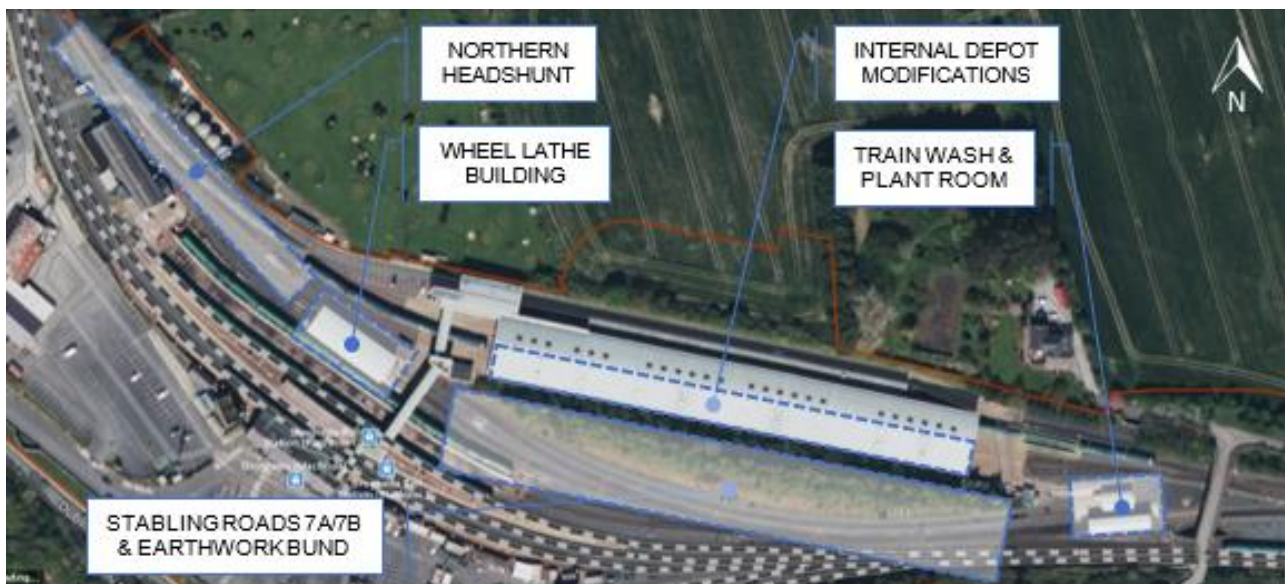


Image 4-75 Proposed locations of external civils works

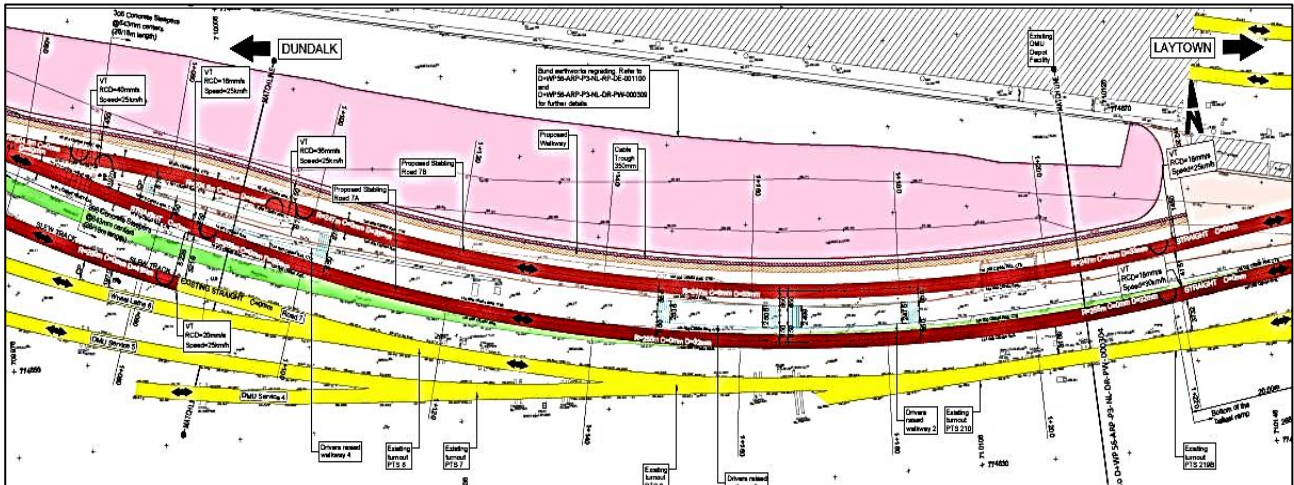


Image 4-76 Proposed new sidings 7A & 7B (red lines)

4.10.6.1.2 Modifications to the Under Train (Frame) Cleaning facility

The Under Frame Cleaning (UFC) facility (see existing in), is located next to the Heavy Maintenance track, adjacent to the maintenance building, at the north end of the Light Maintenance roads. The UFC facility is used to deep clean the underside of trains due to build-up of oils, grease, or bio-hazard waste. Modifications are required to the UFC to make it safe to operate in an electrified depot. This will require minor works such as the inclusion of protective screens.



Plate 4-29 Existing UFC facility

4.10.6.1.1 Maintenance Building Door Modifications

The existing roller doors located on the south end of the train maintenance shed do not allow access for the OHLE wires to enter the building whilst in the closed position. As a solution, bi-folding doors are proposed that have a notch in them to form an opening for the OHLE wires to pass through them in the open and closed positions.

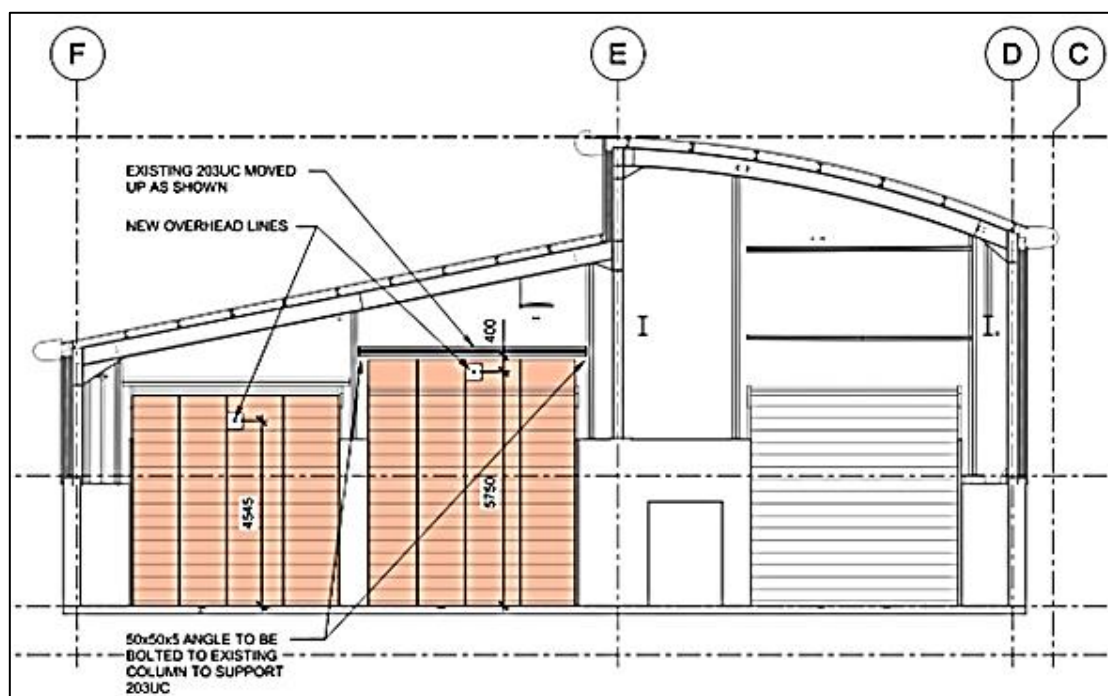


Image 4-77 Proposed bi-fold doors Drogheda train shed

4.10.6.1.2 OHLE Fixings within and on the maintenance building

To electrify the train shed maintenance building it is necessary to modify the internal arrangements with the building and make provision for overhead cabling. To that end, contact wire will be installed and supported from a series of vertical hangers (Droppers). Additional associated electrification equipment will also be installed such as electrical contact wires and electrical terminations fixed by anchor plates externally to the building façade.

4.11 DART+ Coastal North Operational Railway Characteristics

With the implementation of the DART+ Coastal North project, as well as the introduction of the new fleet being procured as part of the DART+ Programme, it will be possible for IÉ, to increase both the capacity and frequency of its service on the Northern Line between Dublin and Drogheda, inclusive of the Howth Branch line. The railway line along this route will be a fully electrified railway, capable of carrying additional traffic, modified with new track infrastructure to allow for increased levels of operational flexibility. The existing depots will be modernised such that there is increased capacity for servicing and stabling of the enlarged train fleet.

An enhanced level of maintenance is essential to operate a safe and reliable train service on the DART+ Coastal North railway. The following sections describe the Proposed Development in the operational phase, following completion of the Proposed Development.

4.11.1 Operational Railway System

The operational railway in the DART+ Coastal North area will consist of new Electric Multiple Units (EMUs) interspersed by the Dublin-Belfast and Dublin-Dundalk services (Diesel, hybrid, or battery-electric trains). The new fleet will operate either as FLUs (Full length units or 10-car trains) with a length of 168m or during lower demand hours, as HLUs (Half Length Unit or 5-car trains).

The EMU train fleet will continue to be stabled, serviced, and maintained at Fairview and Drogheda depots within the enhanced servicing facilities.

4.11.1.1 Operating Pattern and Indicative Train Service Specification

Operational analysis has been carried out for the DART+ Programme. In general, it is assumed that commercial (passenger) services start at approximately 06:00 (some exceptions apply for trains from more distant stations to arrive in Dublin city centre before 07:00) and finish between 24:00 and 01:00. Technical runs, related to morning deployment from depots or stabling locations start at 04:30 (Maynooth line) or 05:00 (other lines). Passenger train services cease generally around 01:00 to allow for overnight maintenance and servicing of railway infrastructure.

Based on IÉ requirements, modelling was carried out for different options of train service specifications. The baseline scenario, preferred by IÉ, provides for an increased number of trains on each of the lines leading to the city centre area. On several lines, multiple services operate with both DART trains and commuter/long-distance services sharing the same lines.

The Train Service Specification (TSS) calls for increased service frequencies that are the same in both directions on the DART+ Coastal Northern Line. Where there are existing DART services, nine DART services will operate in each direction to Clongriffin, with seven in each direction continuing to Malahide. In peak hours, five DART services in each direction will extend north from the current terminus at Malahide to Drogheda MacBride Station. These will be accompanied by two DMU (Diesel Multiple Unit) commuter services per hour from Dublin Connolly to Dundalk in each direction, stopping at all stations. During the peak period the TSS accommodates a further one intercity Enterprise service in each direction per hour between Dublin Connolly and Belfast, stopping only at Drogheda MacBride and Dundalk stations between Dublin and the border.

Proposed changes to the Howth Branch line, as defined in the TSS, would enable a direct line service between Howth and Dublin City Centre and / or a DART shuttle service between Howth Junction and Donaghmede and Howth stations. This removal of crossing conflicts will enable an increased capacity and frequency of service to and from Howth, from the current three services an hour to a maximum of six services an hour during peak periods. Any future DART shuttle service on the Howth Branch line would also enable improvements in the reliability of timetabling, as trains operating on this branch would no longer be susceptible to delays occurring along the Northern Line. Image 4-78 illustrates the proposed increased level of train service pattern, and Table 4-16 presents the difference between the current number of trains and the future maximum number of trains that will run during the peak period in each zone.

Table 4-16 Future (Post BEMU) number of trains per hour.

Name	Number of trains per hour (Post BEMU)		Maximum number of trains after peak hour
Direction	To Connolly (southbound)	From Connolly (northbound)	In each direction
Zone A	9	9	12
Zone B	6	6	10
Zone B (Howth Branch)	3	3	6
Zone C	3	3	8
Zone D	3	3	8
Zone E Drogheda	3	3	8

Overall increases are inclusive of DART, Commuter and Enterprise services and comparisons are based on service level post-BEMU (as opposed to the current service level).

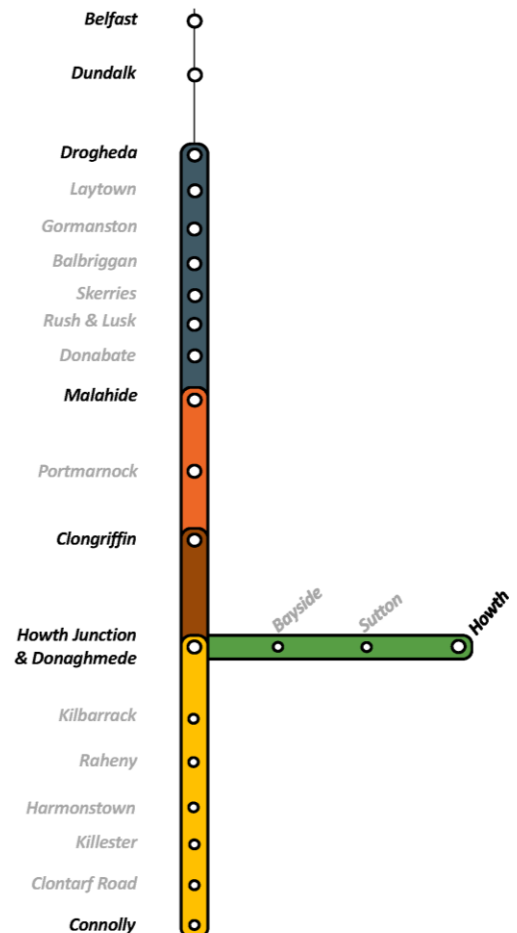
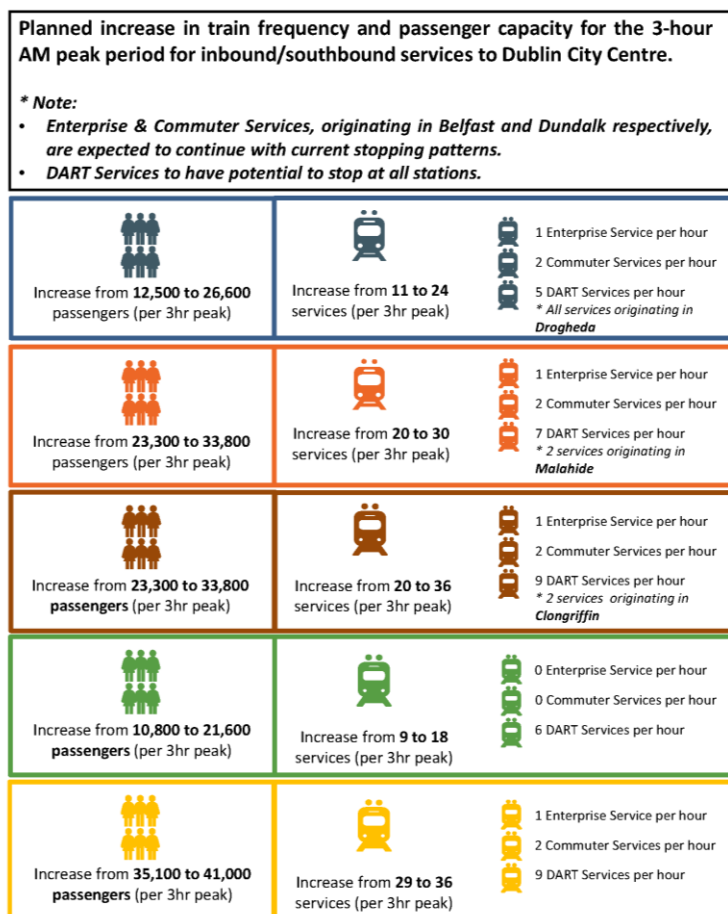


Image 4-78 Proposed Service Capacity Increased during AM Peak Period (Train Service Specification)

4.12 Maintenance Works

The DART and suburban rail routes provide essential transport services to Dublin City and the Greater Dublin Area 7 days a week between approximately 06:00 am and 00:30 am.

The railway infrastructure, the tracks and OHLE, require regular maintenance during night-time when the railway services are not in operation. These maintenance works generate noise that must be mitigated and monitored. A detailed noise and vibration impact assessment has been undertaken to assess potential operational effects of the Proposed Development and is presented in Chapter 14 Noise and Vibration.

The DART+ Coastal North project does not involve substantial changes to existing track maintenance regimes, although extending the electrification of the line and operating a more intensive train service will require additional maintenance activity in the longer term.

4.12.1 OHLE Maintenance

OHLE maintenance activities typically need to be undertaken during night-time and weekend non-operational periods unless the equipment requires urgent attention. The maintenance vehicles to be used are similar to those used for construction, using specialised vehicles operating from the nearest maintenance compound.

The maintenance vehicles are multipurpose, self-propelled, rail mounted vehicles designed for OHLE maintenance, using special tools installed onboard.

As a reference for the frequency of the OHLE maintenance, the current maintenance works on the existing electrified line are carried out 4 times each year, working 6 nights of the week.

4.12.2 Preventative Rail Maintenance

The key maintenance operations that are most frequently performed on ballasted lines are:

- Alignment and levelling of tracks performed by ballast tamping machines. This task is considered corrective maintenance work, therefore is not scheduled maintenance as it depends on the condition of the track. This maintenance task is carried out whenever a track defect is detected (poor horizontal line, incorrect cross-level, poor vertical line, or dipped joints) during the periodic inspections; and
- Track tamping. The process of repacking the ballast under the bearing areas of sleepers, using a track-mounted machine fitted with vibrating tines. Ballast tampers perform this maintenance activity. The frequency of this maintenance task depends on the maintenance strategy. Typically tamping works on the main lines are carried out approximately every 4-5 years.

In addition to the tasks mentioned above, several other routine inspection and maintenance tasks are to be carried out on the tracks, as detailed below.

4.12.2.1 Visual inspections

The track layout must be inspected to detect and control a series of parameters relating to the wear of the track, the condition of the rail, geometry of the track, rail fastening and welding, among others.

These inspections are driven by established standards and have a mandated frequency that guarantees the correct durability of the track system according to its service life. These periodic inspections are conducted on a frequency which may be monthly, quarterly, or at even shorter intervals.

4.12.2.2 Track geometry inspection

Maintaining the track geometry is an essential task which informs other maintenance activities. Dedicated track inspection vehicles inspect the track at night-time when there is no railway traffic to monitor and record track quality data. This is completed on a frequency according to track speed and condition, and on a minimum annual inspection.

4.12.2.3 Ballast track reprofiling

The ballasted track is re-profiled on a regular basis to ensure it provides continuous support to the track, achieved by redistributing the ballast under the sleepers. A tamper-levelling machine carries out this operation. The frequency of this task varies depending on the maintenance plan but can be considered roughly every two years depending on the status of the track system.

4.12.2.4 Points and crossing tamping

Track stability is maintained by tamping and packing of the ballast under the sleepers which support the railway Points and Crossings. This is a regular planned maintenance activity based upon condition monitoring and track quality recording.

4.12.2.5 Ballast track replacement

Ballast track replacement (complete replacement of existing ballast) is carried out every 20-25 years. A ballast cleaning machine removes the ballast, ballast cars/hoppers lay the new ballast on the tracks and a tamper-levelling machine levels the tracks.

4.12.2.6 Rail and manhole cleanliness

Visual track inspections present a good opportunity to open and inspect the track drainage system and check on condition. These activities are completed by a team of two people walking along the network, using hand tools to lift manholes.

4.12.3 Corrective maintenance

Corrective maintenance is an unplanned response to a sudden component failure or imminent failure, and an unsafe condition to the operational services. Once detected, the defects will be immediately corrected by means of a responsive maintenance team and equipment deployment to site.

4.12.4 Maintenance machinery

There is a range of specialised machinery used in the maintenance of the railway network from large scale track relaying trains down to spot sleeper changing machines. The commonly used machines are:

- Tamper – for lifting track to levels and re-packing ballast;
- Liner – for slewing track to a design alignment, this activity is often combined with the tamper;

- Ballast regulator – for distributing and shaping the ballast profile along the track; and
- Dynamic track stabiliser – for consolidating bottom ballast prior to a final tamp to level.

There are also a number of other road-rail machines used to complete maintenance tasks, including excavators, dozers, elevating platforms, load carriers, personnel carriers which can operate both on the road and on the rails.

4.12.5 Substations and technical building maintenance

Substations are generally unattended buildings, which are managed and controlled from a remote-control centre. They require no permanent staff to operate equipment within the buildings and are inspected and routine maintenance is carried out periodically or in response to a corrective maintenance task.

The substation preventive maintenance will be based on a maintenance strategy and scheduled maintenance of electrical equipment. For preventive maintenance, this is planned for twice a year, and during these works, the largest expected vehicle utilised is a truck.

In the case of an unforeseen incident or malfunction, IÉ and ESB will require 24/7 unimpeded access so that maintenance staff can reach the substation and repair any issue that might arise. Consequently, corrective maintenance teams may arrive with a car, pick-up or truck at any hour of the day.

4.12.6 Noise management

IÉ Strategic Noise Maps are provided for public access in accordance with the legislative requirements of the Environmental Noise Regulations 2018 (S.I. No. 549 of 2018).

The strategic noise maps graphically display the exposure of the receiving environment to noise generated by annualised daily train movements along defined sections of the Iarnród Éireann network.

IÉ's maintenance works have stipulated a system for noise management:

- Noise Management Plan: before maintenance activities are done, a Noise Management Plan assesses the activities to be carried out and the potential sources of noise. Noise mitigation measures are proposed to be integrated into the works method statements and included in briefings to internal and contract staff for the duration of the works;
- Noise monitoring surveys: continuous noise monitoring surveys are conducted, especially when maintenance works are carried out in noise-sensitive residential areas; and

Environmental Noise Monitoring reports have been produced which provide baseline environmental noise data and maintenance phase noise data.

4.13 References

British Standard (BS) (2017). BS 1722-14:2017. Fences Part 14: Specification for Open mesh steel panels.

Department of Transport (DoT) (2013). The Design Manual for Urban Roads and Streets (DMURS). (DoT). The Traffic Signs Manual (TSM).

Government of Ireland (2010). Building Regulation 2010 – Technical Guidance Documents.

National Transport Authority (NTA) (2013). The National Cycle Manual (NCM).

Uisce Éireann (2020a). Irish Water Code of Practice for Water Infrastructure.

Uisce Éireann (2020b). Irish Water Code of Practice for Wastewater Infrastructure.