Chapter 5
Construction Strategy

CONTENTS

5. CONSTRUCTION STRATEGY

5.1 Introduction

This chapter describes the construction programme, phasing, and methodology for the proposed DART+ Coastal North project, referred to hereafter as 'the Proposed Development.' This chapter should be read in conjunction with Chapter 4 (Description of the Proposed Development), in Volume 2 of this EIAR, which gives a detailed description of the Proposed Development and with the technical design drawings and figures included in Volume 3A of this Environmental Impact Assessment Report (EIAR).

This chapter details the activities required for the construction of the Proposed Development. It follows a similar structure to that of Chapter 4 (Description of the Proposed Development), which described the Proposed Development from south to north in five geographical zones as set out in Table 5-1 and Image 5-1. For ease of reference, throughout the chapter north is to the top of all images unless otherwise stated. To avoid repetition, works required across the entirety of the Proposed Development (general linear works) are described first in Section 5.3.

Table 5-1 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

The chapter is structured as follows:

- The construction programme and phasing of works;
- Description of general linear works and associated construction methodologies;
- Description of construction methodologies in specific zones; and
- An overview of Appendix A5.1 – Construction Environmental Management Plan (CEMP).

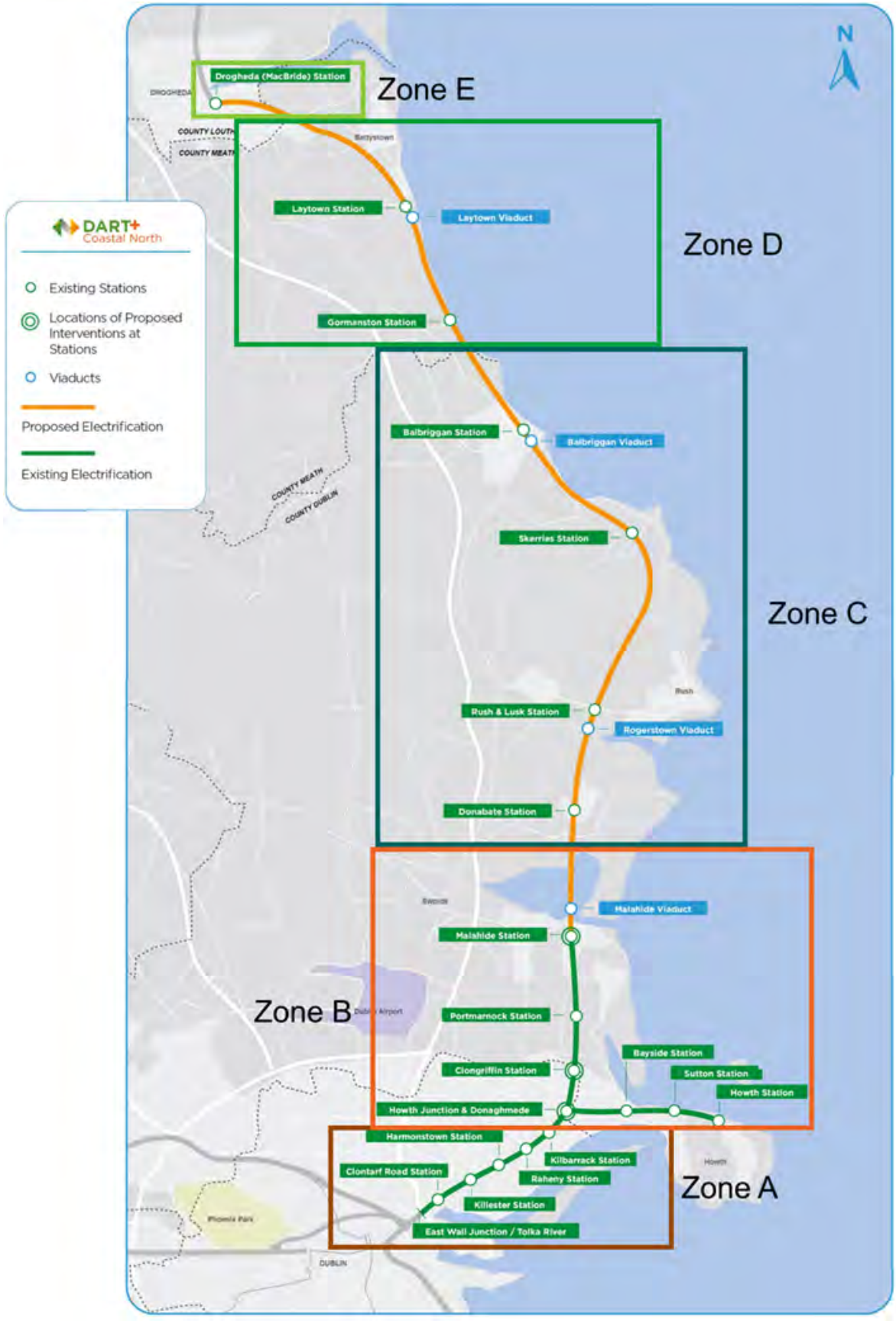

Image 5-1 DART+ Coastal North geographical zones

5.1.1 Key Construction Activities

Construction activities are required along the length of the Proposed Development. The key activities in each zone are presented in Table 5-2.

Table 5-2 Key Activities in each construction zone

Zone	Activity
Zone A	This zone from north of Connolly Station to south of Howth Junction & Donaghmede Station includes the following works: • Minor upgrades and internal modifications to Fairview Depot and sidings; and New drainage connection to combined sewer on Alfie Byrne Road.
Zone B	• This zone from south of Howth Junction & Donaghmede Station to north of Malahide Viaduct (including Howth Branch) includes the following works: • 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 a 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	The zone from the north of Malahide viaduct to south of Gormanston Station (Fingal boundary) includes the following works: • 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: o OBB32A (carrying the Donabate Distributor Road), o OBB35 (access to Beaverstown Golf Club), o OBB38 (carrying Rogerstown Lane), o OBB41 (carrying local road in Rathartan),

Zone	Activity
	o OBB46 (carrying the L1285 / Baldongan Close), o OBB47 (historic access to Skerries Golf Club), o OBB49 (carrying Golf Links Road), o OBB55 (carrying Lawless Terrace / R127) and o OBB68 (local access adjacent Gormanston Camp). • Pedestrian footbridge parapet modifications for compliant safety standards to: o OBB33A (Donabate Station footbridge), o OBB38A (Rush & Lusk Station footbridge), o OBB51A (Skerries Station footbridge), o OBB54 (The Ladies Stairs) and o 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	The zone south of Gormanston Station (Fingal border) to Louth/Meath border includes the following works: • 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: o OBB68 (Irishtown) o OBB77 (Colpe East), and o OBB78 (carrying Colpe Road), • Pedestrian footbridge parapet modifications for compliant safety standards to: o OBB74A (Laytown Station footbridge), and • Utility diversions.
Zone E	Drogheda MacBride Station and surrounds includes the following works: • 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; • Reprofiling 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.

5.1.2 Sustainable Construction Principles

Iarnród Éireann (IÉ) is committed to contributing to the achievement of the United Nations Sustainable Development Goals (UN SDGs) and together with the Córas Iompair Éireann (CIÉ) Group of Companies has developed a Sustainability Strategy that coordinates actions that assist in addressing national economic, social, and environmental challenges.

The key themes used as a focus while designing the project include an endeavour to:

- Avoid, or at least mitigate, all adverse effects on communities during the construction of the project.
- Reduce the carbon footprint of the project during the design, construction, and operation stages (an example being to encourage more sustainable transport modes)
- Provide support for cleaner energy and lower emissions, for example by encouraging the use of electrically powered construction plant
- Facilitate sustainable development growth, with a reduced yet resilient carbon climate economy
- Design for resilience against future demand changes and climate needs; and
- Minimise waste during construction of the project, for example by focusing on using sustainable and reusable materials and construction methods.

These key themes will be considered over the full duration of the construction of the project using the following enabling measures:

- Ensuring a clear plan detailing goals related to each stage of the construction process beginning from the development stage and ending at the maintenance and ultimately, a renewal stage;
- Ensuring that sustainability precedes the construction process during the procurement process and the partners associated with that stage;
- Allowing and encouraging innovation during the construction process and ensuring sustainable measures are safely and efficiently implemented in the later stages of the project; and
- Working with local communities and publicly sharing information regarding the project's sustainability measures while remaining open to accepting and implementing feedback.

Environmental mitigation measures relevant to the construction stage have been identified by the specialist assessments within this EIAR. These include broad measures across the length of the project as well as more specific measures of relevance to particular locations. These measures have been included in the CEMP, see Appendix A5.1 in Volume 4 of this EIAR, and within specialist assessment chapters within Volume 2 of this EIAR. The Contractor(s) when appointed, will be required to further develop, and implement the CEMP to ensure that the works are carried out in accordance with the specified mitigation measures and with minimal impact on the environment.

5.2 Construction Programme

5.2.1 General

The overall construction phase of the Proposed Development is anticipated to be approximately 36 months. This construction programme has considered both efficiency in terms of phasing and duration as well as any measures needed to reduce the potential for environmental impacts.

A high-level indicative construction programme is set out in Image 5-2 identifying the key construction phases and the duration of same over the construction period. It is noted that the period allowed for testing and commissioning also includes sufficient time for decommissioning of redundant assets, other than those decommissioned at the start of the project.

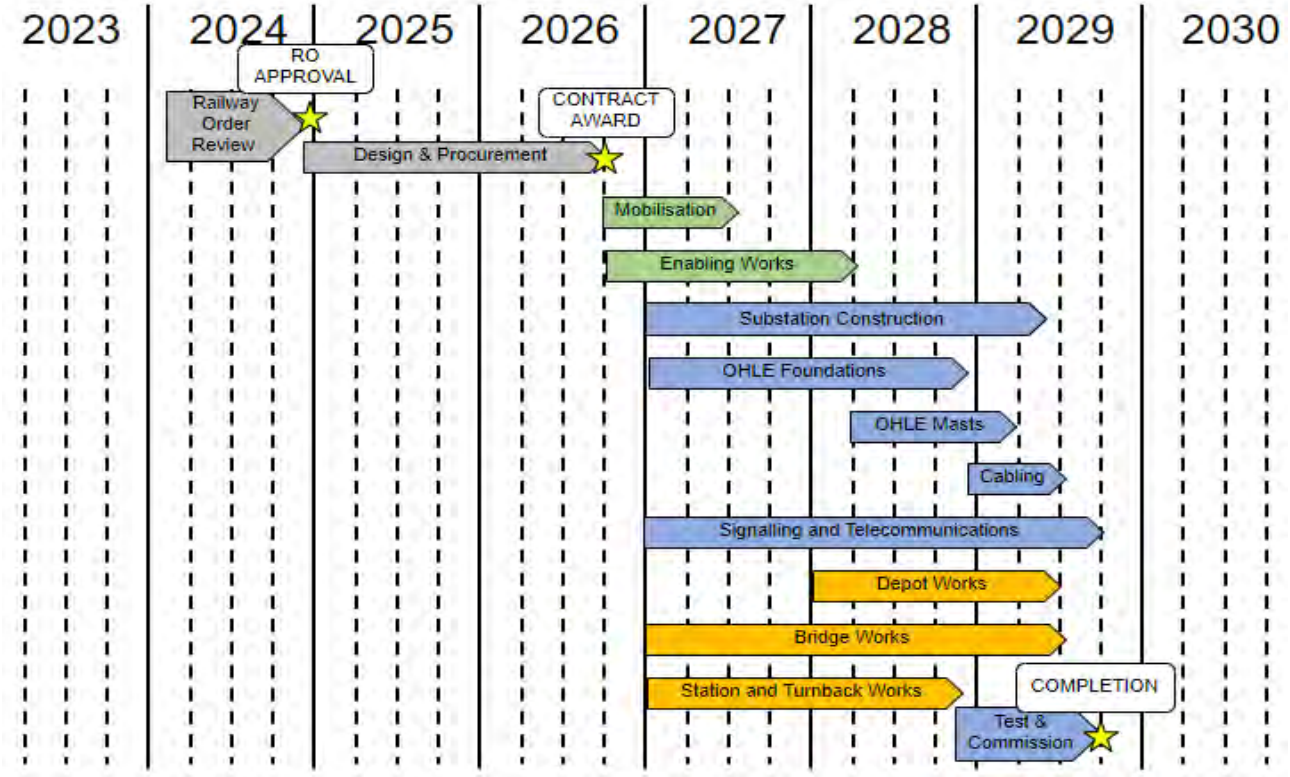

Image 5-2 High-Level Construction Programme

5.2.2 Construction working hours

A key consideration in the design of the construction strategy and programme is the requirement to reduce the impact, on the operation of the railway line during construction and hence, to maintain rail services for passengers. The construction works range from those that are located outside of the railway boundary (thus, having no impact or minimal impact on train operations) to those that would require a temporary closure of a section of railway line (normally during night-time or weekends (termed night-time or weekend track possessions) to allow construction to proceed while limiting the impact on rail services.

The general construction hours proposed for the project, particularly for works away from the immediate vicinity of railway line (these typically needing track closures) are:

- Monday to Friday 07:00 to 19:00 (12 hours)
- Saturday 08:00 to 14:00 (6 hours)
- Sunday Only when agreed in advance with the local authority and IÉ.

Where required, track possession times vary across the route. The times listed below are indicative and are likely to be utilised to a greater or lesser degree depending on likely disruption of railway operations. Non-disruptive track possessions are those possessions which occur outside of the general operational timetable for the railway line, whereas disruptive possessions refer to those track possessions where normal railway operations are disrupted.

Any proposed track possession periods will be finalised when detailed design and detailed construction planning is undertaken. For the purposes of the EIAR a reasonable worse case has been assumed here and for the assessments undertaken in Chapters 6 to 27 in Volume 2 of this EIAR. In general, night-time possessions will be utilised, but is anticipated that a number of daytime and weekend possessions will also be required, to accommodate the construction works. These possessions will be planned with other railway works and peak railway user demand periods in mind. Specific possession hours would be advised nearer the start of construction however, possible types of track possessions are noted in Table 5-3.

Table 5-3 Possession Types and Durations

Possession Type	Duration / Timings
Non-disruptive Weekday night	4 hours / 01:00 to 05:00
Non-disruptive Saturday night	6 hours / 01:00 to 07:00
Disruptive Extended Saturday night	10-12 hours
Disruptive Long Weekend (October and Easter)	3-4 days, twice per year
Disruptive Full weekend (anticipated rarely)	52 hours / Saturday morning at 01:00 to Monday morning at 05:00
Disruptive Bank Holiday weekend (anticipated rarely except October and Easter)	72-76 hours / for example Saturday morning at 01:00 to Tuesday morning at 05:00

There are a number of temporary Construction Compounds identified for the Proposed Development. Given that some works need to be undertaken when the railway is closed to train services, these Construction Compounds will often need to be active at night and at weekends. At these times, contractors would be marshalling construction plant and materials via the Construction Compounds, involving both road and rail vehicles. Many deliveries to the compounds can be made during daytime hours, to reduce disturbance at night for the local community and this will be planned and implemented wherever possible during the construction works. Wherever practicable, measures will be taken to minimise impacts in the vicinity of Construction Compounds during night-time works. For example, where night time concrete operations are required, a contractor might obtain their concrete from a local concrete batching plant, or batch it themselves, drive it to a trackside compound, transfer the wet concrete to a suitable vehicle (e.g., RRV dumper) and then transport it along the railway.

5.2.3 Indicative Durations of Key Construction Activities

The likely durations and activities associated with linear elements of the main works are summarised and described in this section. These durations are indicative only with final durations dependent upon local site constraints, availability of resources and the eventual sequence of works chosen by the appointed Contractor.

A summary of the main activities and their durations are shown in Image 5-2 above.

5.2.3.1 Enabling Works

Enabling works are those works on site that are required to enable other works to commence. They would include (but are not limited to) utility diversions, cable management, vegetation clearance, formation of temporary Construction Compounds and formation of construction access tracks.

It is anticipated that the duration of key enabling works activities would be in the region of:

- Utility diversions 18 months
- Cable Management 18 months
- Vegetation removal 18 months
- Construction Compound establishment 6 months

Utility diversions would include overhead power lines, as well as underground pipes and cables. Communication with utility providers and local authorities, as well as non-intrusive surveys to inform the proposed diversion works, would also be carried out during the enabling works.

5.2.3.2 Track lowering works

Track lowering is required in four locations, to provide the required clearance for OHLE at relevant structures. These track lowering works, given their nature, will need to be carried out during track possession periods, which could include either weekend possessions or, potentially, extended Saturday night possessions.

It is proposed to lower one track at a time so that the remaining track can be utilised for the movement of materials to and from the site. Each (single) track can only be lowered by a maximum depth of 30-40cm at a time so that the other track remains on stable footing. If a track section is required to be lowered more than 30-40cm then the track lowering works would take place over multiple track possession periods, alternating between lowering one track then the other track until the required lowering depth has been achieved. Each location is anticipated to be worked upon over a small number of weeks with the overall period potentially extending to about two years depending upon availability of track possessions and fitting in around other works needing track possessions.

5.2.3.3 New track installation

New tracks are required at locations across the Proposed Development, including for the turnbacks at Drogheda, Malahide, Clongriffin and Howth Junction & Donaghmede Station. The locations and details of these new track works are described in Chapter 4 (Description of the Proposed Development) and their construction methodology is described in Section 5.3.5.

5.2.3.4 OHLE installation

As part of the Proposed Development approximately 1,800 OHLE masts are to be installed between Malahide and Drogheda. These require foundations, which will likely be formed by a bored pile and pile cap solution. At locations where ground conditions allow, ground bearing pad foundations may also be used. The masts and cabling would then subsequently be installed, the methodology for which is covered in Section 5.3.8.

Where OHLE foundations are to be piled, as a conservative assumption, the construction programme has included a typical allowance for the installation of (typically) one pile per night. A total of four work fronts (locations) will carry out this work concurrently across the railway to maximise efficiency and the work will be carried out during non-disruptive night-time possessions (i.e., outside of normal railway operations). Pile caps would then follow, on a rolling basis, also during non-disruptive night-time possessions. Overall, OHLE foundation works are scheduled to take approximately two years to complete. Masts and small parts steelwork would then be installed, also on a rolling basis, followed by the stringing of cables.

Approximately one third of OHLE foundations are expected to require a rotary percussive piling technique, using track mounted Road Rail Vehicle (RRV) plant with “Down the hole hammer” (DTHH) piling capability. The remainder are expected to be bored piles using a more traditional rotary piling technique. Whilst most piles are planned to be completed in a standard four to six hour night time possession, allowance has been made for some piles to be installed during disruptive daytime track possessions, with these anticipated to be over a small number of weekends. It is anticipated that these weekend piling works will be utilised where ground conditions preclude other foundation materials (i.e., shallow rock, high strength strata or strata containing boulders) and in close proximity to residential areas. If required, it may be possible to utilise a double track cantilever design across both tracks, such that there will be a requirement for a foundation on only one side of the track (albeit probably larger foundation) subject to suitable ground conditions.

5.2.3.5 Substation construction durations

Eight new substations are required for the electrification works at various locations within the Proposed Development area, as described in Chapter 4 (Description of the Proposed Development). The Construction Phase works associated with the individual substations are described in more detail in the relevant zone in Sections 5.4 to 5.8 The construction of all substations will take place over approximately a two-year period (including enabling works), comprising the following (overlapping) periods for each site:

- Enabling works: 3 months (varies)
- Civil works and architecture: 3 months
- Equipment installation, cabling and connections: 3 months

5.2.3.6 Signalling systems construction durations

New signalling systems are required to support the Proposed Development. The specific items required are described in Chapter 4 (Description of the Proposed Development). The construction methodology for these signalling works is described in Section 5.3.9.1. Approximate durations for the works are as follows (overlapping periods):

- Stage 1 – New signalling equipment installation: 9 months

- Stage 2 – Installation of new interlocking: 15 months
- Stage 3 – Commissioning of new signalling system: 9 months
- Stage 4 – Old system commissioning and recoveries: 9 months
- Stage 5 – Adaptation of new system to final track configuration: 3 months

5.2.3.7 Railway fencing installation

The installation period for fencing works associated with the Proposed Development is approximately six months.

5.2.4 Construction Programme Assumptions

The construction programme is based on the following assumptions:

- There will be periods when the railway line will need to be closed to undertake works, typically at night but occasionally daytime also. This will be kept to a reasonable minimum. For further details see Section 5.2.1.
- Access to all required land to undertake the works will be provided after consultation with relevant stakeholders.
- Works have been planned so that all parties remain as safe as reasonably possible, with appropriate safe working zones set up.
- Works have been planned to mitigate disruption to road users, cyclists, pedestrians, and rail users. Temporary reductions in local road capacity will be controlled through a Construction Traffic Management Plan. An estimate has been made for traffic volumes based on one or two HGVs per hour on smaller sites up to six HGVs on larger sites with more significant works, such as those with major earthworks or servicing line-wide works.
- A desktop study has been undertaken to identify if major modifications are required to the road network to enable access for deliveries and none were identified. Where there are restrictions alternative access routes are suggested.
- With reference to the ground conditions present in Chapter 9 (Land and Soils), pile lengths in the range of 5m to 12m have been considered for the Proposed Development. Increased pile lengths up to 18m have been considered at the Malahide turnback, given the ground conditions in this area.
- Works can be done outside of any seasonal constraints (i.e., winter birds/nesting seasons), for example.

5.2.5 Construction Programme Constraints

There are several constraints which have the potential to affect the construction programme. Key among these are construction working hours, as defined in Section 5.2.2, as well as the availability of railway track possessions.

Other significant aspects of the construction programme which have been considered include:

- Constraints on traffic management, especially on the R132 Dublin Road at Drogheda.
- Works for overbridge modifications present a constraint for the catenary (overhead electrical wires) installation on the section where they are located. The wire installation should be done after any major deck works to avoid interference of the wires with the deck operations.

- Vegetation removal will be planned with the nesting bird seasons in mind. Further information is provided in Appendix A5.1 (CEMP) in Volume 4 of this EIAR.
- The planning and phasing of the changeover from the existing signalling, electrification, telecommunications (SET) systems to the new SET systems and the staging requirements involved in this process. This is covered in more detail in Section 5.3.9.

5.3 Project Wide Construction Works and Methodologies

This section describes the scope of construction works that are either required in multiple areas (for example construction of substations, Construction Compounds, bridge works etc.) or general linear works (for example track works, fencing, power systems, etc.). The draft Railway Order (RO) includes a set of drawings (see Section 3 of the draft RO) for the proposed works. The associated construction methodologies and indicative construction programme for the following works are described herein:

- Enabling Works;
  - Vegetation clearance;
  - Construction Compounds;
  - Utility diversions;
- Permanent way (track works);
- Cable Management System (CMS);
- Bridges;
- Electrification;
- Signalling and Telecommunication systems;
- Fencing;
- Parapets; and
- Drainage.

5.3.1 Pre-construction environmental surveys

This section outlines some of the pre-construction surveys which are required, including environmental surveys such as ecological surveys and archaeological surveys/monitoring. Ecological surveys may involve invasive species and protected species. Some of these surveys may be seasonally constrained.

5.3.1.1 Archaeological monitoring / testing license

Inappropriate excavation of a heritage site could result in damage to, or destruction of, the integrity, setting or historical context of the site, contrary to the public interest. Excavation licences may be required in such circumstances. A Project Archaeologist with a detailed knowledge of the Proposed Development will be appointed to develop and manage a centralised framework for tracking and managing all archaeological considerations. The Project Archaeologist will oversee the implementation and reporting of all archaeological and cultural heritage mitigation measures. A suitably qualified archaeologist will monitor works, as detailed in Chapter 20 (Archaeology and Cultural Heritage) during the Construction Phase to ensure that all archaeological heritage remains are identified and recorded.

5.3.1.2 Tree surveys

Prior to commencement of the works an Arboricultural Impact Assessment will be produced for the area of the Proposed Development, as well as for any adjoining areas where trees are likely to be impacted by the works, in accordance with British Standard Institution (BSI) British Standard (BS) 5837:2012 'Trees in relation to in relation to design, demolition and construction – Recommendations' (BSI 2012).

All trees and vegetation to be retained within and adjoining the works area will be protected in accordance with the British Standard Institution (BSI) British Standard (BS) 5837:2012 'Trees in relation to in relation to design, demolition, and construction – Recommendations' (BSI 2012). Works required within the root protection area (RPA) of trees to be retained will follow a project-specific arboricultural methodology for such works, which will be prepared by a professional qualified arborist.

5.3.1.3 Bat surveys

There are no known roosts within the Proposed Development. However, a number of bridges identified potential roost features (PRFs) within (i.e. OBB33, OBB39, OBB41, OBB44, OBB46, OBB47, OBB49, OBB54, UBB56, UBB65, OBB68, UBB72, OBB78, OBB80/80A/80B, UBB82), and as a number of trees are due to be removed, a precautionary approach is taken to avoid any harm to local bat species. Where reasonably practicable the removal of trees, and modifications of bridges (i.e. parapet modifications, or any other structural works), with PRFs, will occur only between April – May, and September – October to avoid the most sensitive time periods for bats (i.e. during breeding season and hibernation). However, to ensure the protection of bats and if the project timeframe does not allow for this, the following mitigation will be undertaken.

5.3.1.3.1 PRF Re-Appraisal (First Step of Pre-Construction Survey

A pre-construction survey of all trees being removed, and of all bridges with bat roosting potential, to rechecked for PRFs will be undertaken by an experienced bat specialist/ecologist as part of the pre-construction surveys. The survey will:

- Confirm trees due for removal with PRFs;
- Confirm PRFs identified in bridges are still suitable for roosting bats and have not become unsuitable in the meantime (i.e., become inundated with water or filled etc.).

5.3.1.3.2 Pre-Construction Survey for trees

In the event that additional PRFs are detected during the pre-construction survey, it is recommended that:

- In advance of any clearance, all trees deemed to contain PRFs which are subject to felling / clearance will be checked for the presence of bats by a suitably qualified / licensed bat specialist (using an endoscope);
- In the event that bats are found on the Proposed Development site during construction works such as vegetation clearance, works will immediately cease in that area and the local NPWS Conservation Ranger will be contacted.
- An application will then be made to the NPWS for a derogation licence seeking to permit actions affecting bats or their roosts that would normally be prohibited by law.

- After licence approval from the NPWS (which may include the necessity for additional mitigation measures to those recommended here) bats may be removed by a bat specialist licensed to handle bats and released in the area in the evening following capture; and
- Only then will PRF trees be felled, and this should be undertaken 'in sections' where the section can be handled to avoid sudden movements or jarring of the sections.

5.3.1.3.3 Pre-Construction Survey for Bridges

Bridges where proposed works are being undertaken, i.e., demolition at bridge OBB80/80A/80B, parapet modifications, and track lowering beneath bridges, and that have been deemed to have the potential for roosting bats (as described above) by virtue of having potential bat roosting features, will require a pre-construction survey.

Bats could occupy suitable roosting features at any time prior to the commencement of works. Therefore, there is an inherent risk that bats could be affect by the proposed works at bridges. The following mitigation measures will be followed for the aforementioned bridges with bat roosting potential:

- The night prior to the start of works, a bat activity survey will be undertaken to ensure no roosting bats are present. A suitably qualified and experienced ecologist must carry out one bat emergence and one bat re-entry survey during the active bat season (generally taken as mid-April to mid-September inclusive).
- Where a bat roost is encountered, all relevant works will cease and an application for a derogation licence shall be submitted by the suitably qualified/licenced bat specialist to the NPWS to seek permission for the removal of the roost.

5.3.1.4 Invasive Species Surveys

Invasive species surveys have been undertaken as part of the Biodiversity assessment. Where identified, specific mitigation will be applied to ensure that appropriate management and control measures are enacted prior to works. An Invasive Species Management Plan (ISMP) for the control of invasive species on the Proposed Development will be prepared by the Contractor. All works will be in accordance with Appendix A5.1 (CEMP) in Volume 4 of this EIAR.

5.3.1.5 Otter Surveys

Although there were no holts recorded during field surveys, evidence of otter usage was recorded in a number of areas (see Section 8.4.10.1, Chapter 8 (Biodiversity) in Volume 2 of this EIAR), and otter could potentially establish new holt or couch sites within the ZoI of the Proposed Development.

A confirmatory pre-construction check of all suitable otter habitat will be completed by a suitably qualified ecologist within 12-month period prior to any construction works commencing.

Any new holt / couch sites identified will be treated and/or protected in accordance with the Guidelines for *The Treatment of Otters prior to the Construction of National Road Schemes* (NRA 2006b).

5.3.2 Vegetation Clearance

Wherever reasonably practicable, trees and vegetation will be retained within the Proposed Development. Trees and vegetation identified for removal will be removed in accordance with 'BS 3998:2010 Tree Work – Recommendations' (BSI 2010) and best arboricultural practices as detailed and monitored by a professional qualified arborist. Details of trees and vegetation to be removed will be included in the Arboricultural Impact Assessment Report (and associated Tree Protection Plans) as set out in Section 5.3.1.2. The approach to vegetation clearance will be undertaken in accordance with Appendix A5.1 (CEMP) in Volume 4 of this EIAR.

Vegetation such as trees, climbing plants, shrubs, or vines are required to be removed at various locations prior to works commencing. Site clearance to remove any unwanted materials and equipment may also be required. Before the vegetation clearance commences, an arboricultural survey of each relevant area will be completed as detailed in Section 5.3.1.2. Vegetation clearance will also be done, where possible, outside of the bird nesting season and in full compliance with all relevant statutory requirements and guidance and the relevant mitigation measures for biodiversity set out in this EIAR and any relevant conditions of the Railway Order.

Machinery for site clearance will vary depending on the location, but the following may be required:

- Chainsaws, axes, and hatchets to fell and remove trees;
- Stump grinders, for tree stumps that are removed;
- Mulchers can be used to clear underbrush, small trees, and leftover fencing; the contractor can either use a tracked or wheeled mulching machine or there are also mulching machines that can be used with equipment such as tractors or excavators (which can be road-rail for use on the railway);
- Bulldozers can be used for clearing large areas where leftover structures, boulders, standing trees and debris remain;
- Tractors with front-end loaders can be used to clear rocks, smaller trees, branches etc. and for levelling/grading the land;
- Backhoes and excavators can be used in small-scale land-clearing; and
- A woodchipper may be required to turn trees into woodchips for easy disposal.

5.3.3 Construction Compounds

Construction Compounds are temporary facilities that support the construction of different elements of the project. Some will focus on line-wide works spread along the railway, such as trackwork, overhead electrical cables (OHLE) and signalling, whilst others will support more isolated works such as new substations and bridge works. Some compounds will support both isolated and line-wide works. A list of all Construction Compounds is provided in Table 5-5.

Initial site clearance and establishment activities for the Construction Compounds will typically include:

- Forming the site entrances and exits adjoining public roads;
- Clearing the site as required;
- Installing the site hoarding and gates to ensure that the site is secure;
- Installing general site lighting;
- Carrying out any necessary levelling;

- Stripping topsoil and forming any construction access routes that may be required;
- Laying down areas of hardstanding for material storage;
- Performing all the necessary connections to mains water, sewerage, power, and communications;
- Provision of bunded refuelling areas;
- Installing the site office and welfare facilities;
- Installing site security facilities, goods received checking area, unloading, and loading areas and wheel-washing facilities;
- Establishing segregated pedestrian and vehicle routes to the working areas with clear, designated crossing points and establishing areas for materials and waste storage;
- Establishing power and water distribution and wastewater collection; and
- Forming any Heavy Goods Vehicle (HGV) holding area that may be required for each site.

The activities that will take place on these sites, during the construction phase include:

- Material unloading, storage and loading;
- Erection of prefabricated sections for construction;
- Use of welfare and on-site office space;
- Personnel and machinery access to the railway;
- Parking space for personnel and work vehicles;
- Refuelling of construction plant and vehicles;
- Lifting of material/precast elements, especially in the compounds corresponding to modification of existing overbridges, construction of new bridges and erection of buildings;
- Assembling of catenary cantilevers (the cantilevers consist of metallic bars that are connected by bolts);
- Heavy Goods Vehicles (HGV) and usual construction machinery movement;
- Staff vehicles movement;
- Installation and maintenance of dedicated track access points for Road-Rail Vehicles (RRV); and
- Construction traffic on the access routes for the material/equipment supply by HGV.

5.3.3.1 Environmental Considerations

Construction Compounds are required route wide at different locations to undertake the necessary works. The majority of these compound locations must be located in close proximity to the works required with direct access to site (e.g. track lowering, OHLE on underbridges).

For the substation locations, an MCA assessment considered alternatives for the locations as described in Chapter 3 (Alternatives) in Volume 2 of this EIAR. Where substations are required, these sites will be used as Construction Compounds for all eight locations and will be utilised as far as reasonably practicable for works in close proximity to them.

Environmental constraints have still been considered for all Construction Compounds to ensure they are located in the most suitable locations. Table 5-4 presents the Construction Compound locations and the environmental constraints which were considered in their site selection. As design development progressed, a number of Construction Compounds were added, and in some cases omitted, with the final list of Compounds below.

Table 5-4 Construction Compounds

Construction Compound ID	Location	Environmental Constraints
CC-2650	Fairview Depot (R834 Entrance car park)	Minor upgrade works within IÉ boundary
CC-2700	Fairview Depot (R834 Entrance car park)	Minor upgrade works within IÉ boundary
CC-3000	Fairview Depot (R807 Entrance car park)	Minor upgrade works within IÉ boundary
CC-9000	Howth Junction and Donaghmede Station (Donaghmede Entrance)	Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby Landscape and Visual – potential visual impacts during Construction Phase Population – public open space impacted
CC-9050	Howth Junction and Donaghmede Station (Kilbarrack Entrance)	Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby
CC-9100	Howth Junction and Donaghmede Station (Central Access)	Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby
CC-9200	Howth Junction and Donaghmede Station (Kilbarrack Entrance)	Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby
CC-10600	Clongriffin Station	Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby Water Resources – in proximity of River Mayne
CC-15900E	Malahide Turnback (Strand Court)	Biodiversity – in proximity of European sites Traffic and Transport – access to Construction Compounds
CC-15900W	Malahide Turnback (Bissett's Strand)	Biodiversity – in proximity of European sites Traffic and Transport – access to Construction Compounds
CC-16100	Malahide Turnback (Caves Strand)	Biodiversity – in proximity of European sites Water Resources – in proximity of floodplain
CC-16250	Malahide Turnback (Marina Car Park)	Biodiversity – in proximity of European sites
CC-16400	UBB30 Malahide Viaduct	Air Quality – sensitive receptors nearby Architectural Heritage – viaduct is a protected structure (FCC RPS 0420) Biodiversity – in proximity of European sites Landscape and Visual – potential visual impacts during Construction Phase Noise and vibration – sensitive receptors nearby Water resources – in proximity to estuary
CC-18800	Donabate Traction Substation	Construction Compound location is on a substation location. MCA undertaken for substation location (see Chapter 3).
CC-19800	Donabate Station	Air Quality – sensitive receptors nearby

Construction Compound ID	Location	Environmental Constraints
		Biodiversity – invasive species in proximity of works Noise and vibration – sensitive receptors nearby
CC-23500	Rush and Lusk Traction Substation	Construction Compound location is on a substation location. MCA undertaken for substation location (see Chapter 3)
CC-23772 (E)	Rush & Lusk	Utility diversion compound. Site constrained by location of utility. Water resources – in proximity to waterbody (Rathmooney)
CC-23772 (W)	Rush & Lusk	Utility diversion compound. Site constrained by location of utility. Water resources – in proximity to waterbody (Rathmooney)
CC-25626 (E)	Tyrrelstown	Utility diversion compound. Site constrained by location of utility. Water resources – in proximity to waterbody (Rush)
CC-25626 (W)	Tyrrelstown	Utility diversion compound. Site constrained by location of utility. Archaeology – in proximity of zone of notification of an enclosure (DU008-11) Water resources – in proximity to waterbody (Rush)
CC-27460 (E)	Baldongan	Utility diversion compound. Site constrained by location of utility.
CC-27460 (W)	Baldongan	Utility diversion compound. Site constrained by location of utility.
CC-29000	Skerries South Traction Substation	Construction Compound location is on a substation location. MCA undertaken for substation location (see Chapter 3)
CC-29140 (E)	Golf Links Road	Utility diversion compound. Site constrained by location of utility. Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby
CC-29140 (W)	Golf Links Road	Utility diversion compound. Site constrained by location of utility. Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby
CC-30200	Skerries Station	Air Quality – sensitive receptors nearby Landscape and Visual – potential visual impacts during Construction Phase Noise and vibration – sensitive receptors nearby
CC-31100	Skerries	Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby.

Construction Compound ID	Location	Environmental Constraints
CC-32200	Skerries North Traction Substation	Construction Compound location is on a substation location. MCA undertaken for substation location (see Chapter 3)
CC-34400 (E)	Balbriggan	Utility diversion compound. Site constrained by location of utility.
CC-34400 (W)	Balbriggan	Utility diversion compound. Site constrained by location of utility. Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby
CC-36000	UBB56 Balbriggan Viaduct	Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby Water resources – in proximity to watercourse (Bracket River)
CC-37700	Balbriggan Traction Substation	MCA undertaken for substation location (see Chapter 3)
CC-39720 (E)	Gormanston	Utility diversion compound. Site constrained by location of utility. Air Quality – sensitive receptors nearby Archaeology – area in the vicinity of Zone of Notification
CC-39720 (W)	Gormanston	Utility diversion compound. Site constrained by location of utility. Archaeology – area in the vicinity of Zone of Notification
CC-40200	Gormanston Station	Air Quality – sensitive receptors nearby Architectural Heritage – Station building is a protected structure (NIAH 14322016, 14322017 and 14322018) Biodiversity – potential section of hedgerow removal for access Land and soils – agricultural land (soil management)
CC-41400	Gormanston Traction Substation	Construction Compound location is on a substation location. MCA undertaken for substation location (see Chapter 3)
CC-44320 (E)	Laytown	Utility diversion compound. Site constrained by location of utility.
CC-44320 (W)	Laytown	Utility diversion compound. Site constrained by location of utility.
CC-44500	UBB72 Laytown Viaduct (South Abutment)	Architectural Heritage – viaduct is a protected structure (MH208-303) Archaeology – 50m from zone of notification Biodiversity – in proximity of European sites Flood Risk – coastal flooding risk Geology – within geological heritage area Land and soils – agricultural land (soil management) Landscape and Visual – potential visual impacts during Construction Phase Water resources – in proximity to estuary

Construction Compound ID	Location	Environmental Constraints
CC-44600	UBB72 Laytown Viaduct (South Pier)	Architectural Heritage – viaduct is a protected structure (MH208-303) Archaeology – 50m from zone of notification Biodiversity – in proximity of European sites Flood Risk – coastal flooding risk Geology – within geological heritage area Land and soils – agricultural land (soil management) Landscape and Visual – potential visual impacts during Construction Phase Water resources – in proximity to estuary
CC-44700	UBB72 Laytown Viaduct (North Pier)	Architectural Heritage – viaduct is a protected structure (MH208-303) Biodiversity – in proximity of European sites Geology – within geological heritage area Land and soils – agricultural land (soil management) Landscape and Visual – potential visual impacts during Construction Phase Water resources – in proximity to estuary
CC-44900	Laytown Station	Air Quality – sensitive receptors nearby Architectural Heritage – Station building is a protected structure (NIAH 14319001 and 14319002) Biodiversity – in proximity of European site Land and soils – agricultural land (soil management) Landscape and Visual – potential visual impacts during Construction Phase Geology – within geological heritage area
CC-44920 (E)	Laytown	Utility diversion compound. Site constrained by location of utility. Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby
CC-46900	Bettystown Traction Substation	Construction Compound location is on a substation location. MCA undertaken for substation location (see Chapter 3)
CC-49600	OBB78 Track Lowering	Noise and vibration – sensitive receptors nearby Land and soils – agricultural land (soil management)
CC-50270 (S)	Drogheda	Utility diversion compound. Site constrained by location of utility. Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby
CC-50270 (N)	Drogheda	Utility diversion compound. Site constrained by location of utility. Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby

Construction Compound ID	Location	Environmental Constraints
CC-51700 (S)	Drogheda	Utility diversion compound. Site constrained by location of utility. Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby
CC-51800	OBB80 McGrath's Lane Overbridge (North)	Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby Traffic and Transport – access for local residents on McGrath's Lane
CC-51900	OBB80 McGrath's Lane Overbridge (South)	Air Quality – sensitive receptors nearby Noise and vibration – sensitive receptors nearby Traffic and Transport – access for local residents on McGrath's Lane
CC-52050	Drogheda Traction Substation	Construction Compound location is on a substation location. MCA undertaken for substation location (see Chapter 3).
CC-52250	Drogheda Depot/Station	Site within IÉ boundary. No alternatives considered.
CC-52200	UBK01 Dublin Road Overbridge (Car Park)	Site within IÉ boundary. No alternatives considered.

5.3.3.2 Duration of the Construction Compounds

Each Construction Compound will require to remain operational for the duration of the works with which it is associated. This is dictated by the construction programme and varies for each compound, ranging from several months (in the case of the overbridge modifications) to three years (for instance, those servicing line wide works).

Construction Compounds will often be set up to be operational 24 hours per day, 7 days per week, especially where they are supporting works to be undertaken during track possessions. For much of this time construction plant and materials will be delivered, marshalled, and delivered along the project, with both road and rail vehicles involved. Temporary lighting will be installed to facilitate works during hours of darkness, and new utility connections may be required to service the compounds. Where activities are happening at compounds outside core working hours these will be coordinated with the local authorities and in consultation with the local community.

5.3.3.3 Line-wide Construction Compounds

Line-wide Construction Compounds are required to be spread along the Proposed Development to enable access and storage of plant, materials and equipment to support the SET line-wide works, such as overhead line equipment (OHLE), and associated power, signalling and telecom cabling. The locations of these line-wide Construction Compounds are shown on Image 5-3. Some of these line-wide Construction Compounds may also double up as compounds for specific works in particular locations. Road rail access points (RRAPs) allow vehicles and materials to transfer between roads and the railway line. Lineside compounds have been planned alongside existing RRAPs, though some new temporary RRAPs may be required where they do not currently exist (for example at Donabate Substation Compound and Balbriggan Substation Compound). Construction of these RRAPs may require site clearance, construction of access roads and fencing/gated access.

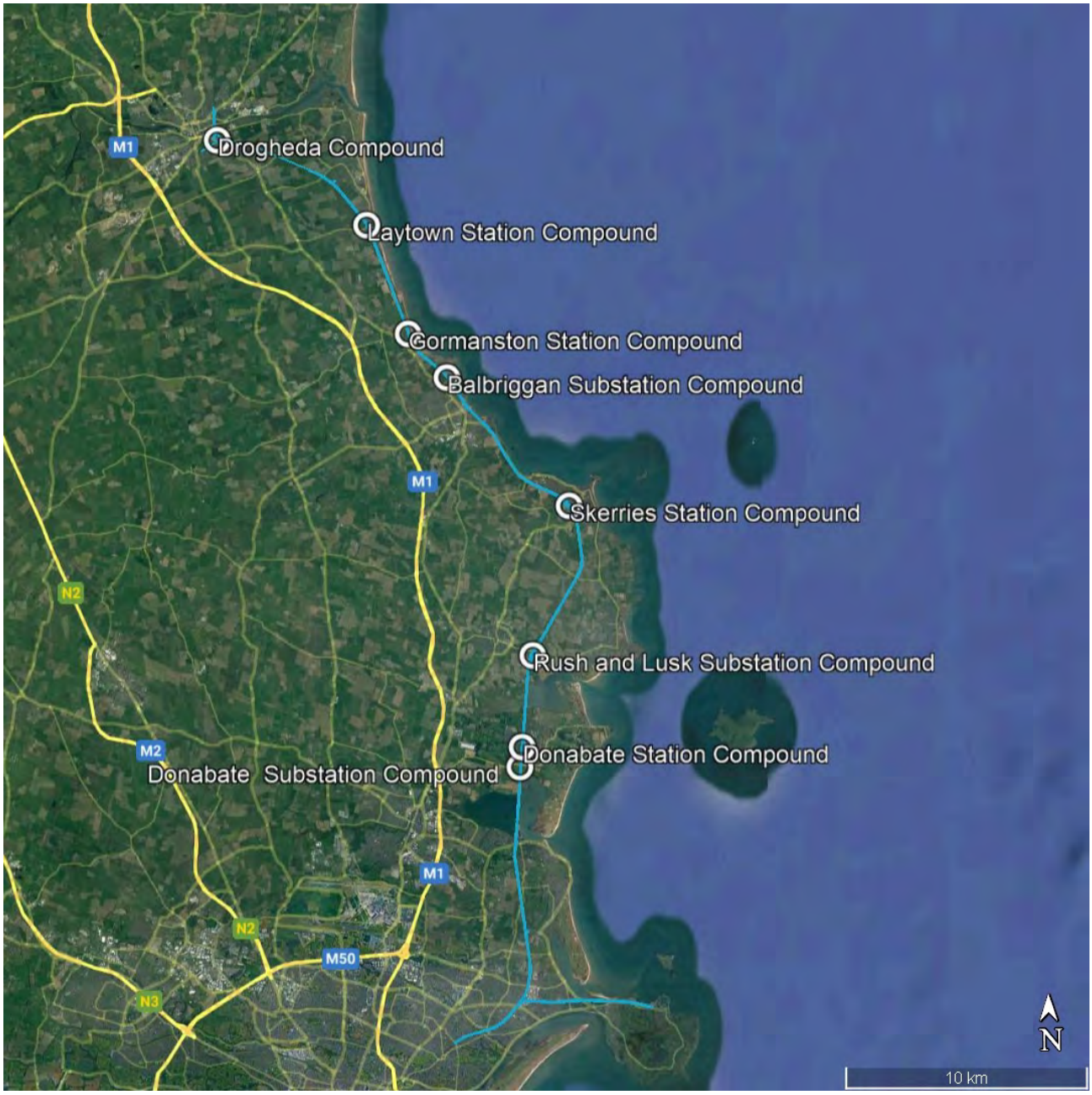

Image 5-3 Main line-wide Construction Compounds

5.3.3.4 Location of Construction Compounds

Construction Compounds that will support the Construction Phase are listed in Table 5-5. Figure 5.1 and Figure 5.2 in Volume 3A of this EIAR presents the locations of the Construction Compounds for the Proposed Development.

Table 5-5 List of Construction Compounds

Code	Zone	Location	Primary Discipline	Chainage	Within IE property?
CC-2650	A	Fairview Depot South (R834 Entrance car park)	Station	2,650	Yes
CC-2700	A	Fairview Depot Centre (R834 Entrance car park)	Station	2,700	Yes
CC-3000	A	Fairview Depot North (R807 Entrance car park)	Station	3,000	Yes
CC-9000	B	Howth Junction and Donaghmede Station (Donaghmede Entrance)	Station	9,000	No
CC-9050	B	Howth Junction and Donaghmede Station (Kilbarrack Entrance)	Station	9,050	No
CC-9100	B	Howth Junction and Donaghmede Station (Central Access)	Station	9,100	Yes
CC-9200	B	Howth Junction and Donaghmede Station (Baldoyle Industrial Estate)	Station	9,200	No
CC-10600	B	Clongriffin Station	Permanent Way	10,600	No
CC-15900E	B	Malahide Turnback (Strand Court)	Permanent Way	15,900	No
CC-15900W	B	Malahide Turnback (Bissets Strand)	Permanent Way	15,900	No
CC-16100	B	Malahide Turnback (Caves Strand)	Permanent Way	16,100	No
CC-16250	B	Malahide Turnback (Marina Car Park)	Permanent Way	16,250	No
CC-16400	B	UBB30 Malahide Viaduct	Structures	16,400	No
CC-18800	C	Donabate Substation	Substation & SET line-wide works	18,800	No
CC-19800	C	Donabate Station	SET line-wide works	19,800	Yes
CC-23500	C	Rush and Lusk Substation	Substation & SET line-wide works	23,500	No
CC-23772 (E)	C	Rush & Lusk	Utility Diversions	23,772	No
CC-23772 (W)	C	Rush & Lusk	Utility Diversions	23,772	No
CC-25626 (E)	C	Tyrrelstown	Utility Diversions	25,626	No
CC-25626 (W)	C	Tyrrelstown	Utility Diversions	25,626	No
CC-27460 (E)	C	Baldongan	Utility Diversions	27,460	No
CC-27460 (W)	C	Baldongan	Utility Diversions	27,460	No

Code	Zone	Location	Primary Discipline	Chainage	Within IE property?
CC-29000	C	Skerries South Substation	Substation	29,000	No
CC-29140 (E)	C	Golf Links Road	Utility Diversions	29,140	No
CC-29140 (W)	C	Golf Links Road	Utility Diversions	29,140	No
CC-30200	C	Skerries Station	Permanent Way & SET line-wide works	30,200	Yes
CC-31100	C	Skerries	SET local works	31,100	No
CC-32200	C	Skerries North Substation	Substation	32,200	No
CC-34400 (E)	C	Balbriggan	Utility Diversions	34,400	No
CC-34400 (W)	C	Balbriggan	Utility Diversions	34,400	No
CC-36000	C	UBB56 Balbriggan Viaduct	Structures	36,000	No
CC-37700	C	Balbriggan Substation	Substation & SET line-wide works	37,700	No
CC-39720 (E)	D	Gormanston Station	Utility Diversions	39720	No
CC-39720 (W)	D	Gormanston Station	Utility Diversions	39720	No
CC-40200	D	Gormanston Station	Permanent Way & SET line-wide works	40,200	No
CC-41400	D	Gormanston Substation	Substation	41,400	No
CC-44320 (E)	D	Laytown	Utility Diversions	44,320	No
CC-44320 (W)	D	Laytown	Utility Diversions	44,320	No
CC-44500	D	UBB72 Laytown Viaduct (South Abutment)	Structures	44,500	No
CC-44600	D	UBB72 Laytown Viaduct (South Pier)	Structures	44,600	No
CC-44700	D	UBB72 Laytown Viaduct (North Pier)	Structures	44,700	No
CC-44900	D	Laytown Station	SET line-wide works	44,900	No
CC-44920 (E)	D	Laytown	Utility Diversions	44,920	No
CC-46900	D	Bettystown Substation	Substation	46,900	No
CC-49600	D	OBB78 Track Lowering	Permanent Way	49,600	No
CC-50270 (S)	D	Drogheda	Utility Diversions	50,270	No
CC-50270 (N)	D	Drogheda	Utility Diversions	50,270	No
CC-51700 (S)	D	Drogheda	Utility Diversions	51,700	No
CC-51800	E	OBB80 (North)	Structures & SET line-wide works	51,800	No

Code	Zone	Location	Primary Discipline	Chainage	Within IE property?
CC-51900	E	OBB80 (South)	Structures	51,900	Yes
CC-52050	E	Drogheda Substation	Substation	52,050	No
CC-52250	E	Drogheda Station	Station	52,250	Yes
CC-52200	E	UBK01 Dublin Road Overbridge (Car Park)	Structures	52,200	Yes

5.3.3.5 Maintenance of Construction Compounds and access points

All access points to work sites will be suitably maintained to ensure safe local circulation for all construction plant, workers, and members of the public. Upon completion of the works, all temporary access roads and Construction Compounds will be removed and reinstated as required.

5.3.4 Utility Diversions

The scope of utility diversions and protection is dependent on the size, number and nature of the utilities impacted by construction of the project. Specific utility diversions have been described in Chapter 4 (Description of the Proposed Development) and assessed in Chapter 18 (Material Assets: Utilities) in Volume 2 of this EIAR. A set of figures including existing utilities (Figures 18.1) and proposed utility diversions (Figure 18.2) are presented in Volume 3A of this EIAR. Some are located along public roads while others are within private land. Existing utilities requiring diversion include:

- Surface water drains;
- Foul and Combined gravity pipes, and Rising Mains;
- Watermains;
- Electricity supplies;
- Overhead and underground Electricity Supply Board (ESB) cables;
- Gas mains; and
- Telecommunication and cable services including fibre optic cables.

Temporary protection measures for utilities within the zone of influence of the works will be completed prior to starting work.

Utility diversions and protection measures will be planned, agreed, and undertaken in cooperation with the relevant utility stakeholders and relevant agencies. Relevant approvals will be in place prior to any work commencing on a utility or service. Some cables are expected to be diverted through new under-track crossings (UTXs), the deeper ones of which will need to be constructed by directional drilling. Where these are required, there is a need for additional temporary land for construction on each side of the railway. Meantime shallower lineside crossings can be formed by open trench methods, with new chambers constructed on either side of the crossing. The majority of works for these shallow crossings are expected to be undertaken using track mounted Road Rail Vehicles (RRVs) during track possessions; some will be positioned so there is no need to access third party land. Where there are exceptions to this situation suitable alternative arrangements will need to be made with the landowners.

It is presently envisaged that no excavation will be required for the following activities:

- Creating access for the decommissioning of existing utilities;
- Creating access for installation of new under-track crossings (UTXs); and
- Creation of compounds if needed at new under-track crossing locations.

5.3.4.1 Horizontal directional drilling

Where trenchless utility diversions are required, as described in Chapter 4 (Description of the Proposed Development), horizontal directional drilling (HDD) would be used. These works will follow the sequencing set out below:

1. Required local construction access and compounds will be established.
2. The launch pit and reception/target pit will be constructed.
3. The directional drilling rig will drive the initial pilot hole from the launch pit to the reception pit.
4. The bore will then be widened by a back reamer.
5. The pipe/duct will be pulled through from the reception to the launch pit.
6. The pits are then backfilled layer by layer and returned to original condition.
7. Cables will then be installed and jointed by a separate workstream.

Image 5-4 Directional drilling plant, in position (Source: IÉ)

5.3.4.2 ESB high voltage cable diversion

In trenching, ducting, and cabling for ESB 38 kV networks, the following methodology is expected to typically be followed:

1. Required local construction access and compounds will be established.
2. Excavate trench to required dimensions.
3. Lay in and level bedding layer of concrete.
4. Lay in and joint High-Density Polyethylene (HDPE) power ducts.
5. Lay in and thoroughly compact layer of concrete around and above ducts and install marker strips.
6. Install HDPE comms cable ducts. Use timber or other spacers to maintain the required spacing.

7. Install further layer of concrete and compact thoroughly.
8. Lay in another wide marker strip.
9. Lay in wide yellow warning tape and backfill the top of the trench.
10. Mandrel all ducts and install draw rope, then seal all ducts.
11. Cables will then be pulled and jointed by a separate workstream.

5.3.4.3 ESB high voltage transmission pylon diversion

In erecting new transmission pylons or relocating existing pylons, the following construction methodology may be followed. Where new pylons are assembled to replace existing pylons, assembly is performed prior to line outages.

1. Verify that all planning and environmental conditions have been satisfied.
2. Carry out pre-construction site investigations including access review and ground conditions.
3. Excavate an access ramp, anticipated to be approximately 1m deep x 10m long x 10m wide.
4. Cast the foundation.
5. Sheet piling methods may be applied in narrow spaces. In this case, interlocking sheets of steel are pressed down where needed first.
6. Erect the structure.
7. Attach to the pylon the surge arresters, isolators, and cable reels after preassembling them on-site.
8. Meanwhile the cable-drum and winch sites are constructed and anchored appropriately.
9. The pilot ropes, pulling rope, conductor and earthing conductor are then hoisted up.
10. Cables are then adjusted to allow for adequate tension and sag.
11. Cables are then braced/clasped.

ESB will then connect the electricity cables to the network.

5.3.4.4 ESB medium and low voltage cable diversion

In trenching and ducting for ESB LV/MV ducts, the following methodology is broadly expected to be followed:

1. Excavate trench to required dimensions.
2. Lay in and compact a bedding layer.
3. Lay ducts and horizontal spacer on bedding layer.
4. Lay in and compact a layer of approved backfill above bedding layer.
5. Install ESB approved red marker strip.
6. Lay in and compact a layer of approved backfill maintaining the maximum depth.
7. Install ESB approved yellow marker tape.
8. Reinstate final layer of backfill and return to original condition.

ESB will then connect the electricity cables to the network.

5.3.4.5 ESB LV/MV pole diversion

In locations where ESB poles need to be raised for MV/LV lines, new poles of the required lengths may be installed near the existing poles. The following strategy would be followed in excavating for the pole and planting the pole using a tracker excavator:

1. Line up excavator with existing pole. Start the dig a minimum of 150mm from the existing pole.
2. The hole shall only be sufficiently large to accommodate the pole.
3. The pole erector is lifted, and the driver tilts the pole into the hole.
4. Lower the pole into the hole and raise it up.
5. The pole is twisted in place.
6. Backfill hole to a minimum depth with a long-handled rammer.

ESB will then connect the electricity lines to the new pole and remove the existing pole.

5.3.4.6 General duct installation on bridges

Where the installation of ducts, conduits and voids on bridges is required, the following is expected to be undertaken:

1. Rigid conduits to be bent only with a standard conduit bender.
2. Ducts, conduits and voids to be firmly secured during casing to prevent floating.
3. Where required, continuous pull wires to be installed in all service ducts and conduits. Pull wires to be galvanized steel, unspliced, extending with a tight fit through the duct end caps and terminating beyond the end of the duct.
4. Where pull wires are not used, an unspliced rope or equivalent may be substituted. The rope shall be longer than the duct and coiled up inside the duct with the end caps secured in place.

5.3.4.7 Water pipe installation

The following construction methods will typically be applied during the construction of a pipe installation (excluding under-track crossings):

1. Pipes (and other material) will be delivered into the Construction Compound area and offloaded using, for example, a lorry-mounted crane.
2. Trial pits are excavated to confirm the locations of existing services.
3. The main bulk excavation to the trench is undertaken.
4. Temporarily support the trench throughout the pipe installation works.
5. Import bedding material by dumper. Lift pipe into position and, if required, test it (often in sections) for being suitably sealed
6. The pipe is then backfilled up to the required level and connected into the network.

Stages 1 to 6 are repeated until the required length of pipe is installed and adequately tested.

5.3.4.8 Gas mains diversion

In diverting gas mains, the following construction methodology is expected to be typically followed:

1. Trenches to be prepared, and sand bed shall be placed.
2. Gas services to be laid at right angles to the main in as short a route as possible.
3. Sand surround shall be placed around the gas main immediately after installation.

4. Two layers of marker tape shall be placed over the main. Marker tape must be extended past the width of the mains.
5. Where a valve and riser are installed, fencing shall be provided around that valve until either adequate temporary reinstatement is provided to protect the valve and chamber, or permanent reinstatement is completed.
6. Concrete protection slabs to be installed above all tops tees on gas mains.

5.3.4.9 Temporary diversion strategy – bridges

Several railway overbridges that require work to be undertaken on them have utilities located within them. In locations where bridge deck reconstruction or lifting works are needed, utilities within the bridge deck may need to be temporarily diverted beforehand or protected.

Where existing utilities cross bridges, and they need to be protected during the project works, temporary utility diversions would be established by erecting enclosed scaffolding to support the utilities alongside, separated by a safe margin to reduce the risk of damage occurring during any bridge works. The utilities would then be slewed temporarily onto the scaffold and protected, before replacing in the bridge once relevant works have been completed. This process will aid in keeping any utility outage time, if required at all, to a minimum.

5.3.4.10 Utilities protection strategy

In areas where track lowering works are planned, and where utility diversions are not required, the protection of utilities underneath the track will be necessary and will be agreed with the utility providers. A reinforced concrete slab is to be provided above the affected utility conduit, so that the loads from the railway are not applied directly on the conduit. The reinforced concrete slab would spread the railway loads into the soil thus safeguarding any utility below.

5.3.5 Permanent way (track works)

Changes to the permanent way included in the Proposed Development include changes to both vertical alignment (track lowering) and horizontal alignment (new and realigned track). The scope of works required is outlined further in Chapter 4 of this EIAR meantime the construction activities associated with these track works are described below.

5.3.5.1 Changes to vertical alignment (track lowering)

There are four locations where the distance between tracks and existing bridge soffits is not enough to accommodate new Overhead Line Equipment (OHLE). It is proposed therefore to locally lower the track in these locations, at overbridges on Station Road (OBB39), Tyrrelstown Road (OBB44), County Bridge (OBB55) and Colpe Road (OBB78). Once completed, the OHLE cable installation can proceed in that section. All track lowering works will be performed during track possessions, for example over one or two weekend possessions, these being arranged in coordination with other works on the line.

The length of the track lowering, and the depth of lowering, will vary depending on the location of the works to achieve the minimum OHLE clearance required. Details are provided in Chapter 4 (Description of the Proposed Development). It is likely that each track lowering will take less than a month, depending upon the track possessions available.

Track lowering is likely to follow the sequence of works set out below:

1. Enabling works such as installation of facilities and storage areas; bringing machinery and materials on-site; utilities diversions (including the relocation of existing signalling and telecoms cables); and suspension of railway operation.
2. Rail cutting of the existing track using a rail cutting machine.
3. Removal of old track panels using road-rail vehicles (vehicles capable of running on both road and rails).
4. Removal of degraded ballast by means of road-rail vehicles, excavators and other engineering equipment that will load the materials into a dump truck. This will be taken off site, tested (particularly for the presence of any hazardous materials) and disposed of appropriately.
5. Build up the track formation until required levels have been reached, by means of road-rail vehicles, excavators and other engineering equipment that will load the materials into a dump truck. Extension and compaction of the subgrade using a compactor and extension of the geotextile.
6. Finish track formation, levelling, and compaction, which would employ the use of road-rail excavators, bulldozers, wheel loads, graders, medium rollers, and dump trucks.
7. Placement of the longitudinal drainage, using trucks, mini excavators, and plate compactors.
8. Extension and compaction of the sub-ballast layer, using wheel loader, trucks, and compactors.
9. Extension of first ballast layer, levelling and compaction using wheel loader, trucks, and compactors.
10. Laying of preassembled track panels and connecting with the provisional joints utilising road-rail vehicles and truck mounted cranes.
11. Extension of second ballast layer, tamping and dynamic stabilisation utilising road-rail vehicles, tampers, and dump trucks.
12. Welding of joints and second stabilisation using welding and tamper equipment.
13. Rail destressing and track tampering using tampering equipment.

5.3.5.2 Changes to horizontal alignment

New track horizontal alignment (and realignment) work is required primarily at the following locations:

- Track modifications in the Drogheda Area (Zone E), particularly the Drogheda Freight Sidings modifications to achieve the addition of another platform and the new stabling area;
- Addition of a turnback at Malahide (Zone B);
- Addition of a turnback at Clongriffin (Zone B); and
- Addition of a turnback at Howth Junction (Zone B).

The ballast track construction works may involve the following typical sequence of activities, this being similar in many ways to the track lowering works. These activities will need to be performed during track possessions.

1. Enabling works, such as: installation of facilities and storage areas; bringing machinery and materials on-site; utilities diversions and temporary suspension of railway operation.
2. Rail cutting of the existing track, maybe using a rail cutting machine.
3. Removal of old track panels using road-rail vehicles (vehicles capable of running on both road and rails), excavators, crane on truck/RRV and other necessary engineering equipment

4. Removal of degraded ballast by means of road-rail vehicles, excavators and other engineering equipment that will load the materials into a dump truck (if required). This will be tested, taken off site and disposed of appropriately.
5. Build-up the track formation until required level is achieved and in-situ testing, using road-rail vehicle excavators.
6. Extension and compaction on the subgrade, using a compactor.
7. Extension of the geotextile.
8. Placement of the longitudinal drainage, using trucks, mini excavators, and plate compactors.
9. Extension and compaction of the sub-ballast layer, using wheel loader, trucks, and compactors.
10. Extension of first ballast layer, levelling and compaction using wheel loader, trucks, and compactors.
11. Laying of the sleepers with the fastening systems, using crane on trucks and excavators.
12. Laying of the rails and clamping the joints, using crane on trucks and excavators.
13. Extension of second ballast layer, tamping and dynamic stabilisation, using crane on trucks, excavators, and a ballast tamper.
14. Welding of joints and second stabilisation.
15. Rail destressing and track tampering using tampering equipment.

It is possible that temporary rail speed restrictions may be required during these works. Any restrictions will be discussed and agreed with IÉ by the Contractor in advance of implementation.

5.3.6 Cable Management System

The cable management system (CMS) relates to the infrastructure required to distribute and protect the required cables for signalling, telecommunications, low voltage power and catenary systems.

Lineside cable routes are usually one of the following types:

- Concrete trough route.
- Buried PVC ducts.
- Elevated routes (metal trays).
- Elevated GRP (Glass Reinforced Plastic) troughing on posts.
- Catenary wire.

5.3.6.1 Concrete trough route

Precast concrete trough solutions may be used to lay cables where only shallow excavation is required to bury the cable route.

A typical construction sequence for laying precast concrete troughing is:

1. Excavation of shallow trench using a road-rail vehicle excavator and/or hand tools.
2. Installation of a sand/gravel bedding layer, using a road-rail vehicle excavator.
3. Installation of precast concrete troughs using a road-rail vehicle crane/excavator with lifting attachment. Troughs may also be manually installed using trough clamps.
4. Backfilling of surrounds, using a road-rail vehicle excavator.

The installation rate for precast concrete troughing is approximately 30m per eight-hour shift and team.

5.3.6.2 Buried PVC ducts

Buried PVC ducts may be considered at railway stations and at locations where there is not enough space to place either a cable trough or a metal cable tray. In this situation, ducts are likely to be surrounded by concrete for protection or with a granular fill. Catenary feeders are typically placed in buried PVC ducts.

The likely construction sequence to bury PVC ducts is as follows:

1. Check area for existing utilities and divert as required.
2. Excavation of duct run including trench support as required (sheet piles for instance).
3. Installation of the sand bedding layer.
4. Installation of PVC ducts with pipe spacer bracket to ensure correct spacing.
5. Pour concrete to secure ducts in place.
6. Backfilling of surrounds ensuring warning plate/tapes are installed as required.

5.3.6.3 Metal cable trays

In areas where space for ducting is very restricted, such as on bridges, cables may be clamped to walls and protected with a hard cover. Installation of metal cable trays would involve drilling and fixing to existing structures, typically using handheld tools.

5.3.6.4 Elevated GRP troughing on post

When space next to the track is insufficient for the installation of a precast concrete trough, and metal cable trays are not feasible because of the structures/retaining walls, the use of elevated GRP trough routes on posts may be considered. The posts, typically no more than six metres apart, may be rammed, hole dug or embedded in concrete with ramming often selected for new cable routes.

5.3.7 Bridge works

5.3.7.1 Overbridges

There are many overbridges along the route of the Proposed Development. These are, generally, historic structures and hence were constructed without the necessary clearances for OHLE. Bridge modifications fall into two categories:

- Major: for example, demolition and reconstruction, or deck replacement
- Minor: for example, minimal parapet modifications

Only four overbridges require major work, all being in the Drogheda area, with three of these effectively forming one elongated bridge (OBB80/80A/80B) on Railway Terrace and the other the pedestrian footbridge (OBB81) at Drogheda MacBride Station. The work to be done on each overbridge requiring major work is described in detail in the section for the zone in which it is located. Table 5-6 provides a summary of the proposed works at all overbridges.

Table 5-6 Overview of overbridge works

Overbridge	Description	Intervention
OBB32A	Donabate Distributor Road	Minor – Parapet modifications
OBB33A	Donabate Station footbridge	Minor – Parapet modifications to panels
OBB35	Access to Beaverstown Golf Club	Minor – Parapet modifications
OBB38	Rogerstown Lane – Protected	Minor – Parapet modifications
OBB38A	Rush & Lusk Station footbridge	Minor – Parapet modifications to panels
OBB41	Local road in Rathartan	Minor – Parapet modifications
OBB46	L1285 / Baldongan Close – Protected	Minor – Parapet modifications
OBB47	Historic access to Skerries Golf Club	Minor – Parapet modifications
OBB49	Golf Links Road	Minor – Parapet modifications
OBB51A	Skerries Station footbridge	Minor – Parapet modifications to panels
OBB54	The Ladies Stairs	Minor – Parapet modifications to panels
OBB55	Lawless Terrace / R127	Minor – Parapet modifications
OBB57A	Balbriggan Station footbridge	Minor – Parapet modifications to panels
OBB68	Local access nr Gormanston Camp	Minor – Parapet modifications
OBB74A	Laytown Station footbridge	Minor – Parapet modifications to panels
OBB78	Colpe Road	Minor – Parapet modifications *(and track lowering works)*
OBB80/80A/80B	Railway Terrace	Major – Demolition and replacement
OBB81	Drogheda Station Footbridge	Major – Span replacement
OBB81C	Drogheda Depot footbridge access	Minor – Parapet modifications to panels

As can be seen there are a mixture of road and pedestrian overbridges to be modified. Further information on the typical modifications for each bridge is provided in the following sections.

Typical Parapet Modification Works – Road Bridges

Works to bridge parapets can be considered in two categories:

1. Parapets to be extended up by a small amount (typically about 100mm), and
2. Parapets to be extended up by a significant amount (typically more than 100mm).

The two parapet design situations are outlined below.

1. Firstly, there are five road overbridges that require a relatively low solid steel plate to be fixed to the existing parapet. This work is likely to be undertaken from the road during non-disruptive night-time possessions. Traffic management would need to be in place on the road for the duration of the works. Alternatively, work may need to be undertaken using construction plant sited on the railway below the bridges, also during non-disruptive night-time possessions.

2. Secondly, there are another five road overbridges that require more significant increases to their parapet heights. For each situation several non-disruptive night-time possessions of the track are envisaged, with work being undertaken from both road level and track level supported with a variety of construction plant.

- **Rogerstown Overbridge (OBB38)** is a masonry arch bridge and is registered as a protected structure. The existing parapets comprise stone masonry built off the spandrel walls.
- **Kingstown Overbridge (OBB41)** is a bridge with a reinforced concrete wall clad in masonry and capped with a steepled coping.
- **Drumlattery Overbridge (OBB47)** is an unused masonry arch bridge.
- **County Overbridge (OBB55)** is similar to OBB41 and will follow the same approach.
- **Irishtown Overbridge (OBB68)** is a bridge with a reinforced concrete wall with a level top surface.

Typical Parapet Modification Works – Pedestrian Bridges

The following pedestrian bridges will undergo parapet modification works:

- Donabate Station Footbridge (OBB33A);
- Rush and Lusk Station Footbridge (OBB38A);
- Skerries Station Footbridge (OBB51A);
- Ardgillan / Lady's Stairs Footbridge (OBB54);
- New Balbriggan Station Footbridge (OBB57A);
- New Laytown Station Footbridge (OBB74A); and
- Drogheda Staff Depot Access Footbridge (OBB81C).

The majority of work to these bridges are planned to be undertaken from the deck of each bridge. In some cases, it may be necessary to install the required panels using a mobile elevated working platform (MEWP) situated on the railway below. All parapet modifications are planned to be undertaken during non-disruptive night-time possessions.

5.3.7.2 Underbridges

Most of the underbridges along the route of the Proposed Development remain unaffected by the proposed works however there are several viaducts whose length is such that the OHLE cannot cross them unsupported. These viaducts must be modified to provide supports for new OHLE gantries.

In addition to these viaducts, Dublin Road Bridge (UBK01) that carries the Drogheda Freight Sidings at Drogheda must be widened to create an additional platform in this location, and a new underbridge (UBB19A) is required at Clongriffin to carry the new Loop Line over the Rover Mayne.

The work to be done on each underbridge will be described in detail in the section for the zone in which it is located. Table 5-7 below provides a summary of the work proposed at each underbridge.

Table 5-7 Overview of underbridge works

Overbridge	Name	Intervention
UBB19A	Mayne River	Construction of a new underbridge
UBB30	Malahide Viaduct	Add three OHLE gantry supports
UBB36	Rogerstown Viaduct	Add two OHLE gantry supports
UBB56	Balbriggan Viaduct	Add two OHLE gantry supports
UBB72	Laytown Viaduct	Add two OHLE gantry supports
UBK01	Dublin Road Bridge	Widening and total deck replacement

5.3.8 Electrification HV Power, Substations and Electrical Buildings

There are significant works to be undertaken involving new substations, electrification with HV power connections and electrical distribution buildings.

5.3.8.1 Substations

There are eight proposed substations as described in Chapter 4 (Description of the Proposed Development). The construction methodology for them all will be similar. The general procedure for construction is expected to be as follows:

1. Substation building:
    - Site clearance and earthworks, as required.
    - Utilities diversion and/or formation of new supply to the site.
    - SET cabling diversion, if required.
    - Foundations.
    - Concrete base slab.
    - Façade and finishes.
    - Pavement works.
    - Access road and landscaping.
    - Boundary treatment, for example fencing.
2. Brickwork housing:
    - In-situ (fire resistant) concrete walls.
    - Cable troughs and upstands cast into the floor, with the appropriate coverings.
    - All concrete surfaces to be cleaned and sealed to minimise dust generation.
3. MEP (Mechanical, Electrical and Plumbing) elements:
    - Building equipment as specified by design including lights, fire detection, fire extinguishing and maybe water, sewerage, and connection to Irish Water.
4. HV equipment (transformers, switchgear, auxiliary transformer, diesel generator, LV panels and UPS (uninterruptible power supply)).
    - Delivered by road and installed using small cranes. Cabling will be laid, along with mechanical and electrical installation of equipment.

Once these activities are completed, the connection from the ESB to the new structure will be carried out. Further details on the individual substations' construction access arrangements are in the sections for each zone.

5.3.8.2 Overhead Line Equipment (OHLE)

A description of the OHLE required for the electrification of the railway between Malahide and Drogheda is provided in Chapter 4 (Description of the Proposed Development) in Volume 2 of this EIAR. The OHLE will need to be supported on suitable foundations along the route. As new OHLE foundations are being constructed, there may be a need to divert utilities to provide suitable space, these works being phased suitably in advance. Most utility diversion works are expected to be achievable during normal working hours. For more information refer to Section 5.3.4.

5.3.8.2.1 OHLE Foundations

The foundations for the OHLE supports are expected to be either concrete bored piles or shallow foundations such as concrete footings. The type of foundation selected will depend on the ground conditions and any site constraints such as proximity to utilities. They will be spaced typically every 40 to 50 metres each side of the track between Malahide and Drogheda.

The construction of the foundations will require track possessions and will utilise road-rail vehicles with ancillary piling, excavation and cranage equipment, rail carts, compressors, dump trucks and concrete wagons. The works are expected to be carried out largely during non-disruptive night-time possessions, though some may require longer periods for example where there are poor ground conditions or constrained access. In these situations, either an extended Saturday night possession or part of a weekend possession is likely to be required.

Concrete Bored Piles

Installing a concrete pile for OHLE mast foundations starts with drilling a vertical hole into the ground using a rotary auger or percussive machine. This machine, often referred to as a piling rig, will be mounted either on the railway track or ground nearby. Further explanation of options is provided in Section 5.2.3. Alternative boring equipment can be outfitted with specially designed drilling tools, buckets, and grabs to remove the soil and rock. The drilling process may include driving a temporary steel tube, or sleeve, into the soil. This remains in place in the upper portion of the hole until the pile is poured with concrete when it is withdrawn.

Once the hole is drilled, a cage of reinforcing steel (“rebar”) is lowered into the hole before it is filled with concrete. The rebar cage is likely to be installed with suitable holding down bolts for future connection of the upper OHLE superstructure. The top of the pile will then be capped with a footing near ground level to support the structure above.

Shallow Foundations

An alternative option for the foundation of the catenary masts are concrete pad footings, which might be used where the upper ground layers are particularly strong. The anticipated construction methodology for these elements is listed below:

1. Excavation of the pad box area by means of an excavator.
2. Pouring of a blinding concrete layer to offer a clean and level surface for the reinforcement.
3. Placement of the foundation reinforcement and any temporary formwork required.
4. Concrete pouring and vibration.
5. Concrete curing.

5.3.8.2.2 OHLE Masts

After the foundations are completed, OHLE masts will be installed using rail-road vehicles. Where site constraints are restrictive gantries will be used instead of masts, for example on viaducts. The works are planned to be carried out during night-time non-disruptive possessions.

The installation of masts and gantries will begin once enough foundations have been constructed. The masts will be predominantly transported to installation points using rail machinery with a boom crane.

Where gantries are to be installed, more than one road-rail vehicle may be required to raise the structure. Masts will be installed on the anchor bolts located in the foundation and locked in their correct position. A mortar finish may be applied around the base of the mast.

5.3.8.2.3 OHLE Cantilevers

Cantilevers will be installed on OHLE masts with insulators and all other elements that are necessary for installing the OHLE wires. They will be installed predominantly during night-time non-disruptive possessions.

5.3.8.2.4 Messenger Wire

Before installing the OHLE messenger wire, all necessary equipment and machinery will be prepared on the track. The end of the cable reel will be anchored with the appropriate fastenings, then the installation of the wire will start.

A wiring train will be used to install the wire until the position of the next cantilever is reached. The wire is placed until the end point is reached, where the wire will be anchored and tensioned. The wire will then be removed from the pulleys located on the cantilevers and placed in its final position. Finally, the excess wire will be cut off, completing the installation of the messenger wire.

5.3.8.2.5 Contact Wire

The process of installing the contact wire is like that used for the messenger wire. The machinery and equipment required are the same. To keep the contact wire elevated, it will be suspended from the messenger wire with copper hooks.

Once the end point of the installed section is reached, the wire will be anchored and tensioned. The hooks placed in the spans will be replaced by temporary droppers until the definitive droppers are installed into place.

5.3.8.2.6 Feeder Wire

Feeder wire will be laid from substations to the OHLE in buried ducts, which will have been placed earlier by road-rail vehicles with excavator attachments. These distribution power cables are attached to the tops of the OHLE masts, to deliver power to the contact wire at selected intervals. Earth wire is also connected directly to all masts at this stage.

5.3.8.2.7 OHLE adjustment

After installing the contact wire, the OHLE position is checked and adjusted if needed. Special track equipment is required for this task. OHLE adjustments cover contact wire, messenger wire, feeder wire and cantilever bracketry. The OHLE structures or supports are not adjusted.

5.3.8.3 Track Paralleling Huts (TPH)

There are two new Track Paralleling Huts (TPHs) required for the Proposed Development, one located close to Skerries Station and the other adjacent to Drogheda Depot. They will be constructed in a comparable manner to that described for the substations. Construction of the Skerries TPH may require land to be temporarily occupied between the IÉ land boundary and the adjacent road.

5.3.8.4 Low Voltage Power Supply

A network of new low voltage infrastructure will be installed along the route. It will connect with the new Signal Equipment Buildings (SEBs), Telecommunications Equipment Rooms (TERs) and location cases (smaller outdoor cabinets) positioned alongside the track. Installation will be either via RRV construction plant or, where accessible from nearby roads or other convenient access routes, by road based construction plant. Additional detail is included in Section 5.3.9.

5.3.9 Signalling and Telecoms Buildings and Infrastructure

New signalling and telecoms buildings and infrastructure is distributed along the railway, as described in Chapter 4 (Description of the Proposed Development).

5.3.9.1 Signalling System

Most of the existing signalling system will be progressively replaced with modern technology to achieve the more frequent train service. This will include lineside masts and signal posts.

As the DART+ Coastal North railway 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 that 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 will then be removed.

5.3.9.2 Telecommunications System

The existing telecommunication systems need to 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 DART+ Coastal North route.

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. This is expected to be undertaken on a phased basis.

5.3.9.3 Equipment cabins

In addition to the electrical buildings, equipment cabins are required to support the signalling, and telecommunication infrastructure. The standard types of cabins required along the Proposed Development include:

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

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. The locations of the SEBs required for the Proposed Development are listed below, all of which are located on IÉ lands unless stated:

- Drogheda Station;
- Malahide Station;
- Clongriffin Station (third party lands); and
- Howth Junction and Donaghmede Station.

Telecommunication 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). TERs will be installed at the following locations:

- Clongriffin Station; and
- Drogheda Station.

From a construction perspective both SEBs and TERs will either follow a similar method to that described in 5.3.8.1 for the more substantial substations or be lifted in as prefabricated units onto prepared foundations.

5.3.10 Fencing and Boundary Treatment

5.3.10.1 Railway fencing

Railway fencing is to be installed in coordination with Permanent Way and SET works. The construction of the fence may be carried out either from the tracks or road access, depending upon local access conditions, design, and railway possession opportunities.

5.3.10.2 Construction methodology for fencing

The construction methodology and sequence for fencing works will vary depending on the type of fence required to be constructed. However, it will typically include:

1. Checking of ground for existing utilities and diversion as required.
2. Excavation for foundations of fencing.
3. Installation of foundations.
4. Installation of fencing, checking vertical and horizontal alignment.

Typical machinery includes mini digger, excavator with lifting equipment, concrete truck, and dumper truck. If it is required to be constructed from the track, RRVs will be used.

5.3.10.3 Temporary fencing

Works zones will be fenced to secure the site against unauthorised access. Where works areas are adjacent to road traffic temporary traffic management will be planned with vehicle containment barriers erected where required. All traffic management will be designed and implemented to required standards and agreed with the relevant Local Authority prior to implementation.

5.3.11 Drainage

The main elements of lineside drainage are:

- Channel drains.
- Piped collector drains.
- Piped carrier drains.
- Manholes.

Many of the drainage works are likely to be carried out simultaneously with the earthworks.

Track drains will generally be laid at a constant distance from the rail.

5.3.11.1 Channel drains

Channel drains are likely to be restricted to locations where only surface or shallow drainage is required.

A construction sequence for channel drains is typically as follows:

1. Buried service survey carried out less than 6 months before the commencement of works.
2. Clear the area and remove any hard surface.
3. Excavation of drainage trench using a mini digger or hand tools.
4. Install a sand and concrete base using concrete truck/mixer.
5. Install channel drain.
6. Install the end cap, seal the joints with sealant, and connect the drain into the underground drainage pipe.
7. Place the grating and pour concrete into the trench, and complete finishes. Side spaces are likely to be filled with porous materials such as small ballast, gravel, or a filter medium.

5.3.11.2 Piped collector drains

Piped collector or surface-water drains are suitable for use in much drainage work.

The construction sequence for the piped collector drains may be as follows:

1. Clear the area and remove any hard surface.
2. Excavation of area for the collector drain using a mini digger or hand tools.
3. Install piped collector drain.
4. Install a sand and concrete base using concrete truck.

5. After the pipe is laid, the trench must be backfilled with porous material such as clean graded ballast or gravel.
6. Install collector drain.
7. Backfill drain.

5.3.11.3 Pipe carrier drains

The general construction sequence for piped collector drains also apply to piped carrier drains.

5.3.11.4 Manholes

Manholes are necessary to inspect the drainage system and to provide maintenance access. Depending on design of the manholes, the construction sequence may be as follows:

1. Clear the area of any obstructions.
2. Excavate to formation level.
3. Construct base concrete layer.
4. Install precast concrete rings as manhole walls, with footrests and connection pipes.
5. Install the manhole top cover and backfill.

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

Zone A encompasses the area between north of Connolly Station to just south of Howth Junction and Donaghmede Station. This zone lies within the Dublin City Council boundary, bordering Fingal County Council to the north. Zone A covers Chainage: 02+450 to 08+800.

Image 5-5 Overview of Zone A (Source: ESRI)

Construction Phase works within Zone A will include:

- Minor upgrades and internal modifications to Fairview Depot and sidings; and

- New drainage connection to combined sewer on Alfie Byrne Road.

5.4.1 Fairview Depot Modifications

5.4.1.1 Overview of works required

Minor modifications internal to the depot are planned to provide a greater output of cleaning for the fleet of new trains. These will include the provision of new cleaning platforms on the sidings to the east side of the mainline, along with associated walkways, services, and new connection to the existing combined sewer along Alfie Byrne Road. On the west side, modifications are proposed largely within the existing maintenance building to provide suitable access and services for cleaning staff. The works will be undertaken within the depot and aim to minimise disruption to the facility.

5.4.1.2 Construction Compounds and Construction Access Routes

Areas for Construction Compounds have been identified within the depot, as follows:

- Fairview depot south, located southwest of the R834 entrance carpark (CC-2650);
- Fairview depot centre, located southwest of the R834 entrance carpark (CC-2700); and
- Fairview depot north, located southwest of the R807 entrance carpark (CC-3000).

The proposed Construction Compounds will be accessed via the existing depot accesses off the R834 and R807, as shown in Image 5-6.

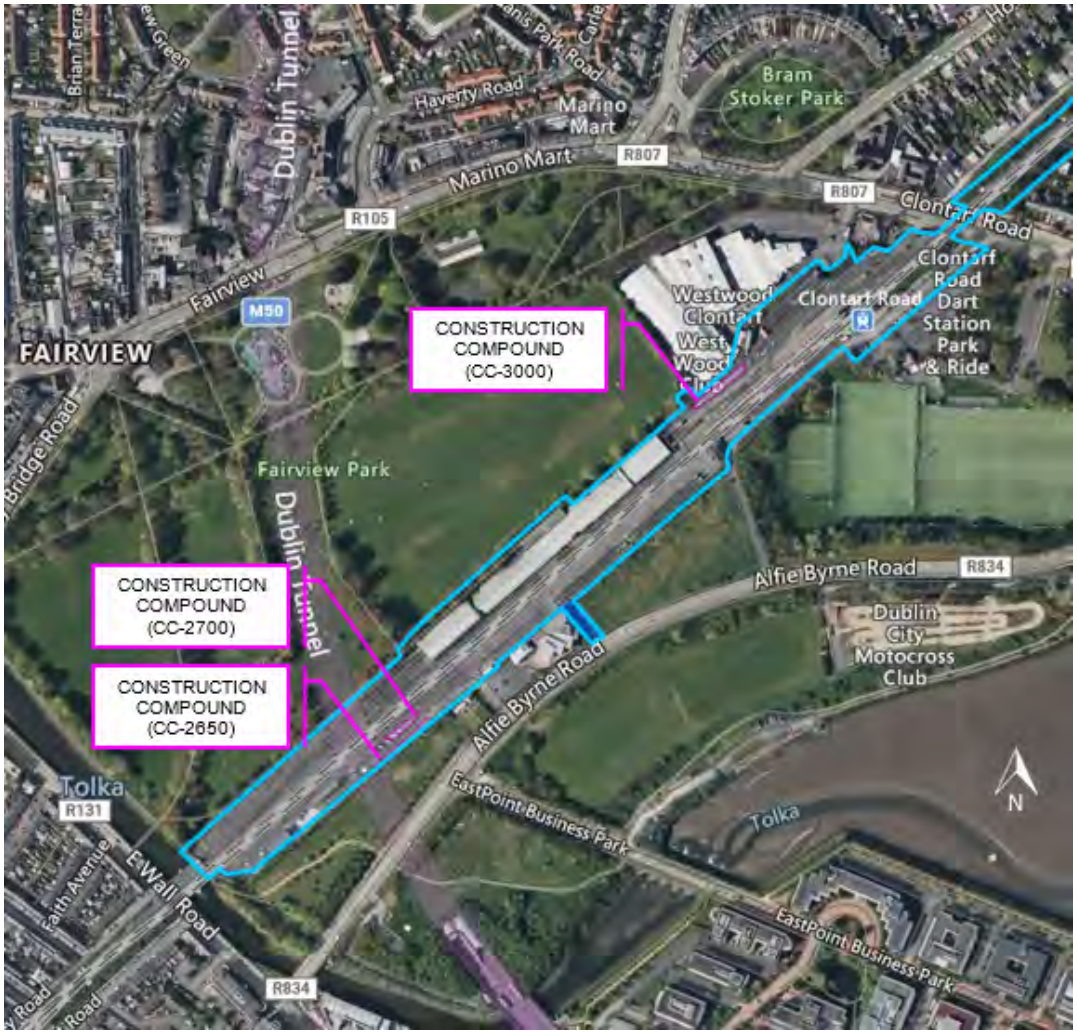

Image 5-6 Fairview Depot Construction Compounds and Access Routes (Source: ESRI)

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

Zone B includes the area between Howth Junction and Donaghmede Station, and the Malahide Viaduct, including the Howth Branch line. Works are due to take place at Howth Junction and Donaghmede Station, Clongriffin Station and Malahide Viaduct within this zone. Zone B lies within the Fingal County boundary, bordering Dublin City Council to the south, and covers Chainage: 08+800 to 18+600.

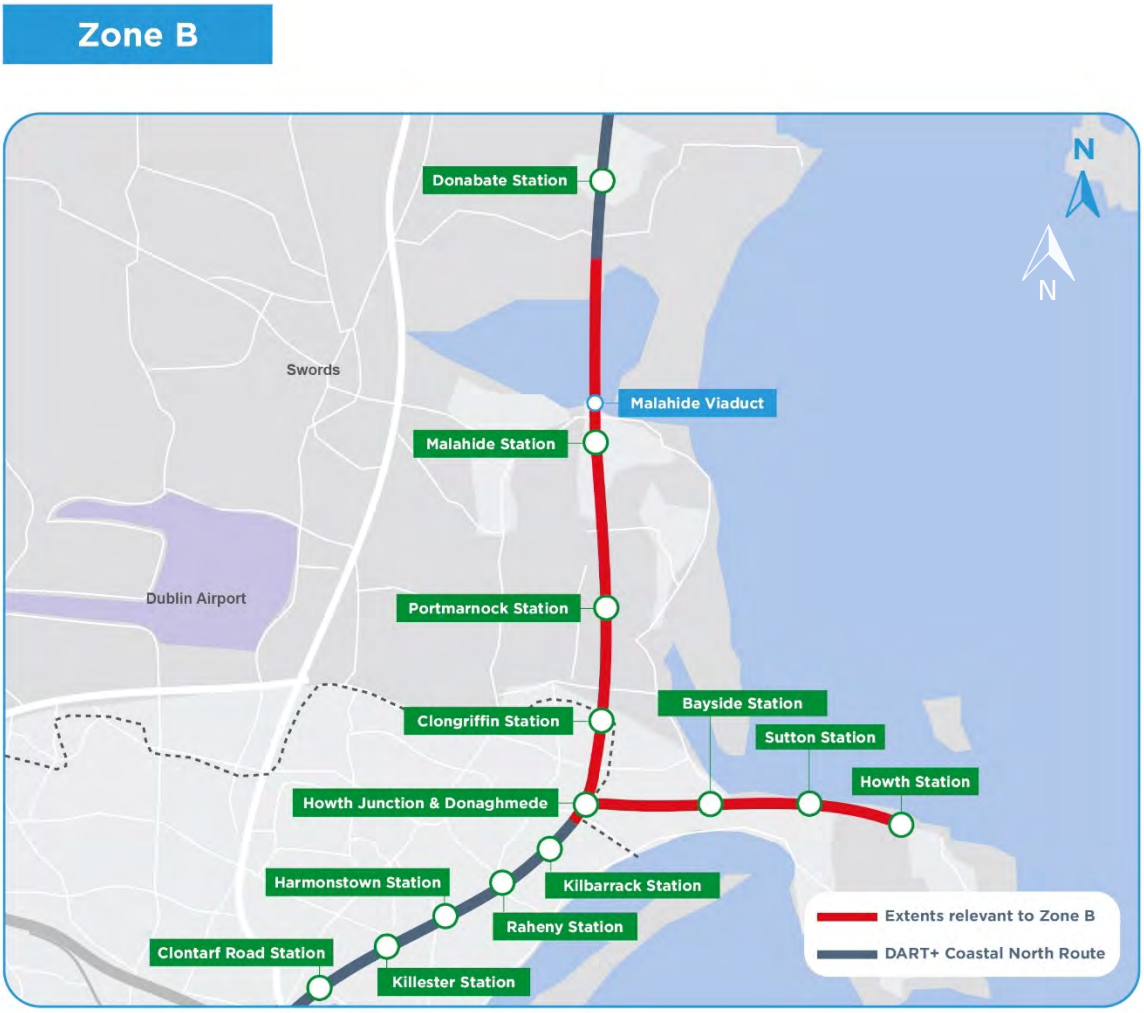

Image 5-7 Overview of Zone B (Source: ESRI)

Construction Phase works within Zone B will include:

- 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 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), culvert extension (UBB18D) 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 a new reinforced earth wall alongside the proposed Broadmeadow Way greenway and embankment widening, north of Malahide Station;
- Modification of Malahide Viaduct (UBB30) to support OHLE;
- Closure of (user worked) level crossing (XB001);
- Construction of a new Otter Crossing, adjacent to the River Pill (UBB31);
- New Signalling Equipment Building (SEB) and Telecomms Equipment Rooms (TER) at Howth, Malahide and Clongriffin;
- 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.

More detail on the works required within this zone is given in Sections 5.5.1 to 5.5.5.

5.5.1 Howth Junction and Donaghmede Station Works

5.5.1.1 Overview of works required

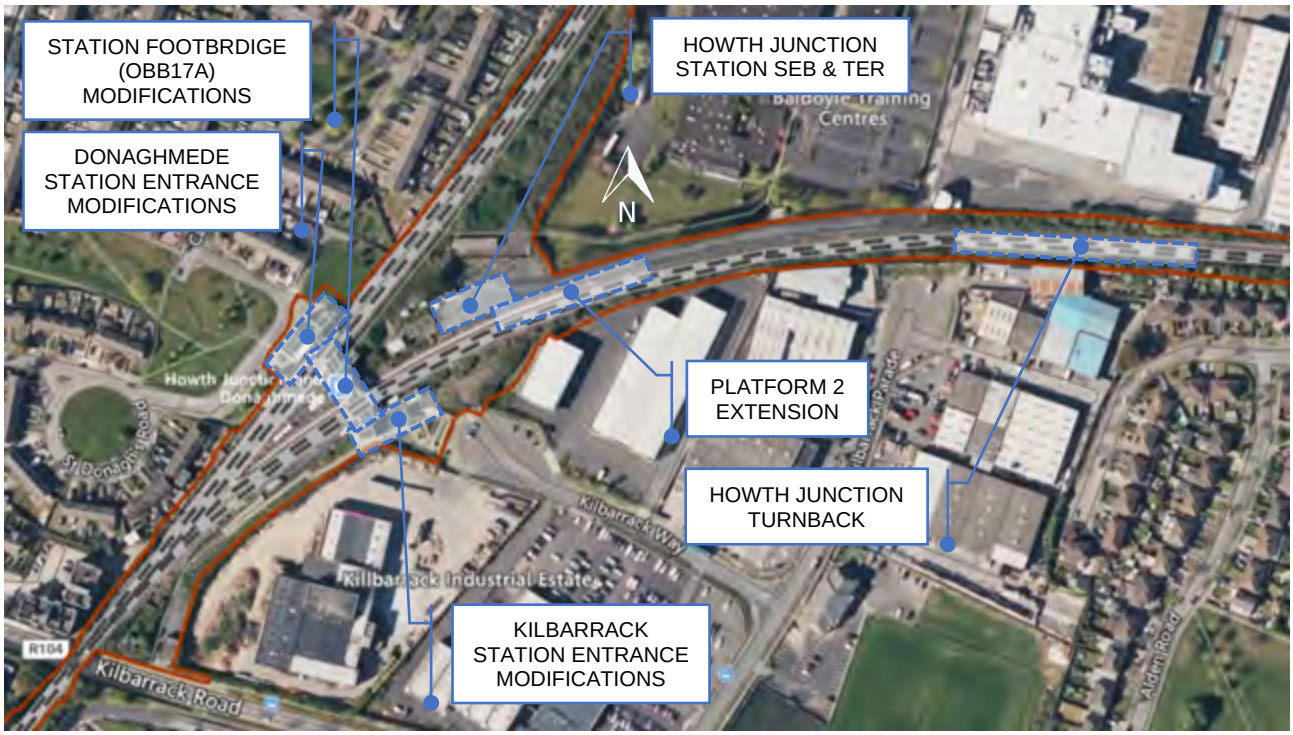

Image 5-8 Howth Junction & Donaghmede Station – Overview of Proposed Works (source: ESRI)

5.5.1.1.1 Platform extension and track works overview

A new turnback facility is proposed at Howth Junction and Donaghmede Station, which involves the installation of a new crossover on the Howth Branch Line and the extension of Platform 2. The proposed extension of Platform 2 is to enable the possible operation of a shuttle service on the Howth Branch line. The platform extension will have a ramp at its end to allow maintenance staff access to the tracks and will also include a new waiting shelter.

It is also proposed to provide a new Signalling Equipment Building (SEB) and Telecomms Equipment Room (TER) within IÉ lands to support the Linear Works along the route.

5.5.1.1.2 Modifications to station entrances and footbridge overview

Modifications to the existing station entrances, central access structure and footbridge are proposed to improve visibility and access. The draft Railway Order (RO) includes a set of drawings (see Section 3 of the draft RO) for the proposed works. This would involve demolition of the existing internal and external stairs and the dividing wall of the footbridge. The stairs would be replaced by a single larger stairway at all three station accesses. The internal station lifts in the central platform access structure would also be replaced as part of these works. Further detail on the modifications to each access is provided in the following sections.

Donaghmede entrance

Donaghmede entrance works include replacement of the stairs and widening of the entrance.

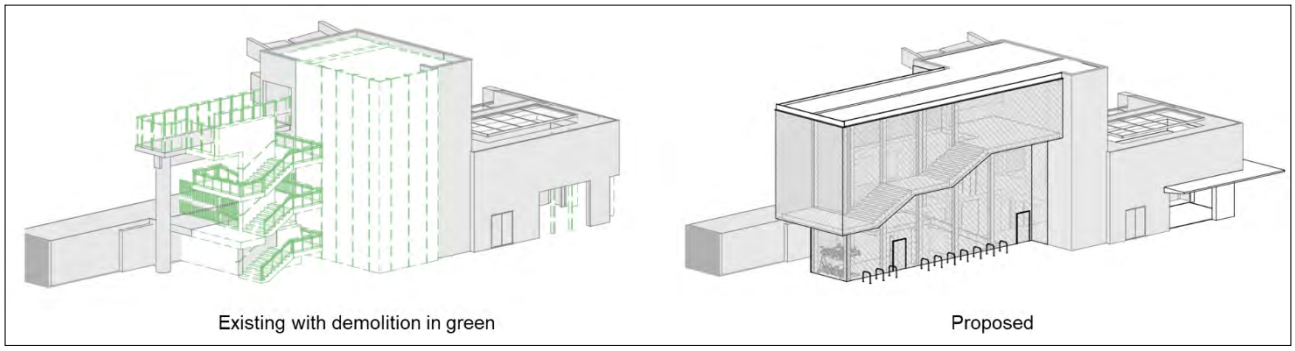

Image 5-9 Donaghmede Entrance - schematic of existing and proposed

Central access

Central access works include replacement of the stairs and lift structures.

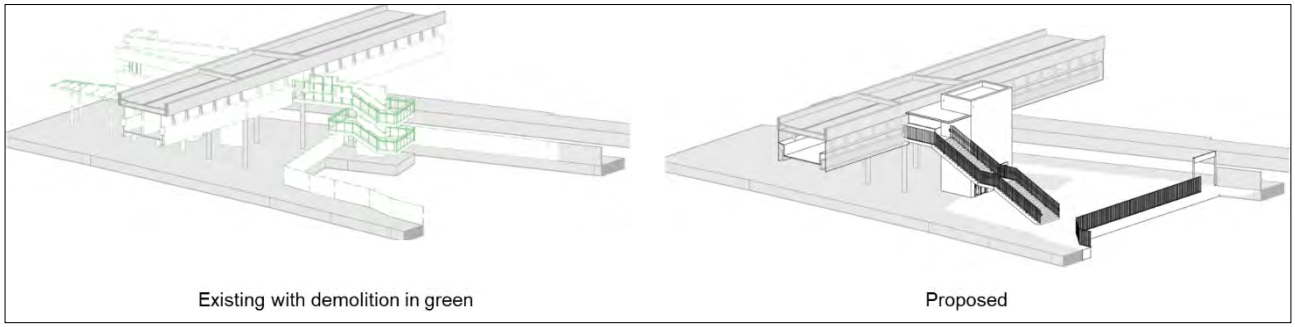

Image 5-10 Central Access - schematic of existing and proposed

Kilbarrack entrance

Kilbarrack entrance works include replacement of the stairs and widening of the entrance.

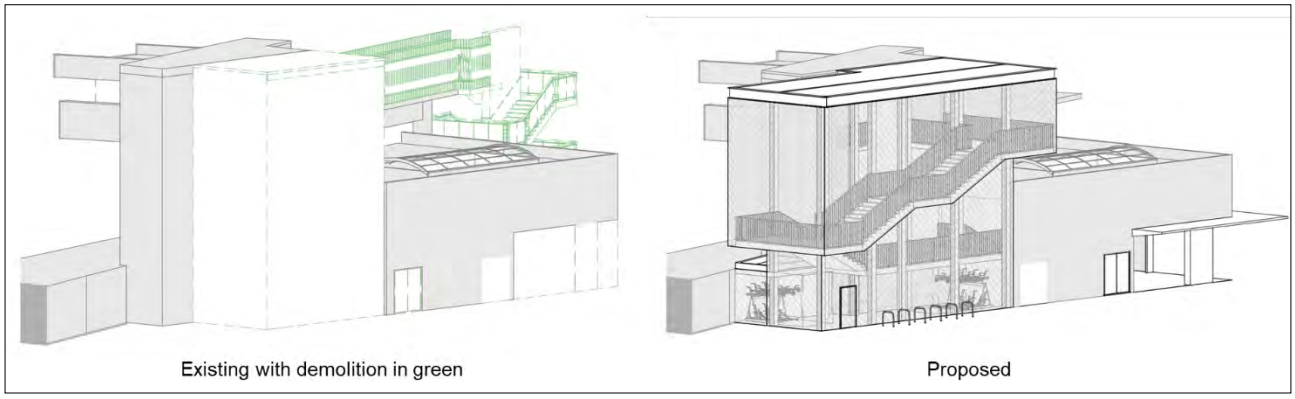

Image 5-11 Kilbarrack Entrance - schematic of existing and proposed

Footbridge

The footbridge works include removing the central wall and replacing the flooring and parapet cladding.

Image 5-12 Kilbarrack Entrance - schematic of existing and proposed

5.5.1.2 Construction methodology

5.5.1.2.1 Platform extension and track works

The superstructure of the Platform 2 extension is likely to be formed from precast elements, founded on a cast in-situ reinforced concrete slab. The slab may be founded on piles.

The construction sequence is likely to be as follows:

- Enabling works
  - Site clearance;
  - Worksite setup;
  - Utility diversions where required.
- Ground works
  - Piling (platform using mini piling rigs and station lift shaft with larger rig);
  - In-situ concreting.
- Civil works
  - Precast platform unit installation;
  - Tie-in to existing platform;
  - Cable ducts and drainage.
- Finishing works
  - Permanent fencing;
  - Platform shelter erection;
  - Benches and lighting;
  - Landscaping.

The platform extension works are expected to take approximately three months, with much of the works offline from the railway, though some possessions and non-disruptive night-time working will be required for operations close to the existing railway, such as piling and lifting in new precast concrete platform units. The crossover installation will follow the track work methodology outlined in Section 5.3.5.

5.5.1.2.2 Modifications to station entrances and footbridge construction

The works to the station entrances and footbridge would be phased to mitigate disruption to passengers. Temporary access stairs would be provided during the period of demolition and reconstruction. The works are anticipated to take between one and two years and would be conducted in four main phases to maintain lift and pedestrian access throughout, as follows:

1. Construct temporary stairs to footbridge at Donaghmede.
2. Demolish the existing:
   - Donaghmede internal and external stairs;
   - Central Access external stairs; and
   - Kilbarrack internal stairs.
3. Construct the:
   - new Donaghmede stairs;
   - new Central Access lift and stairs; and
   - new Kilbarrack stairs.
4. Demolish the existing:
   - Central Access lift and internal stairs; and

- Kilbarrack external stairs.

The above phases and the likely areas required for the works are depicted in the following images. It would be preferable to carry out the proposed modifications to the footbridge following these phases to minimise damage to the new finishes from construction.

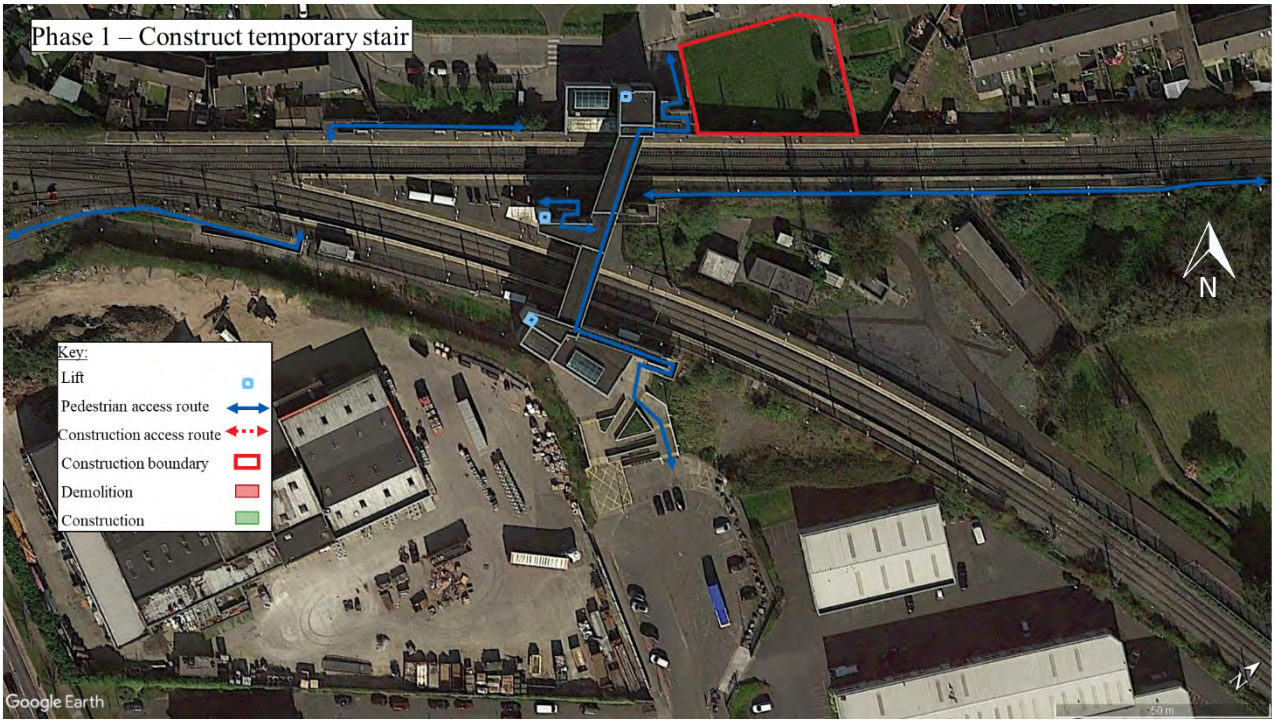

Image 5-13 Phase 1 - Howth Junction & Donaghmede Station works

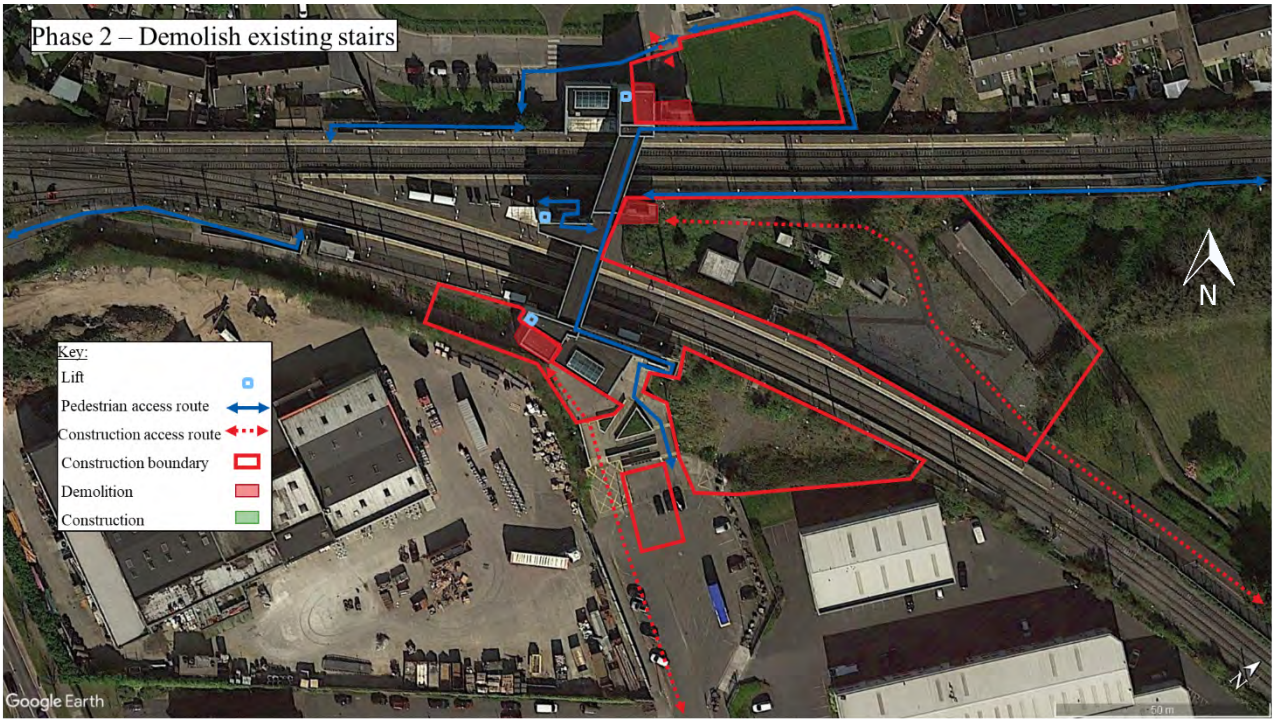

Image 5-14 Phase 2 - Howth Junction & Donaghmede Station works

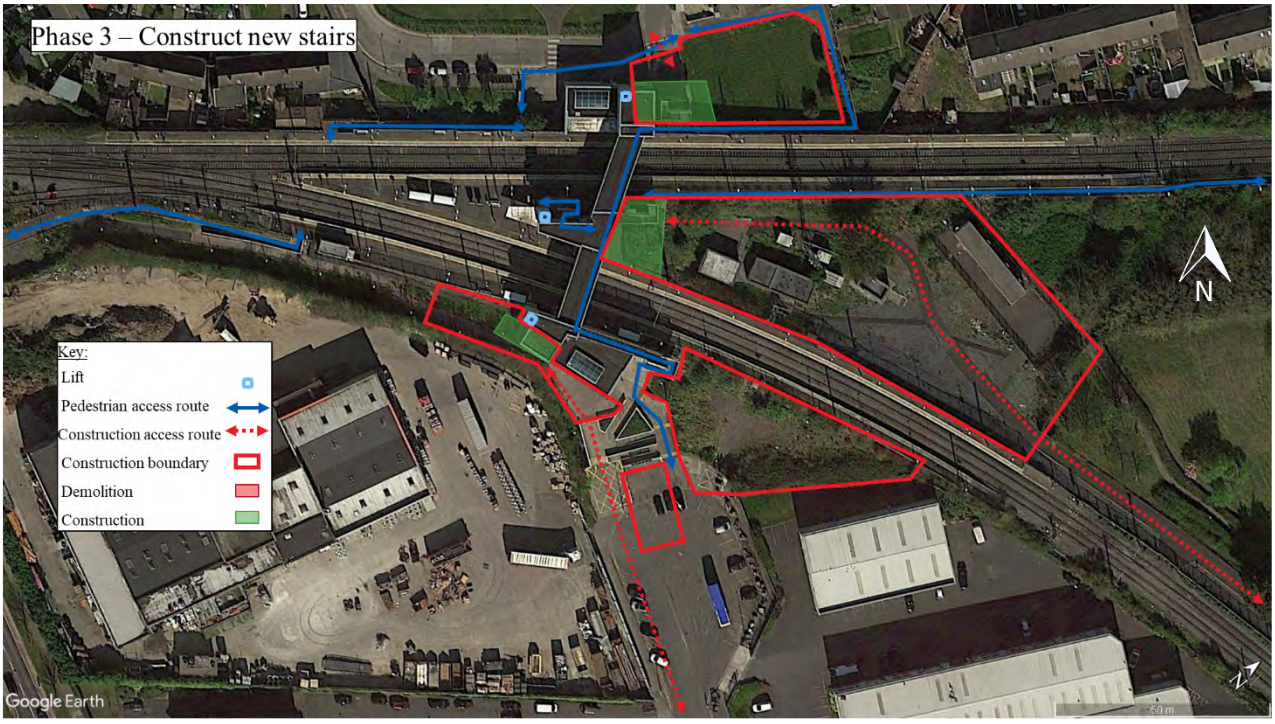

Image 5-15 Phase 3 - Howth Junction & Donaghmede Station works

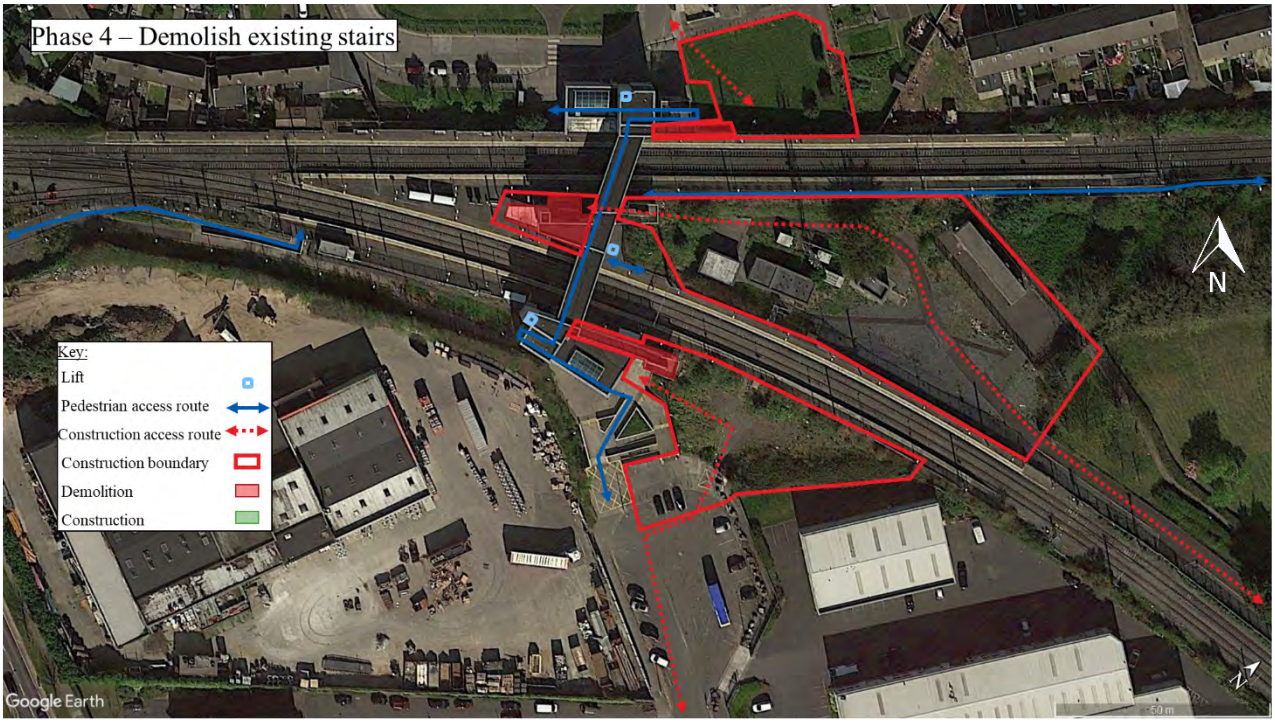

Image 5-16 Phase 4 - Howth Junction & Donaghmede Station works

5.5.1.3 Construction Compounds and Construction Access Routes

It is noted that there is a small existing Construction Compound to the north of the station (CC-9100), but this is too small and congested to support all the works proposed at the station and the local line-wide works needed. Three additional Construction Compounds are proposed, as follows:

- Part of a communal grass area immediately to the west of the station works (CC-9000);
- Part of a vehicular turning area immediately to the east of the station works (CC-9050); and
- Part of a car park on a nearby industrial estate (CC-9200).

The nearest road link of strategic importance is the R139 which joins the M50/M1 in the west via Junction 3. The proposed Construction Compound (CC-9200) would be accessed from the R139 via the Baldoyle Industrial Estate.

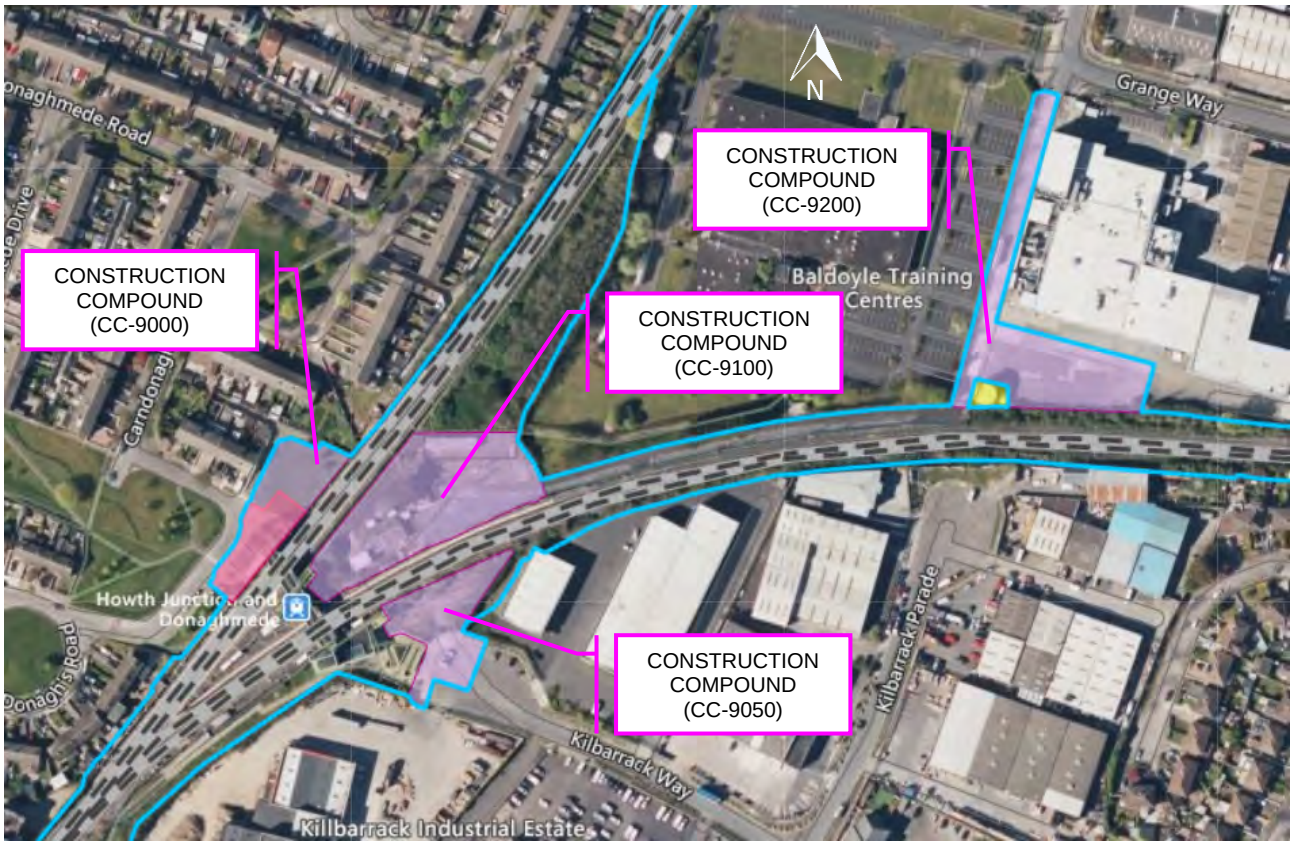

Image 5-17 Howth Junction & Donaghmede Station – Proposed Construction Compounds (Source: ESRI)

Image 5-18 Howth Junction & Donaghmede Station – Proposed Construction Access Routes (Source: ESRI)

5.5.2 Clongriffin Station works

5.5.2.1 Overview of works required

Clongriffin Station comprises three platforms: Platform 1 is located on the Up Dublin Line. Platform 2 is located on the Down Belfast Line and Platform 3 is located on a passing loop off the Down Belfast Line. Access to the platforms is provided by an existing pedestrian footbridge (OBB18D) at the station. The station was designed with a fourth track in mind and has consequently an unused platform face on the east side, named as Platform 0, which is not currently served by track.

The proposed work to be undertaken is as follows:

- The construction of a new track on the east side of the station inclusive of a new bridge (UBB19A), culvert extension (UBB18B), retaining wall and embankment;
- The opening of Platform 0 to receive operational traffic;
- The construction of a new SEB and TER; and
- The installation of two new turnouts to connect the new track to the Up Dublin Line.

It is proposed to provide a reinforced concrete retaining wall structure on earthwork 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. North of the station area it is proposed to provide an embankment, and an extension to the existing culvert (UBB18B) as well as a new underbridge (UBB19A), adjacent to UBB19 to accommodate the additional track.

Image 5-19 shows where works are planned at Clongriffin Station. A construction access route approximately five metres wide is planned for manoeuvring construction plant and materials up and down adjacent to the works, this being immediately alongside a plot being developed by others. Attentive management of this interface is ongoing.

The Construction Compound (CC-10600) area for the works associated with the Proposed Development has been selected to minimise impact with the adjacent development plot, though a shared vehicular construction access route is proposed to and from the north.

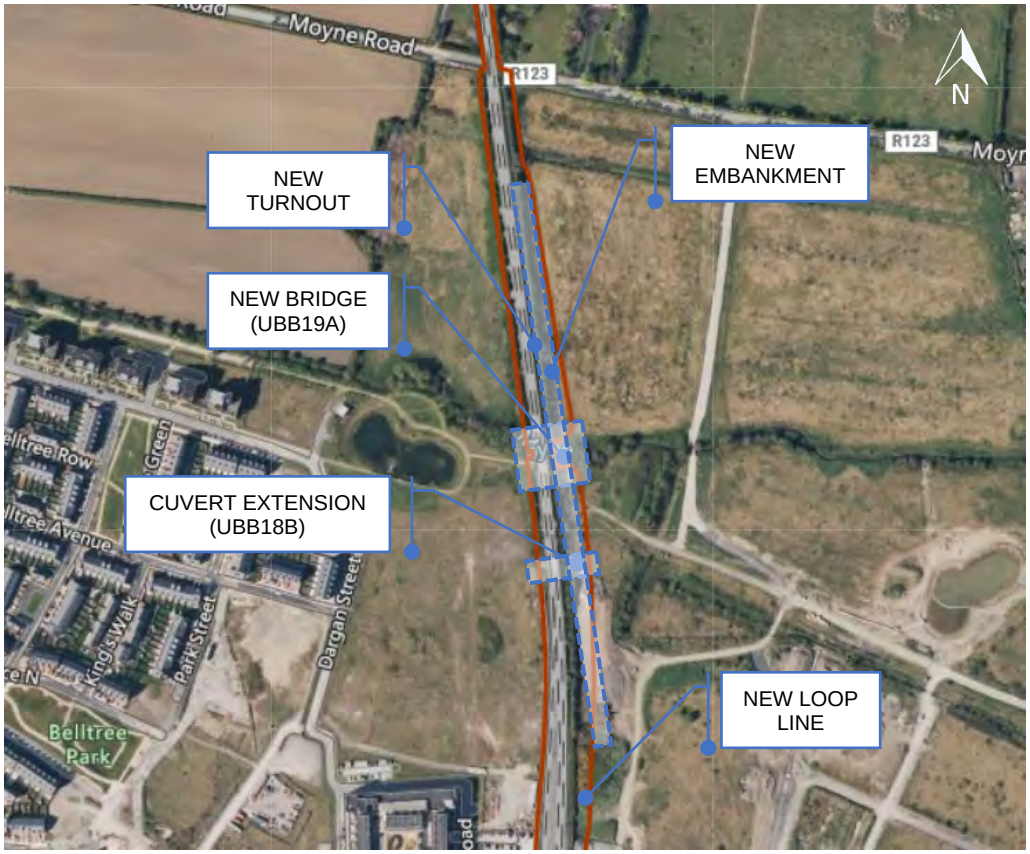

Image 5-19 Clongriffin Station – Overview of Proposed Works (Source: ESRI)

5.5.2.2 Construction methodology

Construction methodology for works at Clongriffin Station will depend on the sequencing of the works with the potential development to the east of the station. This will be managed through ongoing interface management.

Slope stabilisation is expected to be needed before some wall sections can be constructed. In addition, localised minor excavation may be needed for construction plant to manoeuvre, followed by construction of the concrete wall on concrete pad foundations, laid on compacted fill. Other sections of the wall will be built using in-situ concrete capping beams and thereafter a concrete wall. Once sections of the retaining wall have been built, the area behind the wall will be backfilled with appropriate material and compacted.

The new Mayne River Bridge will need earthworks as well as piling and insitu concrete formation to construct new abutments. These will then have precast concrete arch sections laid between them, followed by precast parapet sections, panels, and guardrails. These works are planned to be undertaken largely in normal working hours with some works required during non-disruptive night time periods. Track will lastly be laid on top.

For earthworks, construction plant is likely to involve medium sized excavators, rollers, several dumpers and potentially some small bulldozers. There will need to be a limited number of track possessions to tie in the existing tracks with the new track, either during night possessions or sharing weekend possessions with other works.

The track works which will follow on from the civils will use the methodology for permanent works outlined in Section 5.3.5. At least the tie-in aspects of these works will need to be undertaken during track possessions.

5.5.2.3 Construction Compounds and Construction Access Routes

On the east side of Clongriffin Station, where most works for the Proposed Development are needed, extensive third-party development plans are being progressed, primarily involving new housing to the east and a new park to the north. A Construction Compound (CC-10600) is proposed to be sited between the third-party development area and the railway tracks, to support both Clongriffin Station works and local line-wide works.

Image 5-20 Clongriffin Station – Proposed Construction Compounds (Source: ESRI)

The nearest road link of strategic importance to the proposed Construction Compound is the R123 (Moyne Road) to the north which joins onto the M50/M1 to the west via the R139 and Junction 3. It currently provides access for a new road leading to the ongoing housing construction adjacent to the station. It is assumed that this road will be shared between the appointed contractors for the Proposed Development and the housing developers.

Construction traffic would make use of the regional road network and access the site via the R107 and R139. Underbridge UBB20, where the R123 crosses under the railway, has a clearance of 3.85m. This will restrict larger construction vehicles; in which case such vehicles would need to approach this area via the R106 Coast Road to the east. Construction traffic will be restricted to the regional road network (R-routes) as far as possible. These routes are designed with the functionality of accommodating mobility needs of HGVs in mind. Options to travel along Station Road or Red Arches Road (local roads) are therefore not recommended. General construction access should be along the R123, R106 and R809. Details for appropriate traffic management will be further developed by the Contractor prior to construction. The safe crossing of the Portmarnock Greenway and the safety of the Moyne Park community during construction will be detailed in the Contractor's CTMP.

Image 5-21 Clongriffin Station – Proposed Construction Access Route (Source: ESRI)

5.5.3 Malahide Turnback

5.5.3.1 Overview of works required

A turnback is to be constructed on a widened embankment between the Strand Road underbridge (UBB29) and the Malahide Viaduct (UBB30). This will require the construction of a new modular reinforced earth wall and earthworks slope on the west side of the existing embankment

Image 5-22 Malahide Turnback – Overview of Proposed Works (Source: ESRI)

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 a limestone style grey façade finish, in keeping with the existing embankment, with low planting, such as a native wildflower/grass seed mix suitable for coastal areas on the slope. A typical section is shown in Image 5-23 below.

A dark grey paladin style fence will be provided to prevent trespass onto the railway corridor. 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

5.5.3.2 Construction methodology

Construction of the turnback will involve setting up Construction Compounds and access routes, including the clearing of site vegetation where necessary. To enable the construction of the modular reinforced earth wall and widened embankment, the existing rock armour and a portion of the existing embankment will need to be excavated down to a suitable formation level for the wall. The wall's block facing will be supported on a small strip footing. If soft spots are encountered, these will be excavated and replaced with suitable engineering fill materials.

The reinforced earth wall is then constructed by placing the modular block wall elements, geotextiles and appropriate fill and compacting it in layers. A 1 in 2 (vertical to horizontal) earthworks slope with appropriate fill material and a topsoil finish layer will be constructed to build up the remaining height of the embankment, to track level. The proposed fill materials will be benched into the existing embankment and a geotextile fabric placed along the final excavation level, running under the proposed wall and earthworks fill materials. Slope stabilisation works may include the installation of soil nailing.

It is proposed that the modular blocks will have a limestone style grey façade finish, in keeping with the existing embankment, with low planting, such as a native wildflower/grass seed mix suitable for coastal areas on top of the slope. Where fencing is provided, it would consist of a dark grey paladin style.

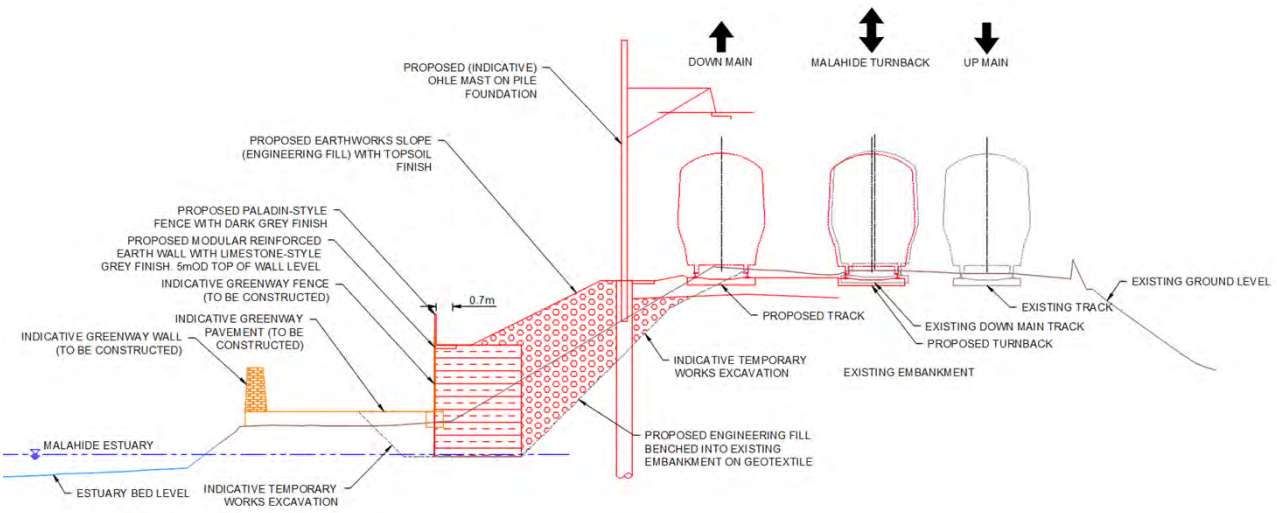

Image 5-23 Typical Section of new Malahide Turnback Modular Reinforced Earth Wall

Construction plant for these operations will include excavators, dump trucks, rollers (compactors) and a variety of heavy goods vehicles (HGVs) including tipper trucks, low loaders, and concrete wagons. Additionally, there is the potential for a soil nailing equipment, drilling rig, grout pump and mixers if further stabilisation measures are identified.

The construction works will impact on the Broadmeadow Way greenway (if in place prior to the commencement of construction) with the full width of the greenway being reduced for the duration of construction. Working space will vary along the wall but will be kept to the minimum to ensure a minimum 2m width of greenway is maintained to reduce the impact on the newly constructed greenway. Phasing of the work in small sections will also be used to limit the impact to the greenway and the existing embankment. The phasing and reduced width sections will continue over the full construction duration.

Access to the work front for the wall will only be available from the south direction for operations and suitable traffic management plans are to be in place to be most efficient. Key activities will include using an excavator to remove rock armour and excavate into the existing embankment, loading tipper trucks to remove rock armour, unloading low loader trucks with wall elements and geotextiles, and discharging concrete wagons, as well as then ultimately placing the earthworks and topsoil backfill material and access equipment to install the fence. If soil nailing is required, these operations will be carried out during daytime hours only.

Key to the delivery of the turnback and associated infrastructure will be the construction interface with the live operational railway. In addition, the existing OHLE extends along where the turnback is planned to be built but ceases close to its northern end. The staging of the construction works and temporary reduction of the existing OHLE just north of Malahide Station will need to be agreed by the Contractor with IÉ and checked against operational requirements and timetabling to set out the proposed possession strategy to facilitate the construction. .

The railway works due to follow the civil works will use the methodology outlined in section 5.3.5, making use of both daytime and night-time possessions. These will be managed to minimise the disruption to both railway operations and the local community as far as reasonably possible.

The overall duration of the wall works will be dependent upon what track possessions are available to undertake the works. Given the proximity to local residents, careful consideration has been given to the mitigation of impacts on residents throughout construction. Appropriate mitigation measures have been considered throughout the EIAR. All works will also be undertaken in accordance with Appendix A5.1 (CEMP) in Volume 4 of this EIAR.

5.5.3.3 Construction Compounds and Construction Access Routes

Construction Compounds

It is proposed to use five local Construction Compounds for the turnback works. The access to the main worksite for construction of the proposed modular reinforced earth wall and modified embankment is planned to be supported from a Construction Compound adjacent to Bissett's Strand on the west of the railway. This compound would primarily be used for construction plant movements, staff welfare facilities and short-term material storage. The main worksite would be supported from an additional compound located to the south of the Malahide Yacht Club on Sea Road (L2130). This is due to the limited space available for laydown and storage of materials to the west of the embankment. The use of the support compound will be subject to seasonal restrictions, i.e., only in use during the period May to September, to ensure against any potential adverse biodiversity impacts, as detailed in Chapter 8 (Biodiversity). Additionally, given that this compound is located within a potential tidal flood zone, its use is restricted to material storage and laydown, with adequate controls in place, along with the restricted use of the compound (see seasonal restrictions above) further reducing the risk. Image 5-24 shows the entrance points to both compounds.

Image 5-24 Photos of the proposed support and main (embankment) construction compound locations (Source: Google)

As detailed above, the proposed Broadmeadow Way greenway will be impacted during construction (if it is in place at that time), with occupation of part of the greenway needed to enable construction of the wall. At these times a temporary reduction in the greenway width to 3m will be in place to maintain acceptable levels of pedestrian and cyclist access on the greenway for the public.

The main compound for the railway works is planned to be in the car park immediately south of the wastewater treatment plant with an additional compound at Strand Road supporting the main worksite, to be used for construction plant movements and short-term material storage. Image 5-25 shows the entrance points for the central and southern compounds.

Image 5-25 Photos of the proposed main (turnback) and south east construction compound locations (Source: Google)

It is proposed that the access road to the wastewater treatment plant will be shared between the contractor, for construction compound access, and the wastewater treatment plant to enable construction of the turnback and viaduct works. Suitable traffic management plans will be in place to maintain acceptable levels of vehicular access for the wastewater treatment plant.

The northern section of the site is planned to be supported from a Construction Compound in the marina boatyard as well as the compound immediately south of the wastewater treatment plant, for overall ease of logistics. This is also planned in conjunction with the Malahide Viaduct works as such works will also need a Construction Compound in the same area.

Construction Access Routes

Construction access by water has been ruled out due primarily to insufficient water depth, poor mooring opportunities for construction marine vessels and level differences.

The nearest road link of regional importance is the R106 Swords Road / Dublin Road / Main Street which joins the M1 to the west via the R132 and R125 at Junction 3. This road provides the best form of access to the site, through the village of Malahide, leading to the Malahide Wastewater Treatment Access Road. A low-clearance underbridge (UBB29) on Bissett's Strand (2.2m headroom) segregates access between the Construction Compounds on the east and west of the railway. Therefore, access to the Construction Compounds on the west of the railway will be accessed from the R106 via the L2130 and L2133 to the proposed site access point on Bissett's Strand.

Options from the R106 to/from the two Construction Compounds on the east of the railway were considered. New Street has Part 8 planning permission for pedestrianisation and is therefore not an option. Townyard Lane (northbound only) is very narrow with a lot of activity around the shop / restaurant area at the northern end. Old Street (northbound only) is relatively wider with on-street paid parking adjacent and is currently accommodating buses and heavy vehicles accessing a treatment plant in the Marina. James' Terrace (southbound only) is relatively wide with on-street paid parking, a bus stop and taxi lay-bye adjacent. It is therefore recommended that the main construction access route will be via Old Street (northbound) and James' Terrace (southbound). General construction access along the public road will take place between 10 am and 4pm avoiding peak hours and nighttime.

A high level swept path analysis based on aerial photography and OS mapping was carried out along the proposed access routes. It was found that a standard construction vehicle (12m rigid truck) can be accommodated within the current available road cross-section. Larger vehicles, such as the 16.5m articulated truck would require additional traffic management, such as the removal of on-street parking in certain locations in order to be accommodated, especially if being used regularly throughout construction. It is therefore recommended that construction vehicles be restricted to 12m rigid trucks and that larger vehicles follow the permitting requirements for abnormal loads. In case of abnormal loads, the most appropriate access route will be determined by the contractor for the specific load and the specific vehicle type. The appropriate route for abnormal loads may be James' Terrace, in which case it may temporarily be required to be changed to accommodate two-way traffic, in order to accommodate an occasional articulated truck or abnormal load.

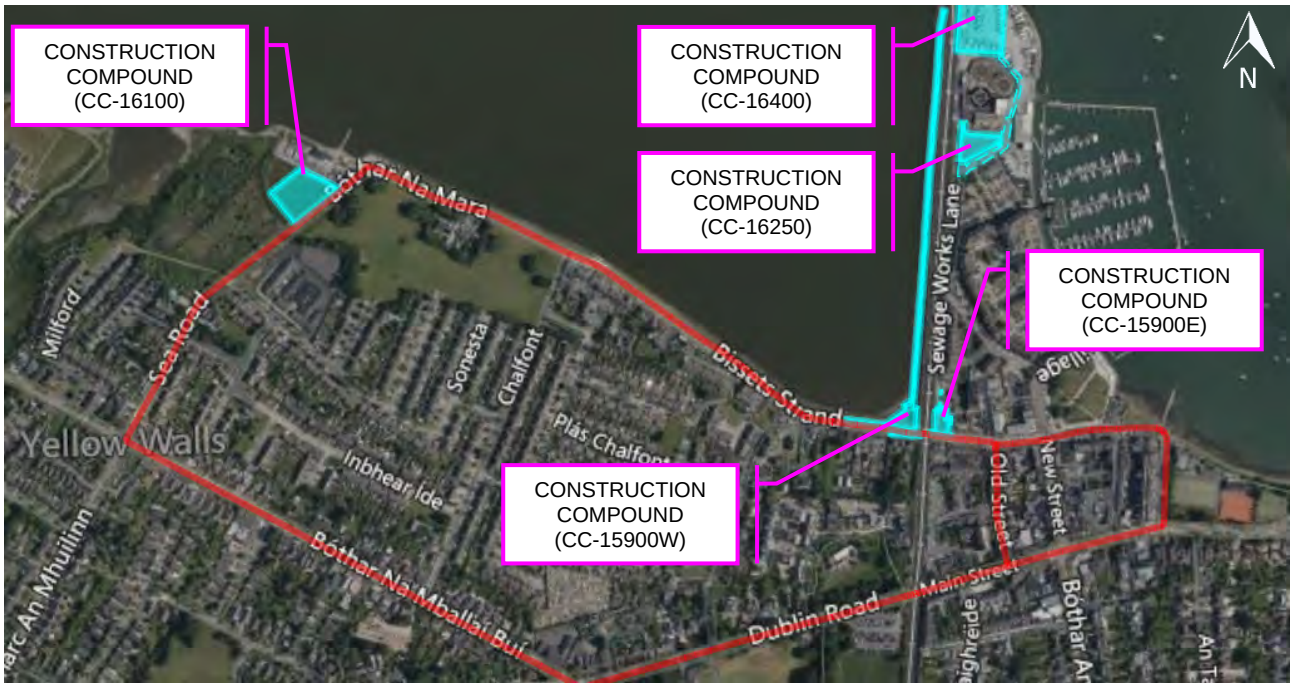

Image 5-26 Malahide Turnback – Proposed Construction Compounds (Source: ESRI)

Image 5-27 Malahide Turnback – Proposed Construction Access Route (Source: ESRI)

5.5.4 Malahide Viaduct works

5.5.4.1 Overview of works required

Malahide Viaduct is a 176m long viaduct over a tidal estuary. There are three new OHLE supporting frames to be installed on Malahide Viaduct.

Image 5-28 Malahide Viaduct – Overview of Proposed Works (Source: ESRI)

Image 5-29 Photos of Malahide Viaduct (west elevation and deck ballast/handrail)

5.5.4.2 Construction methodology

5.5.4.2.1 Proposed OHLE Support at Pier 3

The recently constructed (2009) superstructure at Spans 4 and 5 comprises prestressed concrete beams with a cast in-situ deck slab and reinforced concrete edge beams supporting the bridge parapet. It is proposed to utilise the existing parapet connection at the location of Pier 3 to support the OHLE masts. Additional anchor bolts will be installed in the edge beam to support the OHLE post and transfer the load into the supporting deck slab and beams.

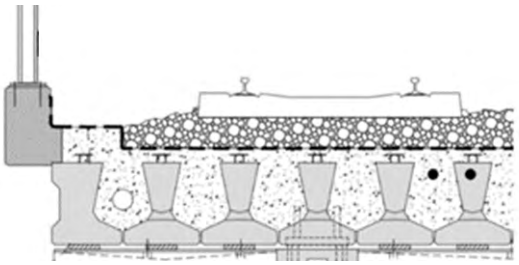

Image 5-30 Section for proposed OHLE support at Pier 3 of Malahide Viaduct

The OHLE post will align with the centre of the existing parapets. Hence, it is proposed to modify the existing parapet at the location of the OHLE post by stopping it short to align with the post either side.

The proposed construction sequence for either side of the pier is:

1. Cut back the existing pedestrian guardrail and finish off with new vertical;
2. Cut back the existing hold-down bolts and make good;
3. Drill and grout in new anchor bars;
4. Install OHLE post.

It is planned that these works will be undertaken over the course of a weekend possession, for each gantry. The gantries would then be erected during non-disruptive possessions as part of the wider OHLE gantry erection works.

5.5.4.2.2 Proposed OHLE Support at Piers 6 and 9:

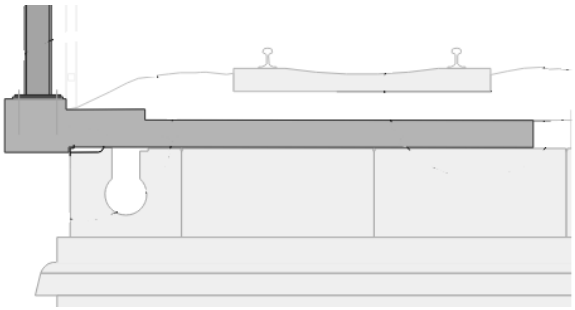

Image 5-31 Section for piers 6 and 9 OHLE supports of Malahide Viaduct

A reinforced concrete pad footing is proposed to support the OHLE masts at Piers 6 and 9. The footing will sit within the ballasted depth of the track and above the deck beams at the piers. To reduce construction duration, it is proposed that the support slabs be constructed as precast elements which are lowered into position.

The precast slabs will be positioned directly above the existing beams, which have the potential to create an uneven support surface. To avoid hard-spots beneath the slab, it is proposed to place them on mastic asphalt, framed at the extremities by elastomeric strip bearings.

A review of records from IÉ and utility providers identifies that several power and communications services are carried by the bridge. It is proposed to temporarily either protect these or to move them (given sufficient slack) before repositioning them later above the slabs.

The proposed construction sequence for OHLE works on either side of the piers is:

1. Remove track and sleepers over designated length;
2. Remove ballast material and locally divert services;
3. Remove pedestrian guardrail over designated length;
4. Break down concrete nib locally to facilitate placement of support slab and make good;
5. Clean out deck joints and re-seal;
6. Place elastomeric strips and mastic asphalt layer;
7. Install precast concrete slab;
8. Reinstall pedestrian handrail guardrail; and
9. Reinstall services, ballast material, track, and sleepers.

It is planned that these works will be undertaken over a weekend possession along with several weeks of preparatory work in engineering hours for the gantry foundations. The gantries would then be erected during non-disruptive or weekend possessions as part of the wider OHLE gantry erection works.

5.5.4.3 Construction Compounds and Construction Access Routes

The proposed Construction Compound location for Malahide Viaduct works is south of the viaduct in part of the Malahide marina boatyard. A temporary road rail access point would need to be installed to enable access on and off the tracks, along with a temporary new ramp between the tracks and boatyard. Having a Construction Compound here would alleviate the need to bring construction plant, personnel, and materials along the railway, thus reducing the risk of delay. Access to this compound is described in Section 5.5.3.

Image 5-32 Malahide Viaduct – Proposed Construction Access Route (Source: ESRI)

5.5.5 Level Crossing Closure (XB001)

5.5.5.1 Overview of works required

The user worked level crossing (XB001) is due to be closed as part of the electrification work.

5.5.5.2 Construction methodology

The existing access will be permanently closed, and gates replaced with fencing.

5.5.5.3 Construction Compounds and Construction Access Routes

This site is planned to be accessed via the railway from the Donabate Substation Construction Compound (CC-18800) using road rail vehicles. Activities will be scheduled to fit in around other works requiring possessions along the same section of railway.

5.5.6 Utility Diversions

Below is a brief overview of the utility diversions required in this zone. Further details of the diversions required are described in Chapter 4 (Description of the Proposed Development) and assessed in Chapter 18 (Material Assets: Utilities) in Volume 2 of this EIAR.

5.5.6.1 Electricity

Existing electricity infrastructure has been identified in the zone, including HV transmission lines, as well as MV and LV distribution lines.

Underground line - South of Clongriffin (UG-PDV15)

One underground diversion (UG-PDV15) for an MV asset is required that is capable of being conducted via standard means.

Image 5-33 UG-PDV15 – South of Clongriffin Station (Ch. 10,050)

5.5.6.2 Telecommunications

Telecommunications infrastructure interacts with the railway tracks in both the northern and easterly directions within this zone. To the east, Virgin Media ducts cross the tracks along the Baldoyle Road. No other telecommunication infrastructure has been noted between Howth Junction and Donaghmede Station and Howth Station. No conflicts or diversion requirements with the existing telecommunication infrastructure assets have been identified in this section of the area.

To the north, the previously identified BT ducts running parallel to the tracks from Zone A continue through Zone B in close proximity to the tracks. These ducts are believed to cross the tracks in four locations. Virgin Media, Eir and ESB telecom ducts cross the tracks at a further 18 no. locations, however these are predominantly confined to existing bridges. Crossing the Malahide Estuary, both Eir and BT ducts run parallel to the tracks in the confined section. One Vodafone tower was identified as having an existing telecommunication asset at the Malahide Station.

5.5.6.3 Gas

No conflicts or diversion requirements with the existing gas infrastructure assets have been identified in this area.

5.5.6.4 Sewer and watermain.

There is one locations where one surface water, and one gravity foul diversions are required along this zone.

Underground lines - South of Clongriffin (UDV-8 & UDV-9)

At Clongriffin station, realignment works are proposed which would require new tracks adjacent to Myrtle Close. Existing 225mm foul sewer (UDV-8) and 225mm surface water (UDV-9) services located along the track at the east side would require diversion.

Image 5-34 UDV-8 & UDV-9 – Clongriffin Station (Ch. 10,250)

5.5.7 Otter Crossing

An otter crossing will be constructed across the railway by installing a 600mm diameter pipe located just south of the River Pill (approximate chainage 18+100).

5.5.7.1 Construction methodology

This will be constructed using open trench methods using track mounted Road Rail Vehicles (RRVs) during track possessions, one half at a time. No additional construction land take is required. The contractor will comply with Appendix A5.1 (CEMP) throughout to ensure that nearby environmentally sensitive sites are protected during the works.

Once the pipe has been installed, appropriate scour protection will be provided and an otter proof fence will be erected alongside, using RRVs during non-disruptive track possessions.

5.5.7.2 Construction Compounds and Construction Access Routes

This site is planned to be accessed via the railway from the Donabate Substation Construction Compound (CC-18800) using road rail vehicles. Activities will be scheduled to fit in around other works requiring possessions along the same section of railway.

5.6 Zone C: North of Malahide Viaduct to south of Gormanston Station (Fingal boundary)

Zone C encompasses the area north of Malahide Viaduct to south of Gormanston Station. The zone includes four railway stations at Donabate, Rush & Lusk, Skerries and Balbriggan. Zone C lies within the boundary of Fingal County Council, bordering Meath to the north. Zone C covers Chainage: 18+600 to 39+400.

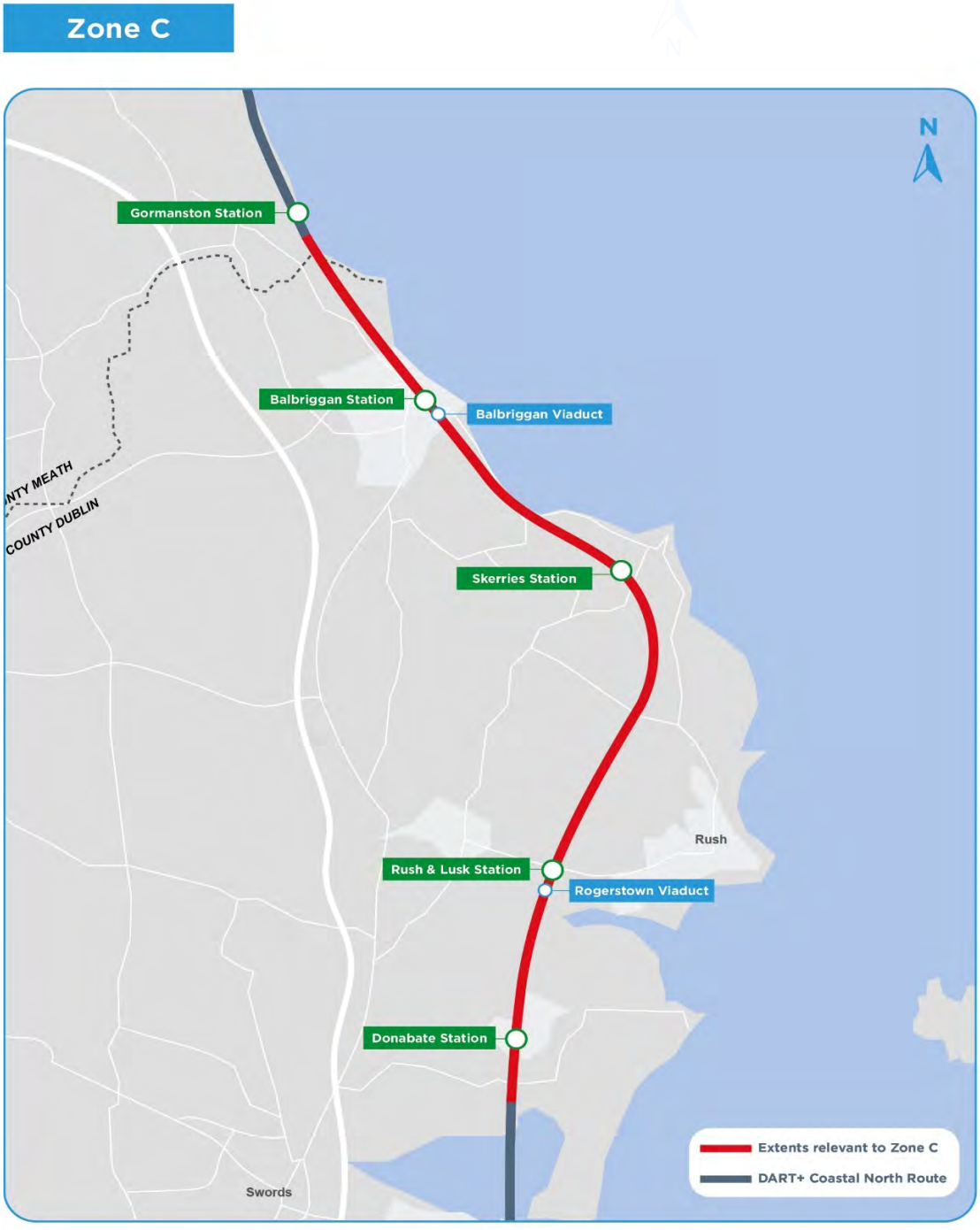

Image 5-35 Overview of Zone C (Source: ESRI)

Construction Phase works within Zone C will include:

- 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:
    - OBB32A (carrying the Donabate Distributor Road),
    - OBB35 (access to Beaverstown Golf Club),
    - OBB38 (carrying Rogerstown Lane),
    - 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:
    - 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.

More detail on the works required within this zone is provided in Sections 5.6.1 to 5.6.13. For further information on the listed parapet modifications refer to Section 5.3.7.1.

5.6.1 Donabate Substation

5.6.1.1 Overview of works required

The new Donabate Substation will be located on agricultural land to the south of Donabate. The associated Construction Compound (CC-18800) which is located adjacent to the substation site, is also planned to support line-wide works.

Image 5-36 Donabate Substation – Proposed Construction Compound (Source: ESRI)

5.6.1.2 Construction methodology

Construction of the substation will follow the scheme outlined in Section 5.3.8.1. The general duration of the works at this location is expected to be as follows:

- Civil works 3 months
- Equipment installation 3 months

In addition to substation works, there will be construction activity in support of line-wide works. The general duration of the works is expected to be up to 12 months.

5.6.1.3 Construction Compounds and Construction Access Routes

The land take required to construct the substation will be slightly larger than the permanent land take. This construction site is also proposed to support the line-wide works so additional land take is required beyond that required for the substation alone. Additionally, the Construction Compound (CC-18800) is well suited to support the works to the Rogerstown and Malahide viaducts to the north and south if a RRAP is created as part of the line wide works.

The nearest road link of strategic importance in this area is the R126 which links with the M1 to the west. Local site access will be a via a new access road off the L6165, this will also form the permanent access to the substation.

5.6.2 Rogerstown Viaduct Works

5.6.2.1 Overview of works required

There are two new OHLE supporting frames to be installed on the abutments of Rogerstown Viaduct.

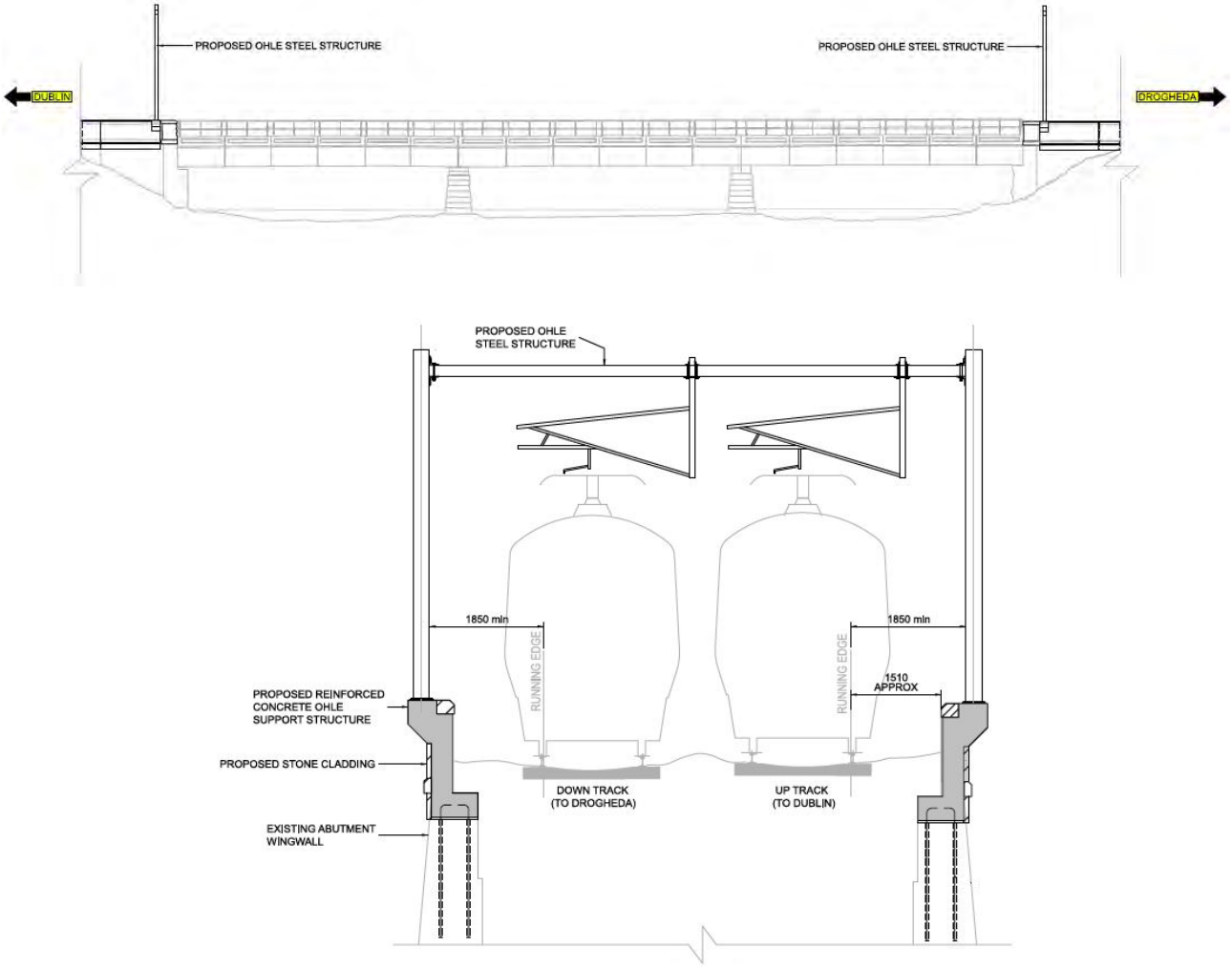

Image 5-37 Elevation and typical section of Rogerstown Viaduct showing proposed OHLE masts

Image 5-38 Photos of Rogerstown Viaduct from the east and of the north-eastern wingwall

5.6.2.2 Construction methodology

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 vertically into the wingwalls and grouted in place. An exposed concrete corbel will support the post locally with the remainder of the proposed reinforced concrete wall having a proposed stone cladding on the exterior face to match existing.

A review of records from IÉ and utility providers identifies that several power and communications services are carried by the bridge. It is proposed to temporarily move the services (given sufficient slack) and then reposition them adjacent to the reconstructed wingwall.

The construction sequence for each support will be as follows:

1. Existing wingwall stone parapet demolished, and ballast excavated locally to facilitate access.
2. Existing services temporarily diverted to facilitate construction.
3. Existing wingwall substructure demolished to slab formation level.
4. Vertical anchor bars drilled and grouted into existing wingwall substructure.
5. Proposed RC OHLE support wall poured with drilled bars anchored within proposed RC slab.
6. Waterproofing applied to substructure and ballast reinstated.
7. Install OHLE post.
8. Existing services reinstated following works.

It is planned that these works will be undertaken over the course of one weekend possession for each gantry foundation. The gantries would then be erected during non-disruptive possessions as part of the wider OHLE gantry erection works.

5.6.2.3 Construction Compounds and Construction Access Routes

There appears to be no viable site to locate a Construction Compound within 200 metres of Rogerstown Viaduct, with Rogerstown Park within the former Balleally landfill site to the north and a lack of roads to the south. Other more distant sites have been considered alongside the railway, but none found to be worthwhile establishing for the relatively brief period they would be needed in comparison to using compounds already planned for other works.

The nearest such compounds are at Rush and Lusk Station (CC-23500), and the two compounds proposed in the Donabate area (CC-18800 and CC-19800). Supporting the Rogerstown Viaduct works from one of these compounds will need to be factored around other workstreams using the tracks during possessions.

5.6.3 Rush and Lusk Substation and OHLE maintenance depot

5.6.3.1 Overview of works required

The new Rush and Lusk Substation will be located adjacent to the southern end of the existing eastern Rush and Lusk Station car park. There will also be a permanent maintenance compound in this location for the new OHLE, which will include a two-storey building with parking, storage areas, offices, and welfare facilities. The existing access road will be reconfigured to improve the safety of its junction with the public road, this requiring additional permanent land take.

Image 5-39 Rush and Lusk Substation – Proposed Construction Compound (Source: ESRI)

5.6.3.2 Construction methodology

Construction of the substation will follow the scheme outlined in Section 5.3.8.1. The general duration of the works at this location is expected to be as follows:

- Civil works 3 months
- Equipment installation 3 months

In addition to substation works, there will be construction activity surrounding the permanent maintenance compound as well as in support of line-wide works. The general duration of the works on the OHLE maintenance facility is expected to be as follows:

- Civil works 12 months
- Equipment installation 6 months

5.6.3.3 Construction Compounds and Construction Access Routes

The Construction Compound (CC-23500) is located on the east side of Rush and Lusk Station in the location of the new proposed substation. Irish Rail own sufficient land in the immediate vicinity to install the proposed Rush and Lusk substation and OHLE maintenance facility, but the existing access is proposed to be improved as part of the work and this will require permanent land take. This will enable separation of contractors' vehicles from the station car park, thus reducing risk of damage to public vehicles, as construction vehicles would otherwise need to pass between rows of parked cars.

The nearest road link of strategic importance in this area is the R127 which links Skerries, Balbriggan and Lusk with the M1. Local site access will be off the R128 (Station Road). The existing access between the station and R128 involves a sharp turn; it is planned that this is realigned as part of the permanent works. Once undertaken it will enable improved access for both public and contractors' vehicles.

Image 5-40 Rush and Lusk Substation – Proposed Construction Access Route (Source: ESRI)

There is also an existing railway maintenance compound at the southern end of the station car park which will attract vehicle movements.

Image 5-41 Road rail access point (RRAP) at Rush and Lusk (Source: Arup)

5.6.4 Station Road (OBB39) track lowering works

5.6.4.1 Overview of works required

OBB39 (Station Road) is an overbridge located immediately north of Rush and Lusk Station. Works are required to lower the track level under the bridge by less than 0.1m.

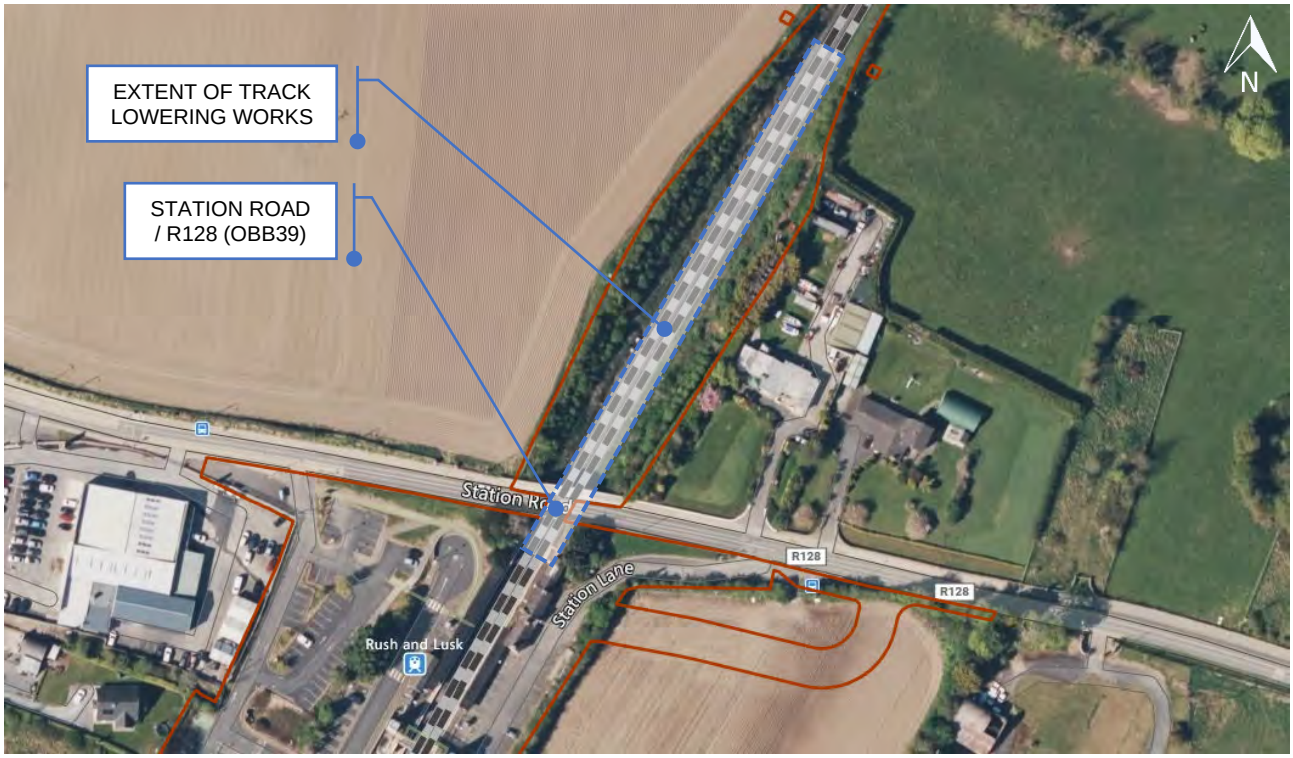

Image 5-42 Extent of track lowering works at Station Road (OBB39) (Source: ESRI)

Image 5-43 Photo of OBB39 elevation looking north (Source: IÉ)

5.6.4.2 Construction methodology

The track lowering works will follow the construction methodology proposed in Section 5.2.3.2 lowering one track at a time over a weekend closure whilst utilising the other track for access. The overall duration of the works will depend on the availability of weekend possessions.

5.6.4.3 Construction Compounds and Construction Access Routes

Given the proximity of the RRAP and proposed line-wide Construction Compound at Rush and Lusk Station (CC-23500) a separate Construction Compound to support the track lowering work is not required.

5.6.5 Tyrrelstown Bridge (OBB44) track lowering works

5.6.5.1 Overview of works required

OBB44 (Tyrrelstown) is an overbridge located approx. 1400m north of Rush and Lusk Station. Works are required to lower the track level under the bridge by approximately 0.4m.

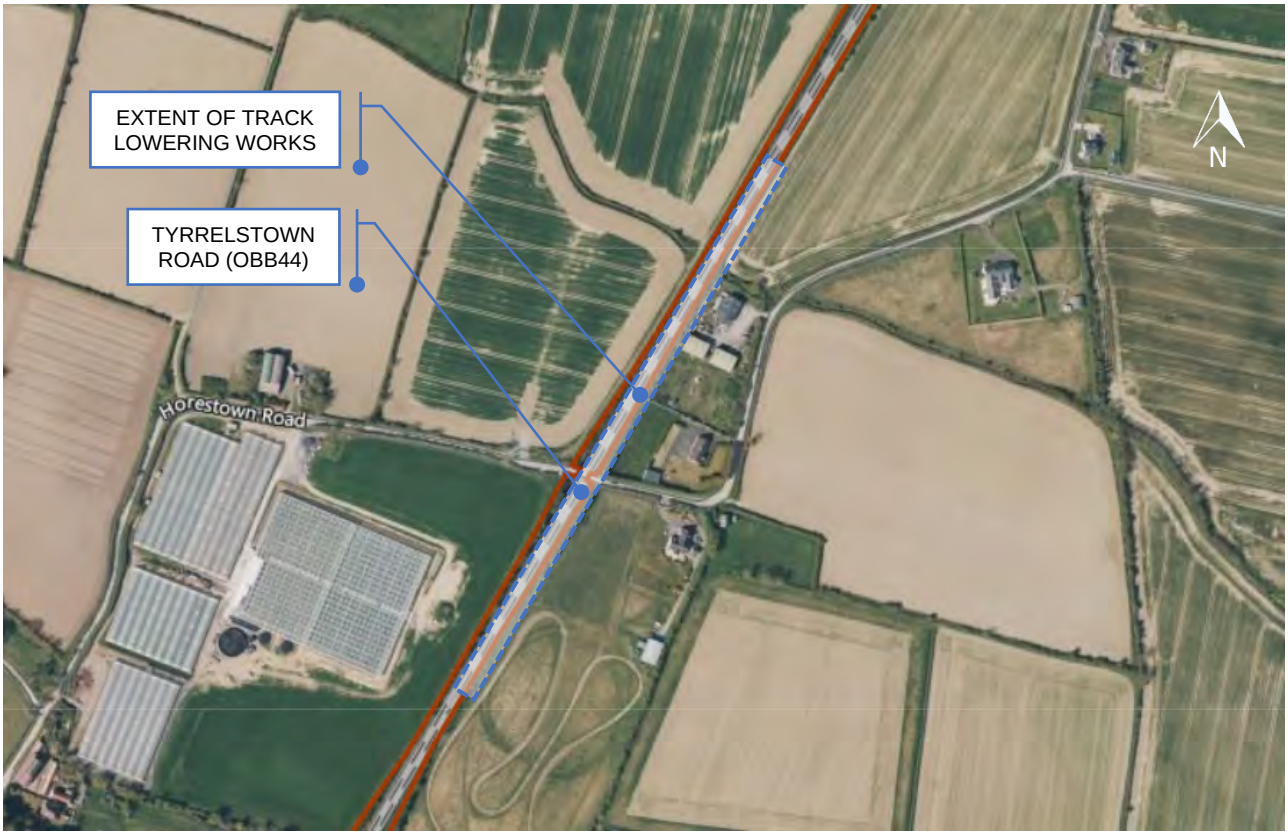

Image 5-44 Extent of track lowering works at Tyrrelstown (OBB44) (Source: ESRI)

Image 5-45 Photo of OBB44 elevation looking north (Source: IÉ)

5.6.5.2 Construction methodology

The track lowering works will follow the construction methodology proposed in Section 5.2.3.2 lowering one track at a time over a weekend closure whilst utilising the other track for access. The overall duration of the works will depend on the availability of weekend possessions.

5.6.5.3 Construction Compounds and Construction Access Routes

The proposed Construction Compound (CC-25626 (W)) for these track lowering works is located to the West of OBB44 in agricultural land outside the IÉ land boundary. The bridge is surrounded by suitable fields. The option shown is deemed to minimise the impact to residents to the east of the bridge.

Image 5-46 Proposed Construction Compound at OBB44 (Source: Arup)

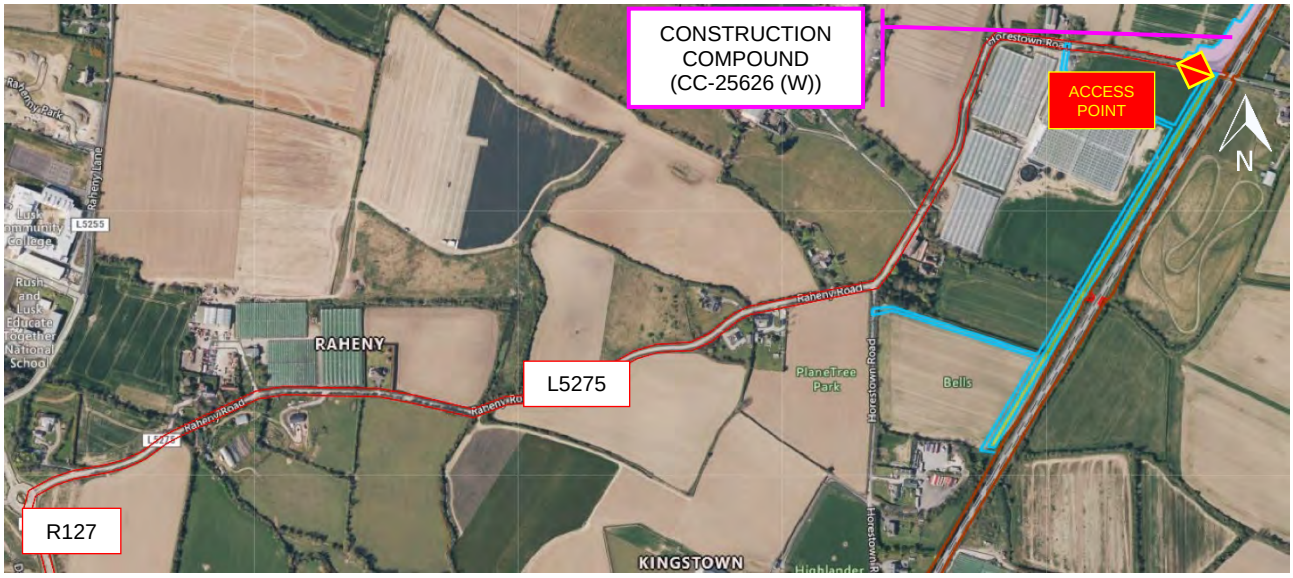

Image 5-47 Tyrrelstown (OBB44) – Proposed Construction Access Route (Source: ESRI)

The nearest road of strategic importance is the R127 which joins the M1 via the R132 to the south-west. Horestown Road and the adjoining lanes that would be used to reach the R127 are narrow and may constrain access to larger construction vehicles. There is also a notable height difference between this site and the track which is in a cutting. Therefore, larger construction vehicles required for track lowering works will be from the line-wide Construction Compounds proposed at Rush and Lusk Station (CC-23500) to the south.

5.6.6 Skerries South Substation

5.6.6.1 Overview of works required

The new Skerries South substation will be located on agricultural land to the south of Skerries, adjacent to the railway. The site is on the opposite side of the railway to Skerries Golf Club, adjacent to a small number of residential properties and a school. This new substation will be constructed to provide power to the OHLE.

Image 5-48 Skerries South Substation – Proposed Construction Compound (Source: ESRI)

5.6.6.2 Construction methodology

Construction of the substation will follow the scheme outlined in Section 5.3.8.1. The general duration of the works at this location will be as follows:

- Civil works 3 months
- Equipment installation 3 months

Most of the disruptions will come from the civil works, whereas the installation of the equipment and the tests will be less disruptive.

5.6.6.3 Construction Compounds and Construction Access Routes

The Construction Compound (CC-29000) is located on the east side of the railway in the location of the new proposed substation. The land take required to construct the substation will be slightly larger than the permanent land take. A new access road will be created off the east embankment of the existing overbridge which will serve as the substation access in the permanent case as well. Prior to construction of the new permanent access road, temporary access to the site would initially be via the farm access to the field to the east as shown in Image 5-50.

The nearest road link of strategic importance in this area is the R127 which links Skerries, Balbriggan and Lusk with the M1. Local site access will be off the R127 via Golf Links Road avoiding the town and low clearance bridge to the east.

Image 5-49 Skerries South Substation – Proposed Construction Access Route (Source: ESRI)

Image 5-50 Temporary access through farm entrance (Source: Arup)

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5.6.7 Skerries Track Paralleling Hut

5.6.7.1 Overview of works required

A new track paralleling hut (TPH) is required in Skerries off the Barnageeragh Road to the North of the station. It will be constructed in a similar manner to that described for the substations.

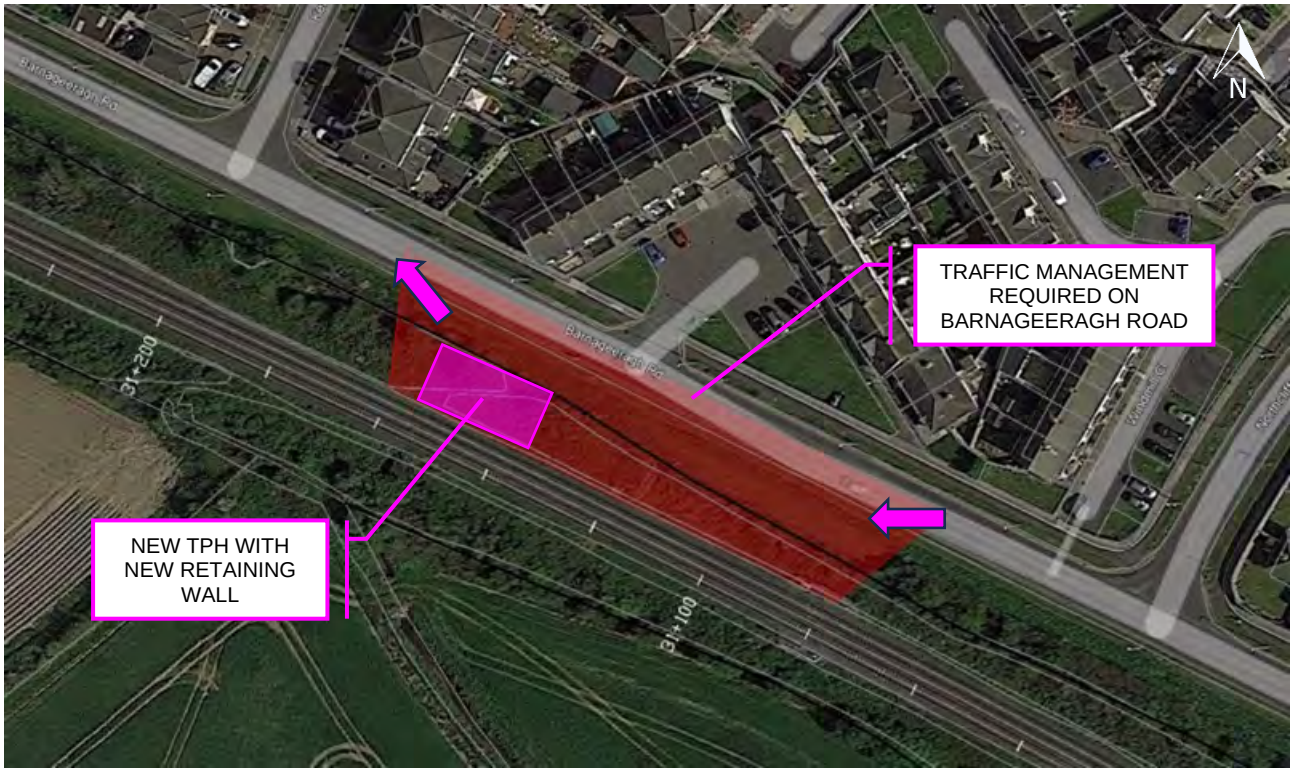

Image 5-51 Overview of Skerries Track Paralleling Hut

5.6.7.2 Construction methodology

Construction of the track paralleling hut (TPH) will follow the scheme outlined in Section 5.3.9. The general duration of the works at this location will be as follows:

- Civil works 1 month
- Equipment installation 1 month

Most of the disruptions will come from the civil works, whereas the installation of the equipment and the tests will be less disruptive.

5.6.7.3 Construction Compounds and Construction Access Routes

The extent of the Construction Compound is shown in Image 5-51, with traffic management required for a portion of the Barnageeragh road to enable access during the civil works and equipment installation phases.

5.6.8 Skerries North Substation

5.6.8.1 Overview of works required

The new Skerries North Substation will be located on agricultural land to the north-west of Skerries, adjacent to the railway. The site is adjacent to a small number of residential properties and a garden centre. The existing access road will need to be widened at the ninety degree corner to allow clearance for construction vehicles and fire tenders. This will require the removal of part of the existing stone wall which will be reinstated in the original style along the new boundary line.

Image 5-52 Skerries North Substation – Proposed Construction Compound (Source: ESRI)

5.6.8.2 Construction methodology

Construction of the substation will follow the scheme outlined in Section 5.3.8.1. The general duration of the works at this location will be as follows:

- Civil works 3 months
- Equipment installation 3 months

Most of the disruptions will come from the civil works, whereas the installation of the equipment and the tests will be less disruptive.

5.6.8.3 Construction Compounds and Construction Access Routes

The Construction Compound (CC-32200) is located on the west side of railway in the location of the new proposed substation. The land take required to construct the substation will be slightly larger than the permanent land take.

The nearest road link of strategic importance in this area is the R127 which links Skerries, Balbriggan and Lusk with the M1. However, at its nearest point to the site the R127 can only be accessed by passing under a nearby railway underbridge with a low clearance of 3.12m. Therefore, larger vehicles will have to access the Skerries North site via an alternative route to the South via the L1270. Local site access will be via a new section of road off the Barnageeragh Road/L1270, which will also serve as the substation access in the permanent case.

Image 5-53 Access to Skerries North Substation - Proposed Construction Compound Access (Source: ESRI)

5.6.9 Lawless Terrace Bridge (OBB55) track lowering works

5.6.9.1 Overview of works required

Overbridge OBB55 (Lawless Terrace Bridge) is located on the south side of Balbriggan in a built-up residential area. Works are required to lower the track level by approximately 0.3m under the bridge.

Image 5-54 Extent of OBB55 track lowering works (Source: ESRI)

Image 5-55 Photo of elevation of OBB55 from track level (Source: IÉ)

5.6.9.2 Construction methodology

The track lowering works will follow the construction methodology proposed in Section 5.2.3.2 lowering one track at a time over a weekend closure whilst utilising the other track for access. The overall duration of the works will depend on the availability of weekend possessions. It is noted that there are a number of sensitive receptors in the vicinity, so noise mitigation measures, as detailed in Chapter 14 (Noise and Vibration) will be required during works in this area. .

5.6.9.3 Construction Compounds and Construction Access Routes

Due to the developed nature of the surrounding area, the proposed works and the site topography, there is no suitable area in which to establish a Construction Compound directly adjacent to the site. Instead, it is envisaged that the work will be supported by one of the nearby Construction Compounds, the proposed line-wide works Construction Compound at the Balbriggan Substation site (CC-37700), just to the north Balbriggan.

5.6.10 Balbriggan Viaduct Modification

5.6.10.1 Overview of works required

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 proposal considers placing the masts at the 3rd and 8th pier locations, resulting in a 55m span between masts when viewed in elevation. The proposed design involves siting the OHLE posts on a replacement wider section of the pedestrian walkways to either side of the tracks on the viaduct outside the existing fence line.

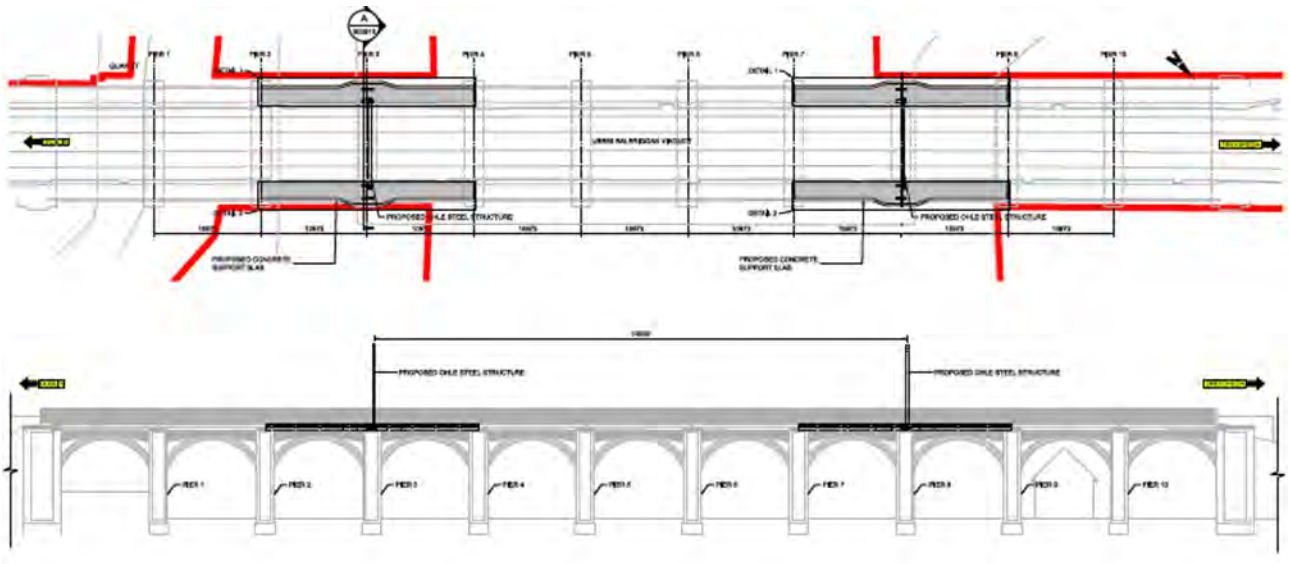

Image 5-56 Plan and Elevation of Balbriggan Viaduct (UBB56)

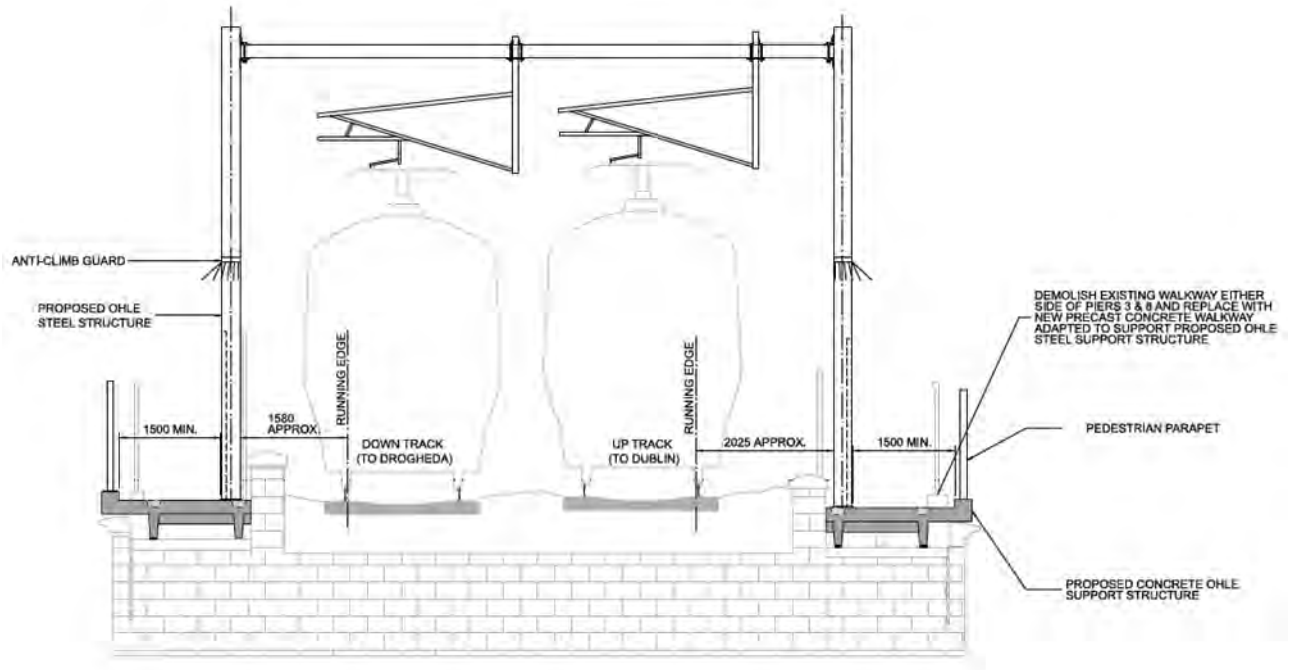

Image 5-57 Cross section of gantry installation

This option proposes to replace the pedestrian walkway spans either side of Piers 3 and 8 (see Image 5-56) with new precast concrete sections. The new spans will comprise precast concrete double-T-beams simply supported on elastomeric bearings. The OHLE post will be connected to the deck of one of the spans at each pier via a bolted base plate connection. The new walkway will widen out locally at the location of the OHLE masts to allow for suitable pedestrian passage.

5.6.10.2 Construction methodology

The construction sequencing proposals are summarised as follows:

1. Existing pedestrian spans to be lifted off bridge.
2. New elastomeric bearings to be put in place on existing piers.
3. New spans to be lifted into place on bearings.
4. Dowel bars to be installed and in-situ concrete “stitch” cast.
5. OHLE post to be installed.

It is planned that the work would be undertaken from the car park alongside the viaduct and Harbour Road in a comparable way to the reconstruction of the walkways in 2002. An indicative site arrangement is shown in Image 5-58. It is recognised that there are plans to redevelop the car park site by others. It may be that different parts of the car park are less disruptive to use than other parts, especially over different periods.

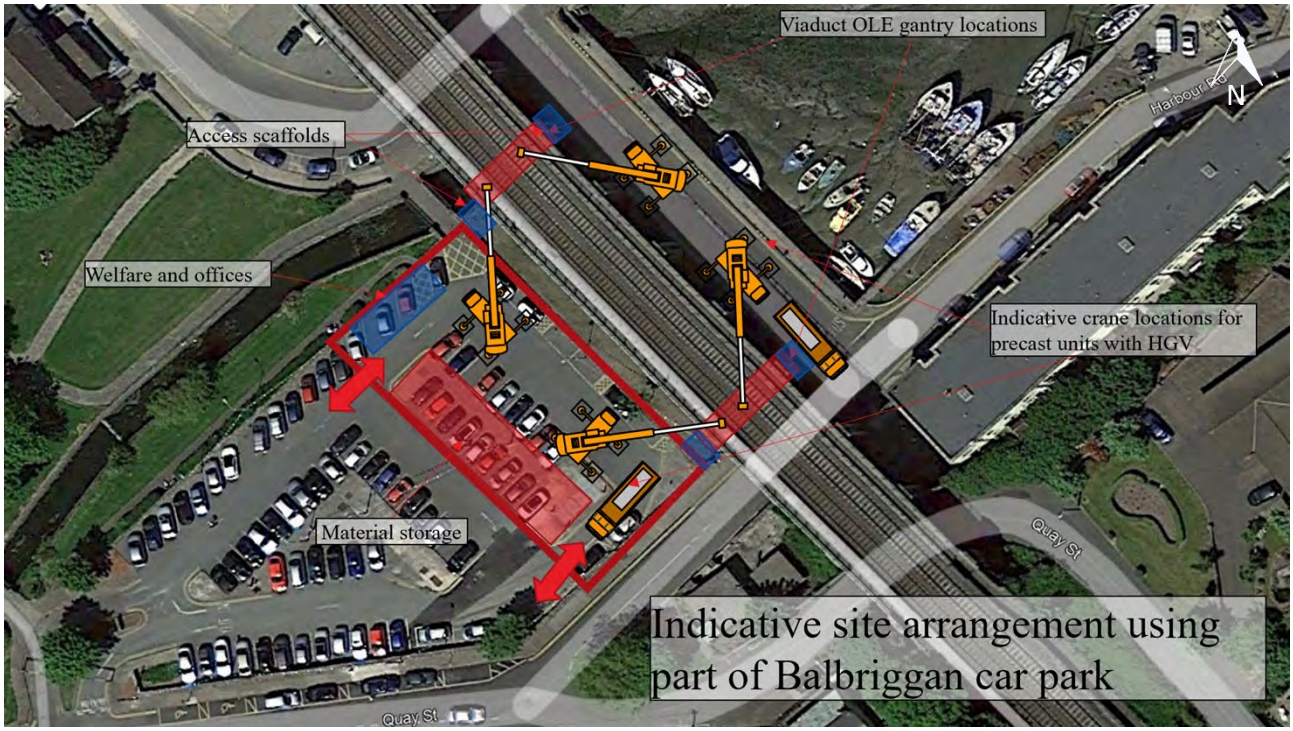

Image 5-58 Plan of site arrangement for UBB56 gantry installation

Image 5-59 Photos of the works carried out in 2002

It is planned that most of the works will be done offline from the railway, thus helping to reduce the requirement for track possessions. Some preparation works may be able to be undertaken during non-disruptive night time possessions but much will need to be performed during longer closure periods, for example at a weekend. The intention is to close only one footbridge section at a time, to retain ongoing pedestrian connectivity across the bridge. If this is not possible an alternative walking route would be established as shown in Image 5-60.

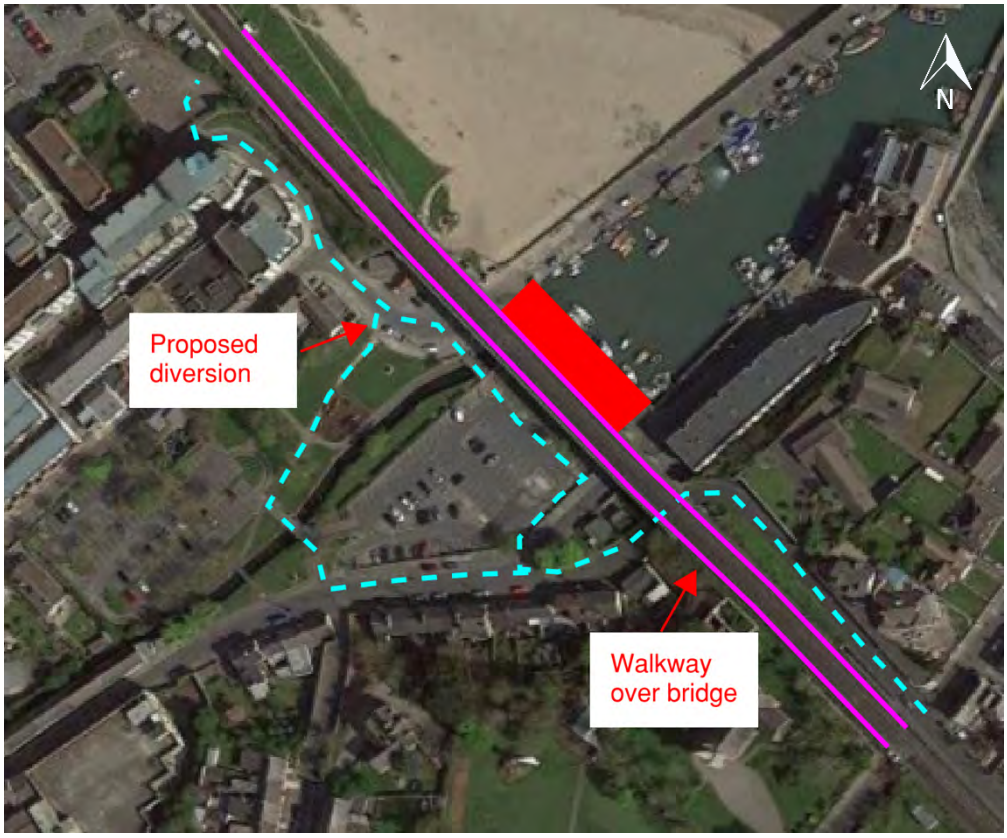

Image 5-60 Potential pedestrian diversion route during UBB56 modification

5.6.10.3 Construction Compounds and Construction Access Routes

The adjacent car park is the location for the proposed Construction Compound (CC-36000) for these works, to fit in with the evolving plans to redevelop the car park area. Discussion with the relevant stakeholders is ongoing to mitigate the impact on the Proposed Development as the project progresses.

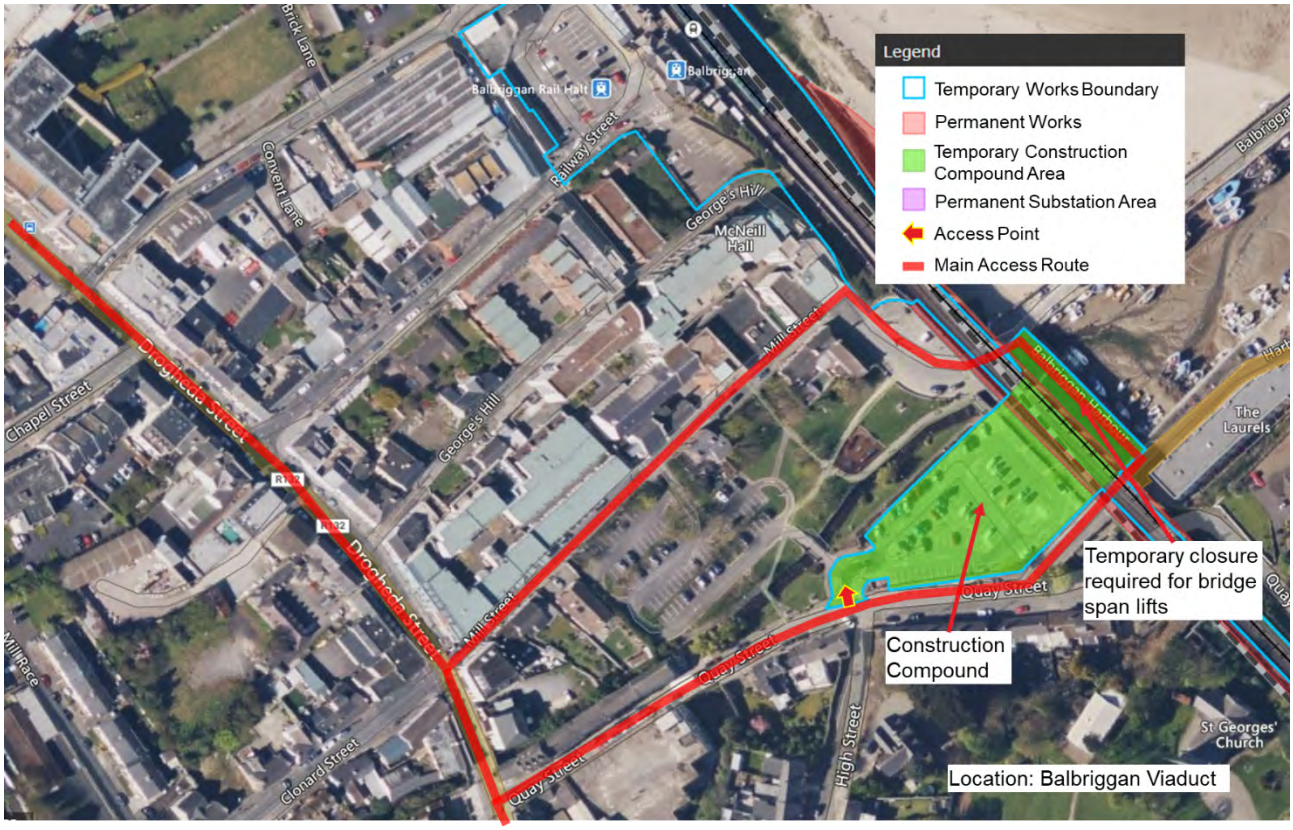

Image 5-61 Balbriggan Viaduct – Proposed Construction Compound and Access Route (Source: ESRI)

Image 5-62 Existing car park adjacent (Source: Arup)

During the Construction Phase it will be necessary to close Harbour Road overnight on several occasions, or over a small number of weekend days, to site a crane for lifting large structural sections onto or off the viaduct. Traffic would need to be diverted away from the area during these periods. The Construction Traffic Management Plan (CTMP), which forms part of the CEMP (Appendix A5.1), which will be further developed by the Contractor will co-ordinate this process with the relevant authorities.

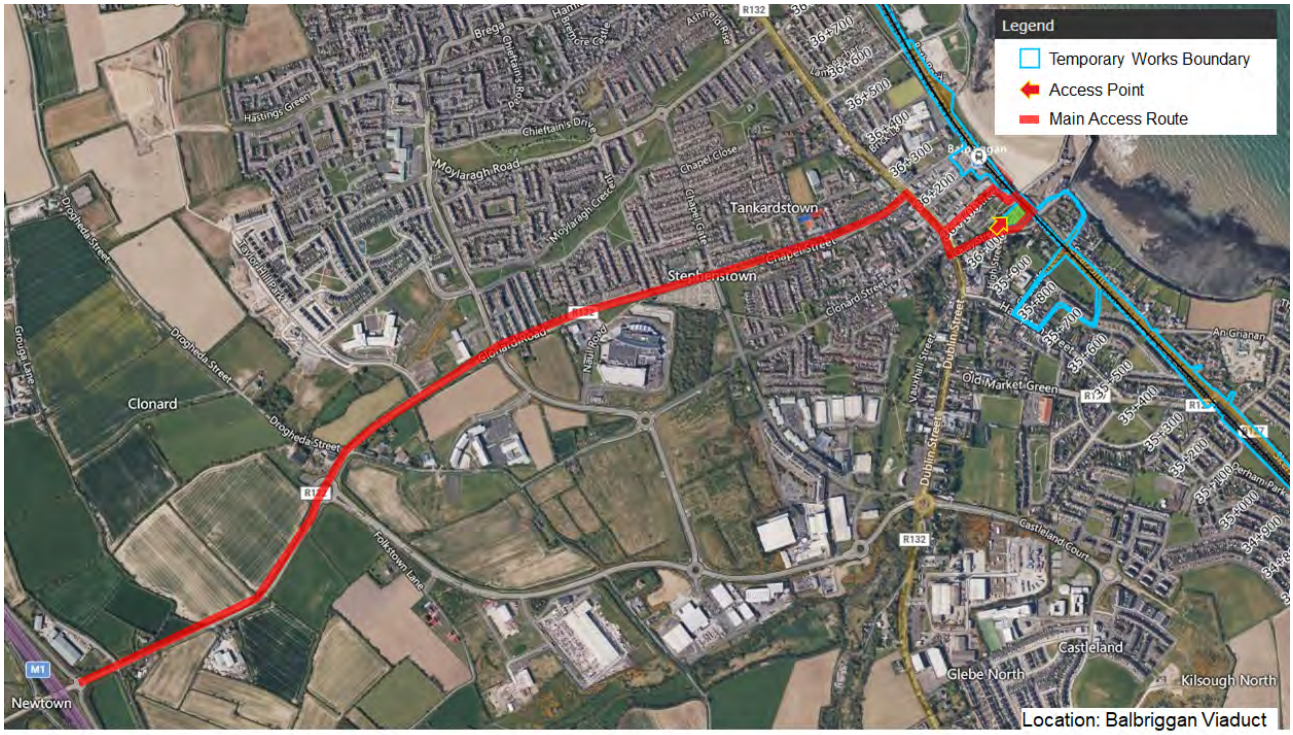

Image 5-63 Balbriggan Viaduct – Proposed Construction Compound Access (Source: ESRI)

Access to the Construction Compound (CC-36000) from the M1 would be via the R122. Local access in Balbriggan would follow the one-way system along Quay Street and Mill Street. It is noted that the proposed redevelopment of the car park may alter the existing one-way system.

5.6.11 Balbriggan Substation

5.6.11.1 Overview of works required

The new Balbriggan Substation will be located on agricultural land to the north of Balbriggan remote from any residential property, adjacent to the railway. This new substation will be constructed to provide power to the OHLE.

Image 5-64 Balbriggan Substation – Proposed Construction Compound and Access (Source: ESRI)

5.6.11.2 Construction methodology

Construction of the substation will follow the scheme outlined in Section 5.3.8.1. The general duration of the works at this location will be as follows:

- Civil works 3 months
- Equipment installation 3 months

Most of the disruptions will come from the civil works, whereas the installation of the equipment and the tests will be less disruptive.

5.6.11.3 Construction Compounds and Construction Access Routes

The land take required to construct the substation will be slightly larger than the permanent land take, particularly as this location is also proposed to serve as a line-wide Construction Compound due to the good road access and availability of space (CC-37700).

The nearest road link of strategic importance in this area is the R132 which connects with the M1 in the north, avoiding routing through Balbriggan. This road should be suitable to serve construction traffic. Site access will be via a new section of road off the R132, which will also serve as substation access in the permanent case.

5.6.12 Utility Diversions

Below is a brief overview of the utility diversions required in this zone. Further details of the diversions required are described in Chapter 4 (Description of the Proposed Development) and assessed in Chapter 18 (Material Assets: Utilities) in Volume 2 of this EIAR.

5.6.12.1 Electricity

Existing electricity infrastructure has been identified in the zone, comprised of both ESB and EirGrid services. This includes HV transmission lines, MV and LV distribution lines operated by ESB, and the east-west interconnector operated by EirGrid. Additionally, there are nine instances where overhead MV and LV assets run parallel to the tracks in this zone, for an approximate combined total length of 2.5km.

Diversions for HV, MV and LV assets are required in this zone. Where feasible, diversions have been designed to limit the extent of intervention necessary at the track interface, primarily using existing bridges/underpasses and existing electricity infrastructure already present on the opposite side of the track crossing.

Five overground diversions and five underground diversions for MV and LV assets are required that are capable of being conducted via standard means. Horizontal directional drilling (HDD) is required for seven diversions in this zone, diverting utilities beneath the track. Additionally, there are instances where overhead MV and LV assets run parallel to the tracks and may need to be diverted in this zone.

The temporary land take required to carry out the diversions is summarised in the following images. The land take includes an allowance for construction access routes, space for vehicles to pass and turn around on site and space to remove the existing lines.

Overhead line - South of Donabate (UG-DV3)

Image 5-65 UG-DV3 – OBB32A South of Donabate (Ch. 19,331)

The existing line that crosses the railway in this location is planned to be diverted along the R126 over OBB32A to the south. As shown in the image, work areas and access routes have been allocated both for the diversion and the removal of the existing line. The existing field accesses would be used to access the agricultural land areas. Some traffic management will be required on the R126 to facilitate the works, likely reducing it to a single lane for several weeks.

Overhead line - South of Rush & Lusk Station (OH-DV5)

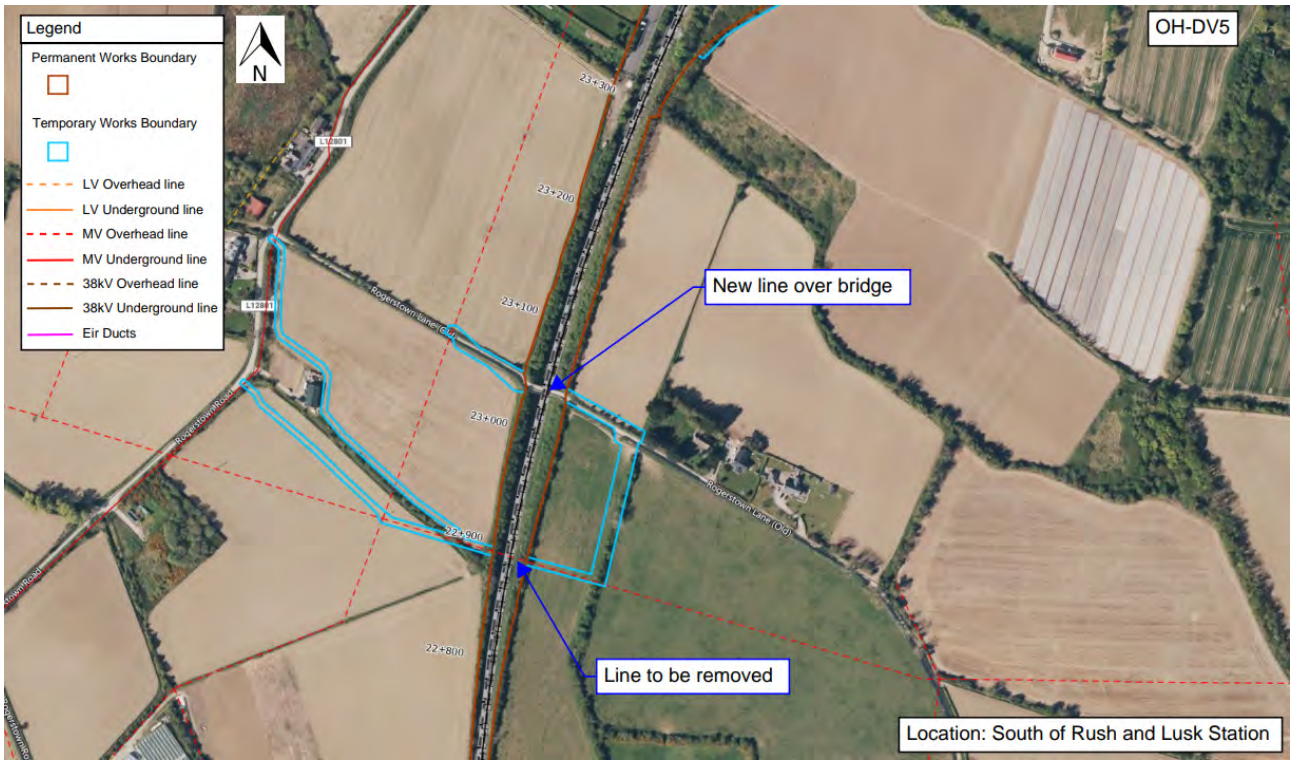

Image 5-66 OH-DV5 – OBB38 South of Rush & Lusk (Ch. 22,888)

The existing line that crosses the railway line in this location is planned to be diverted along Rogerstown Lane over OBB38. As shown in the image, a work area and access routes have been allocated both for the diversion and the removal of the existing line. The road will need to be temporarily closed under traffic management for the duration of the diversion in that area, approximately a week. The existing field accesses would be used to access the agricultural land areas.

Overhead lines - North of Rush & Lusk Station (UTX 9, OH-DV4 and UG-DV7)

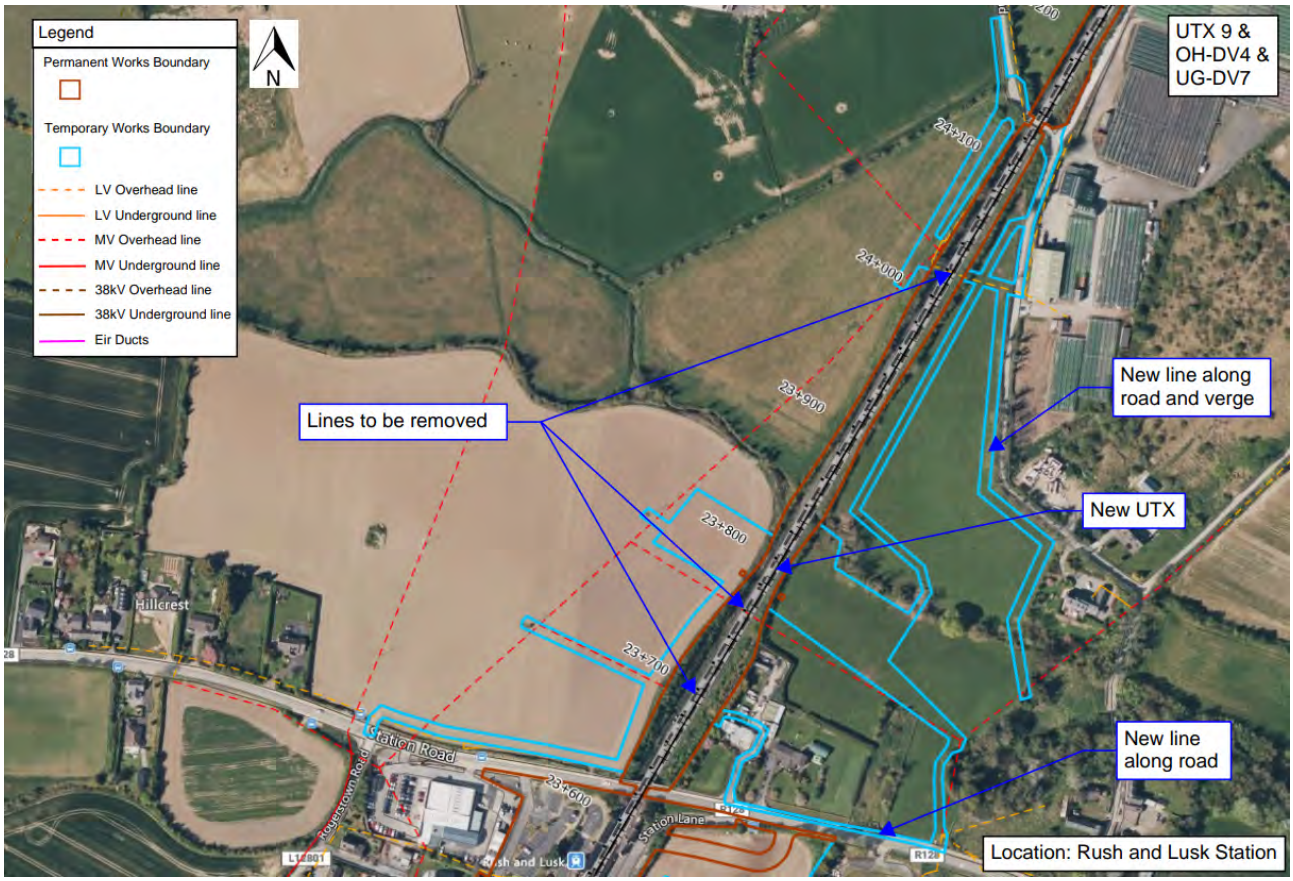

Image 5-67 UTX 9, OH-DV4 and UG-DV7 – North of Rush & Lusk Station (Ch. 24,000)

Three existing lines in this location cross the railway and are planned to be diverted, two via a new UTX and one from MV cable north of R128. As shown in the image, a work area, compounds, and access routes have been allocated both for the diversion and the removal of the existing lines. The R128 will need to be reduced to a single lane under traffic management for the duration of the diversion in that area, likely several weeks. The existing field accesses would be used to access the agricultural land areas. The stretch of local road to the north within the indicated work area would require traffic management for the duration of the works along it, likely several days.

Parallel overhead line - North of Rush & Lusk Station (OH-PDV1)

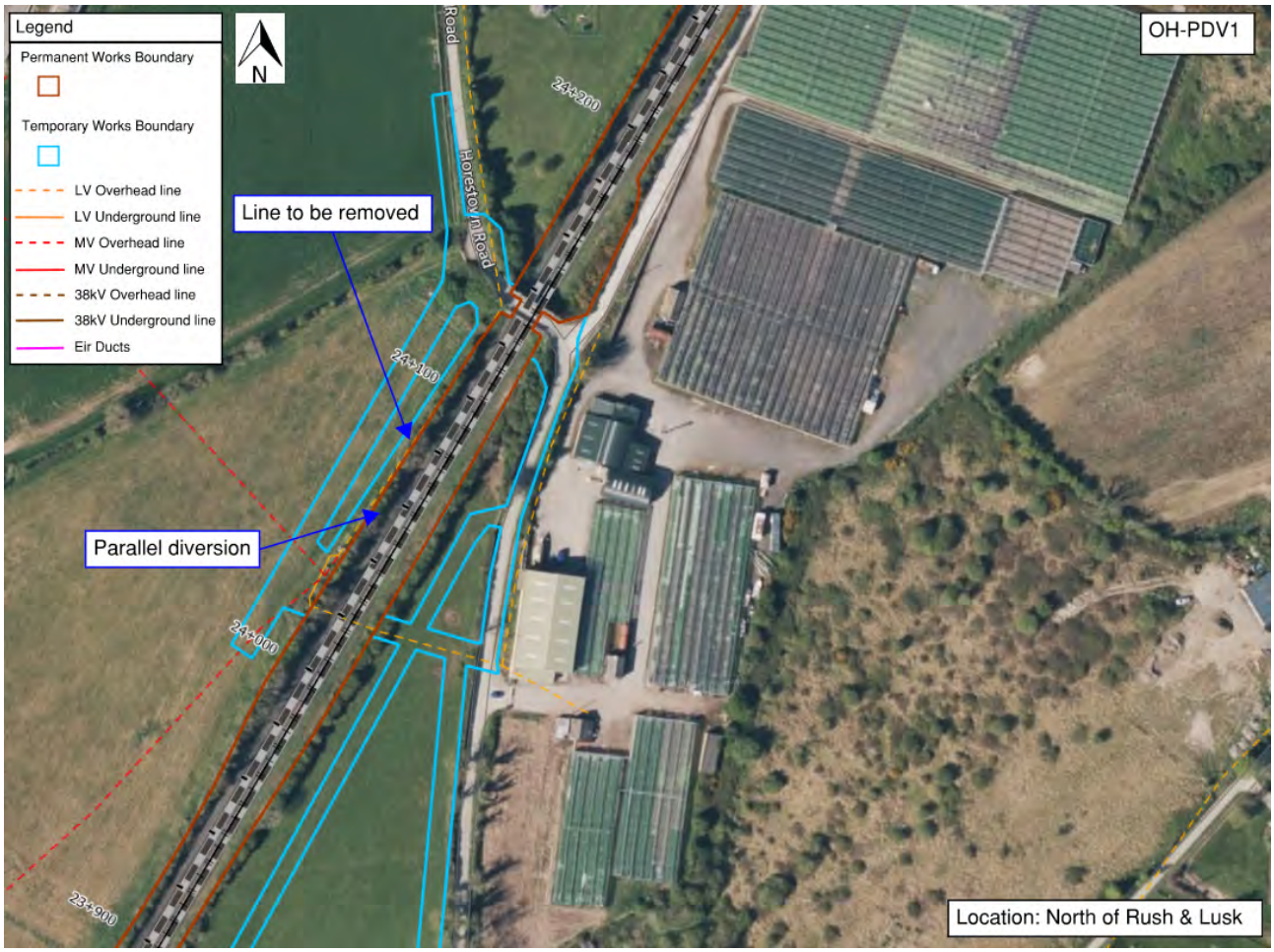

Image 5-68 OH-PDV1 – North of Rush & Lusk Station (Ch. 24,000-24,200)

The LV line that runs parallel to the railway in this location is planned to be diverted to the west in parallel to the existing line. As shown in the image, a work area has been allocated for the diversion. The existing field access from the local road would be used to access the agricultural land areas.

Parallel overhead line - North of Rush & Lusk Station (OH-PDV2)

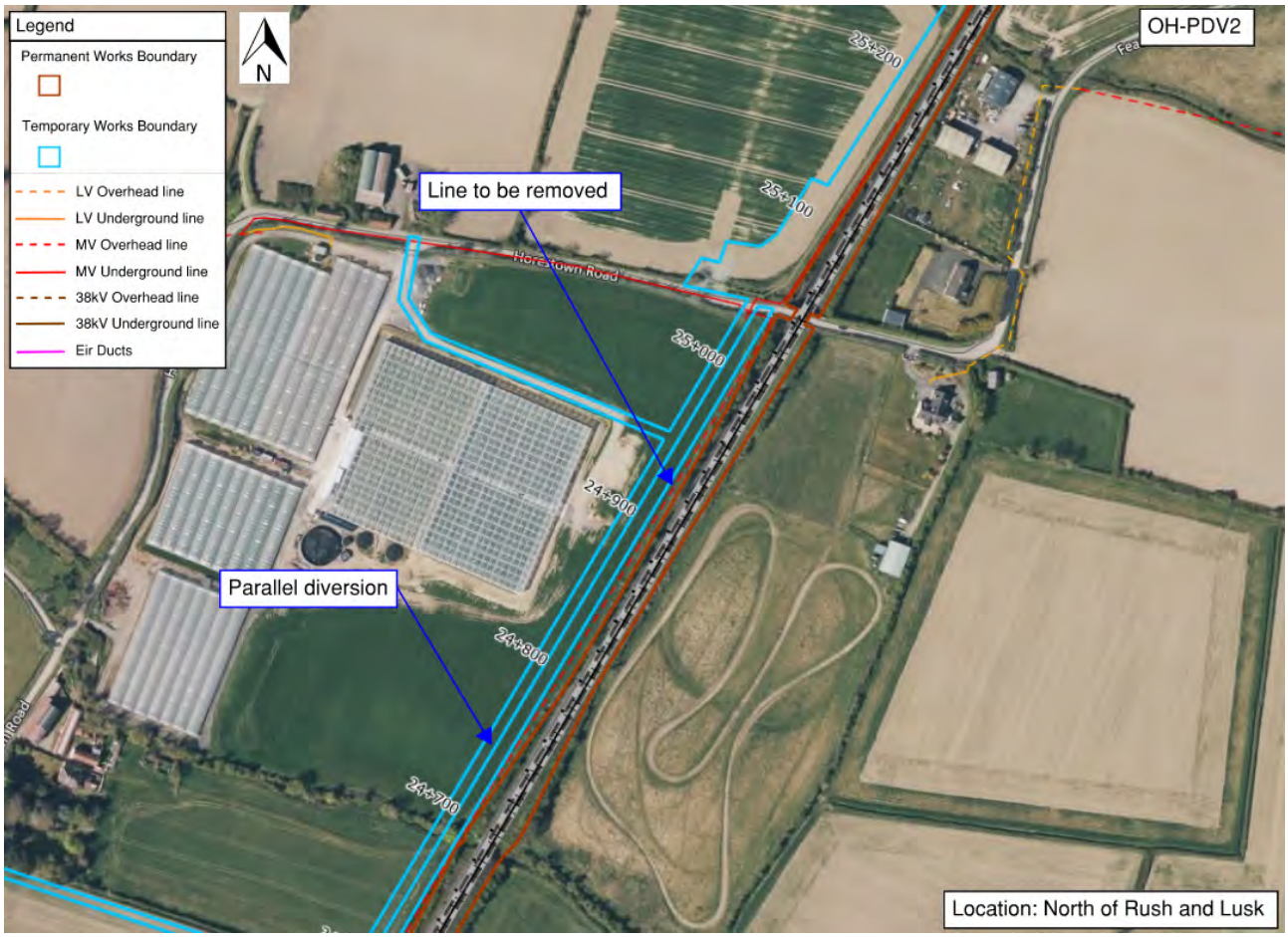

Image 5-69 OH-PDV2 – North of Rush & Lusk Station (Ch. 24,440-25,030)

The MV line that runs parallel to the railway in this location is planned to be diverted to the west in parallel to the existing line. As shown in the image, a work area has been allocated for the diversion. The existing field accesses from the local roads would be used to access the agricultural land areas.

Parallel overhead line - North of Rush & Lusk Station (OH-PDV3)

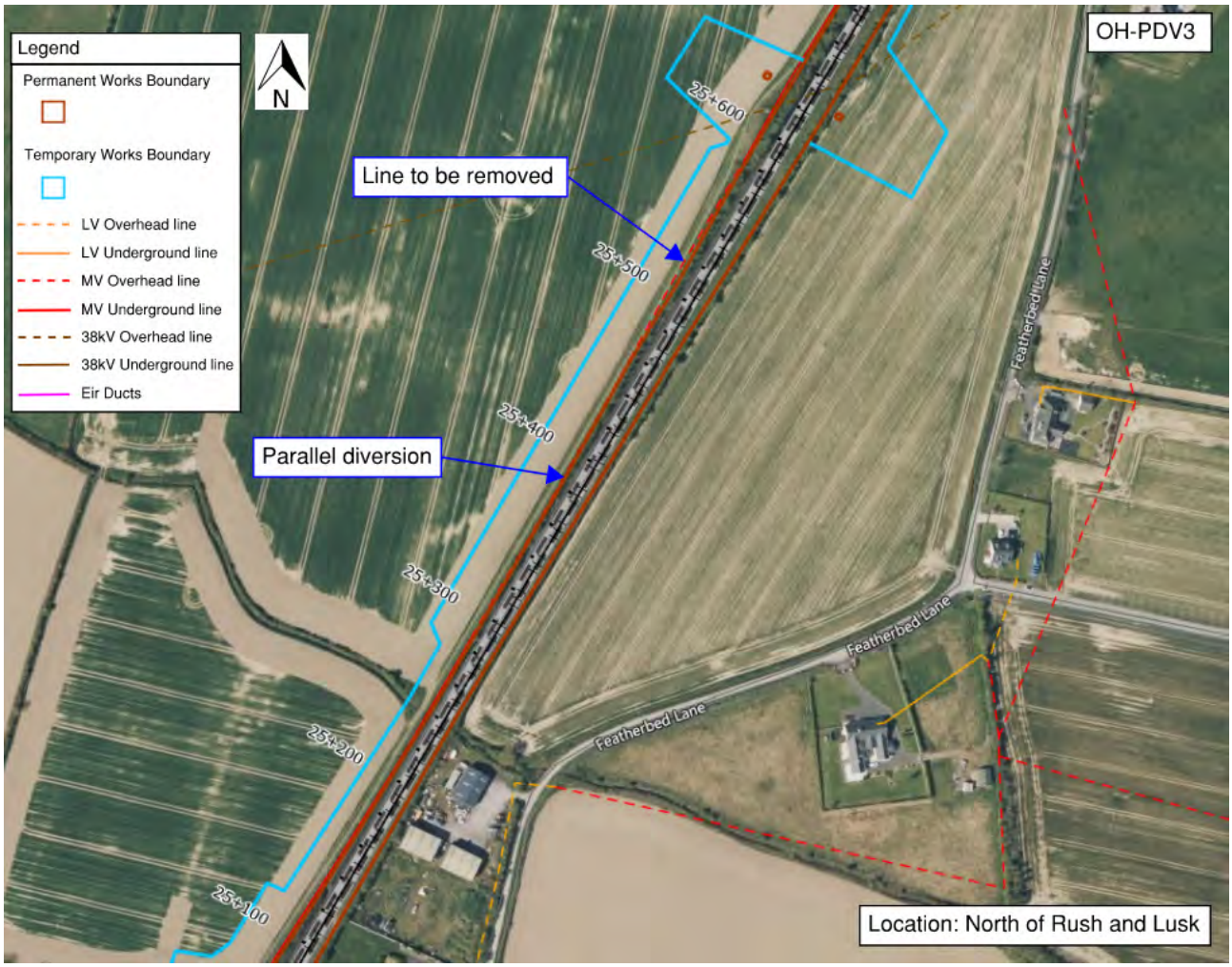

Image 5-70 OH-PDV3 – North of Rush & Lusk Station (Ch. 25,270-25,600)

The MV line that runs parallel to the railway in this location is planned to be diverted to the west in parallel to the existing line. As shown in the image, a work area has been allocated for the diversion. The existing field accesses from the local roads would be used to access the agricultural land areas.

Overhead line - North of Rush & Lusk Station (UTX 10)

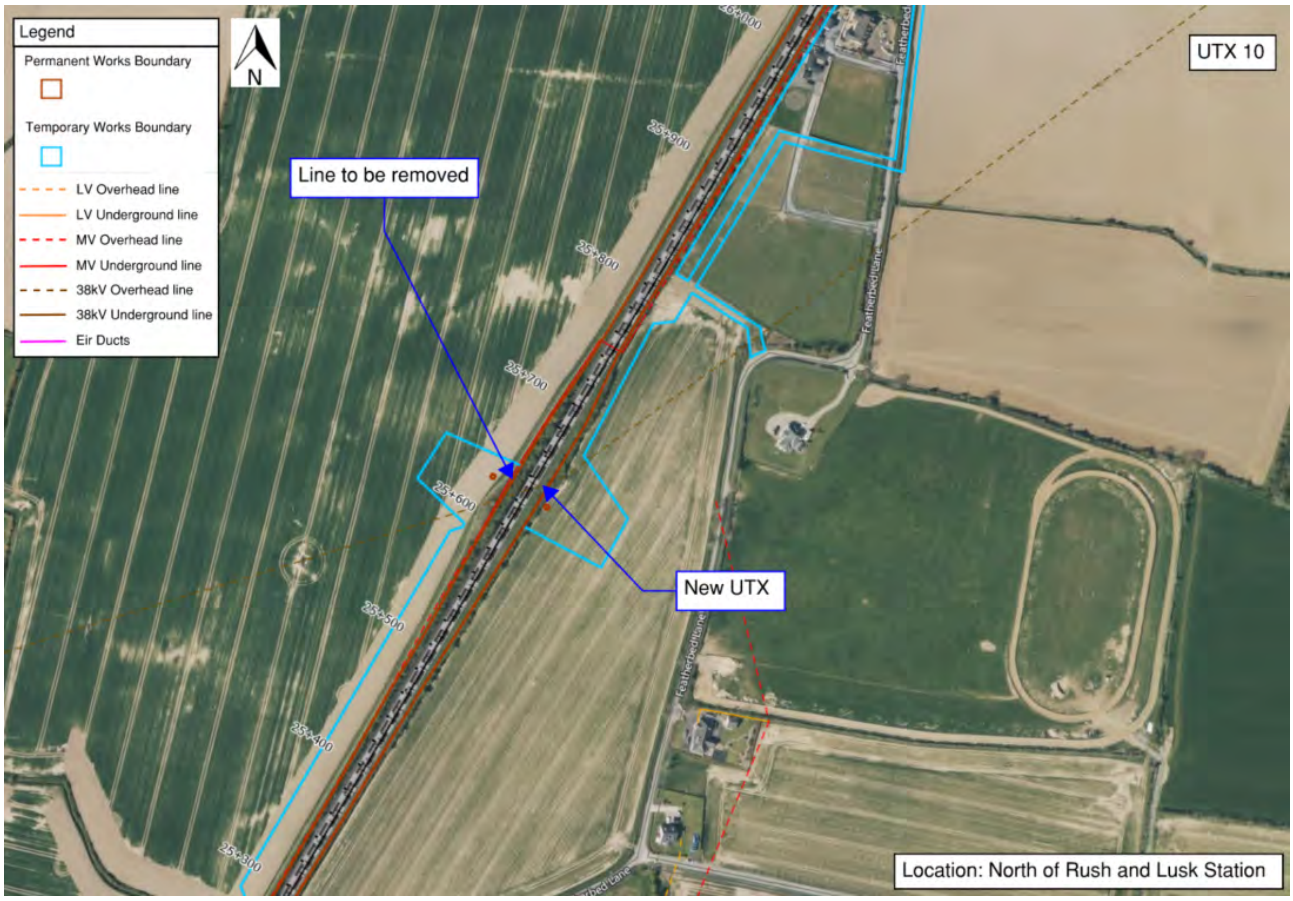

Image 5-71 UTX 10 – North of Rush & Lusk Station (Ch. 25,626)

The HV line that crosses the railway in this location is planned to be diverted via a new undertrack crossing (UTX). As shown in the image, a work area, compounds, and access routes have been allocated for the diversion. The existing field accesses from Featherbed Lane and Horestown Road would be used to access the agricultural land areas.

Parallel overhead line - North of Rush & Lusk Station (OH-PDV4)

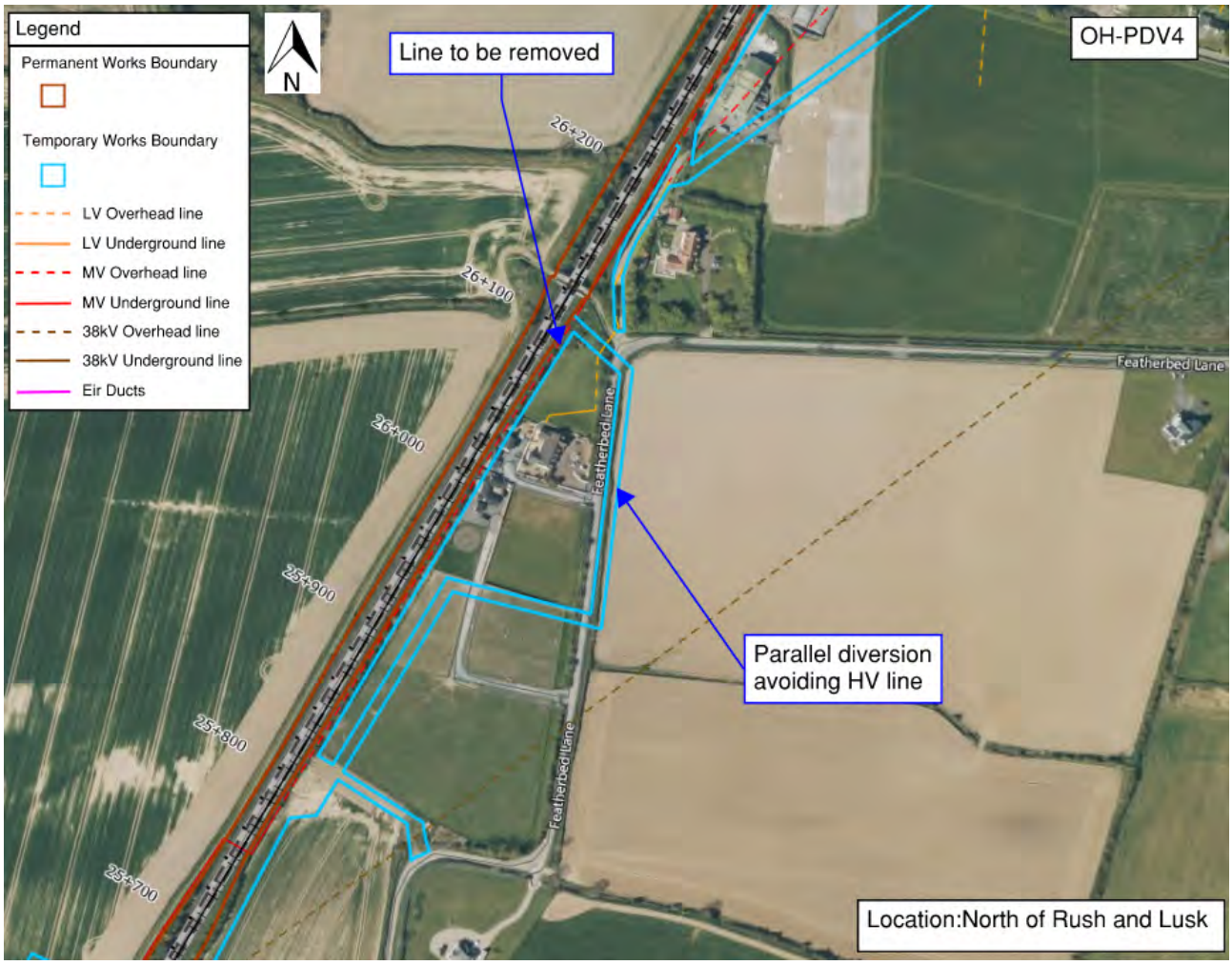

Image 5-72 OH-PDV4 – North of Rush & Lusk Station (Ch. 25,780-26,100)

The MV line that runs parallel to the railway in this location is planned to be diverted to the east. As shown in the image, a work area has been allocated for the diversion. The existing field accesses from the local roads would be used to access the agricultural land areas. The stretch of local road within the indicated work area would require traffic management for the duration of the works along it, likely several days.

Parallel overhead line - North of Rush & Lusk Station (OH-PDV5)

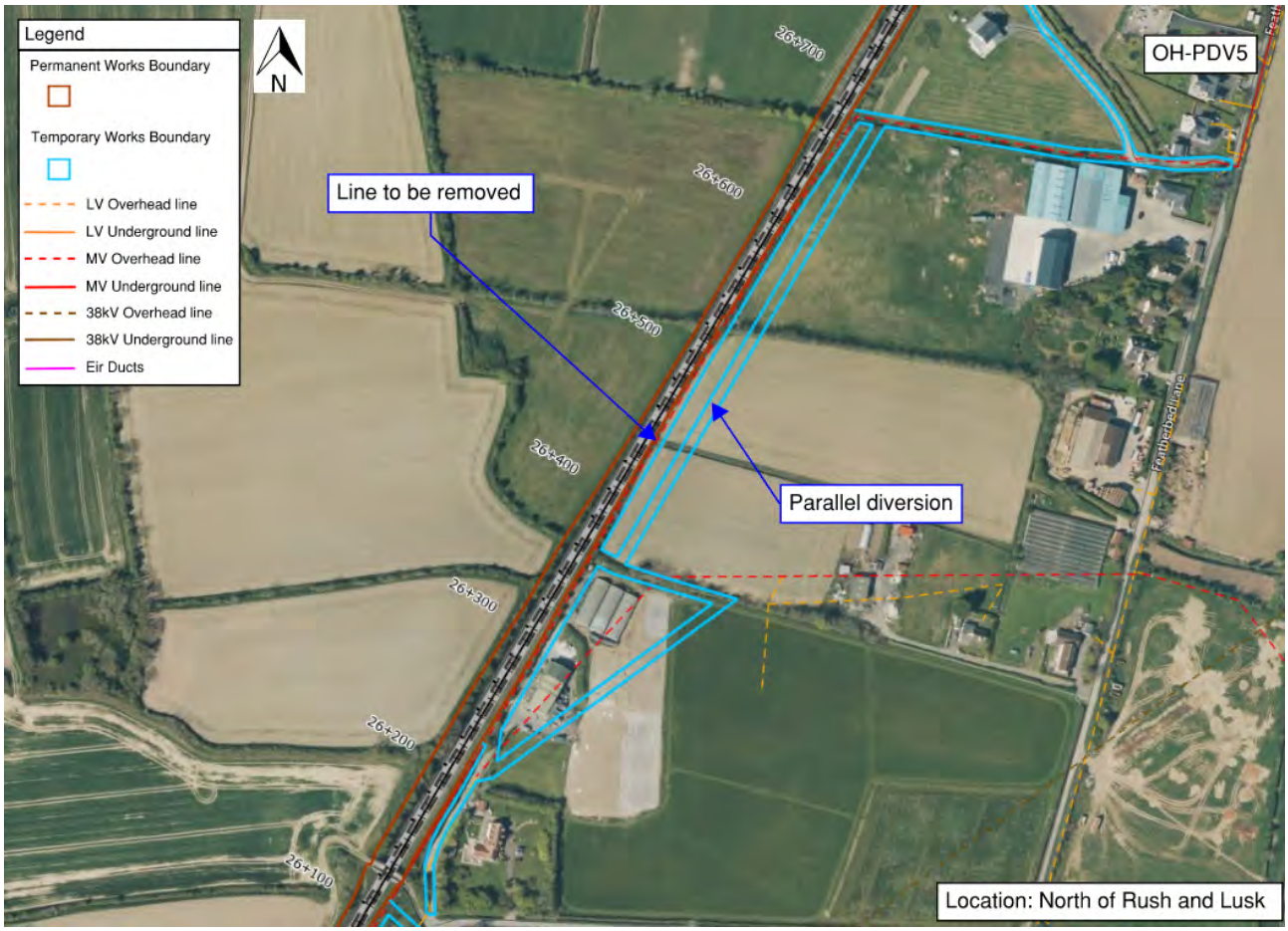

Image 5-73 OH-PDV5 – North of Rush & Lusk Station (Ch. 26,200-26,680)

The MV line that runs parallel to the railway in this location is planned to be diverted to the east. As shown in the image, a work area has been allocated for the diversion. The existing field accesses from the local roads would be used to access the agricultural land areas.

Parallel overhead line - North of Rush & Lusk Station (OH-PDV6)

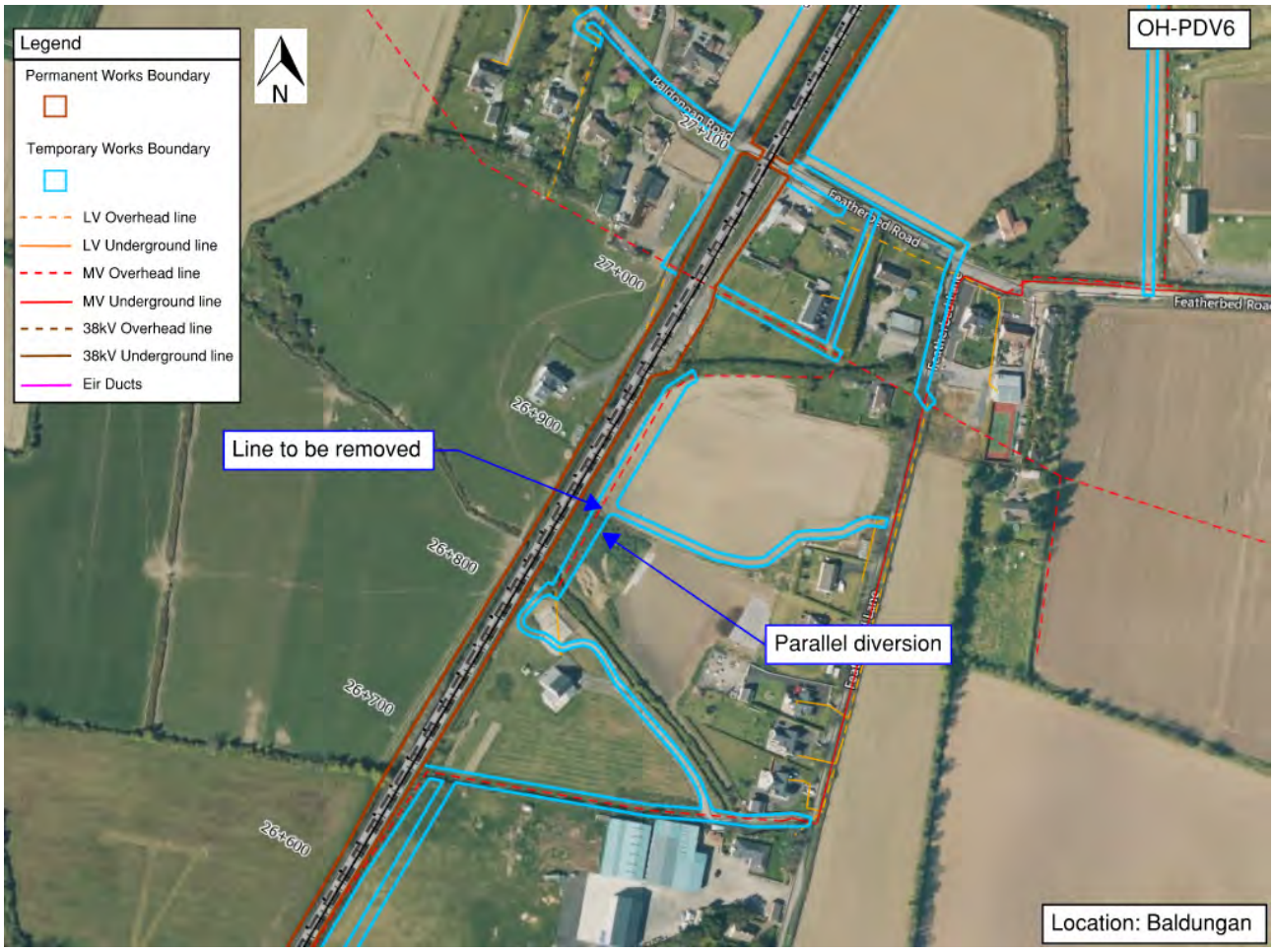

Image 5-74 OH-PDV6 – North of Rush & Lusk Station (Ch. 26,810-26,960)

The MV line that runs parallel to the railway in this location is planned to be diverted to the east. As shown in the image, a work area has been allocated for the diversion. The existing field accesses from the local roads would be used to access the agricultural land areas.

Overhead line - North of Rush & Lusk Station (UTX 8 and UG-DV8)

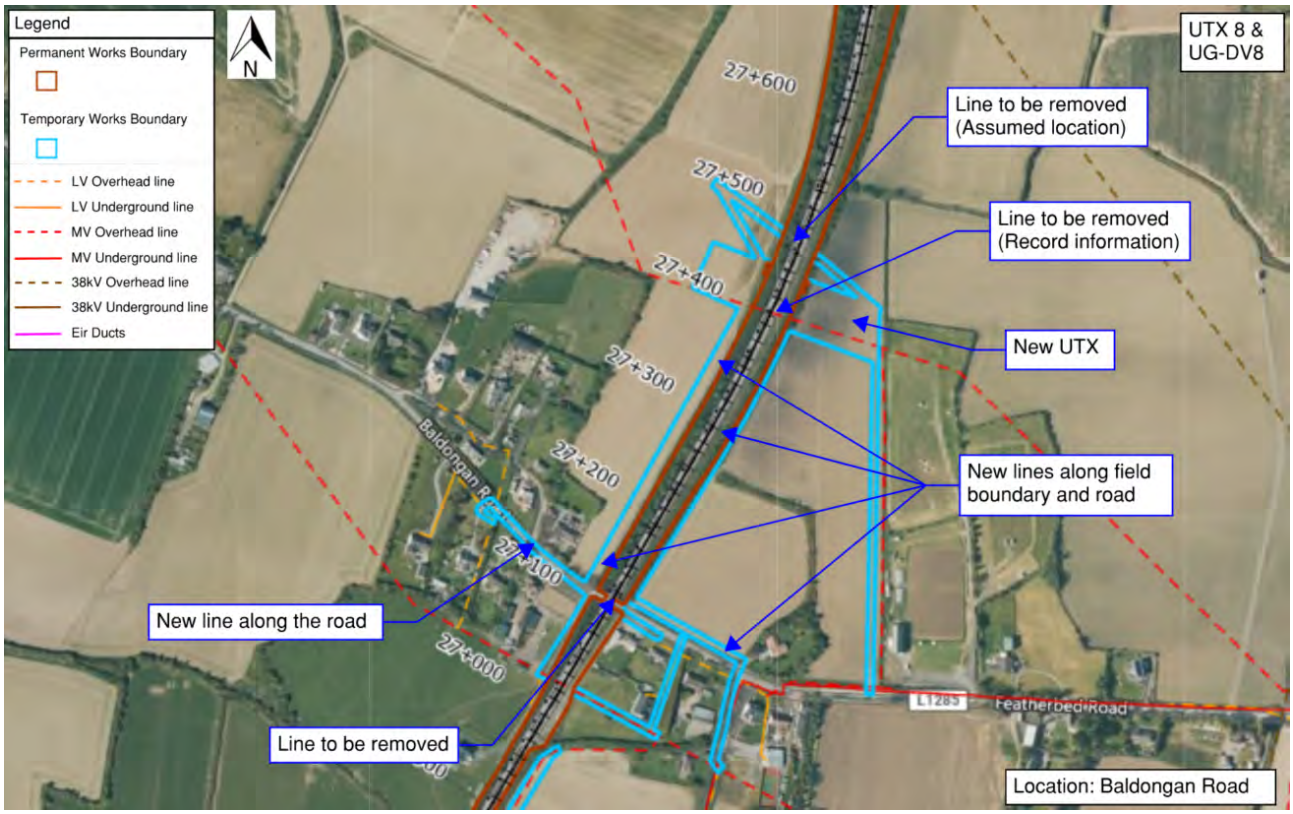

Image 5-75 UTX 8 and UG-DV8 –North of Rush & Lusk Station (Ch. 27,042)

The two lines that cross the railway in this location to the North and South of OBB46 are planned to be diverted via a new UTX. The one line that cross the railway at the L1285 / Baldongan Close (OBB 46) is planned to be diverted with an LV connection from the east side of the Baldongan Road. As shown in Image 5-75, a work area, compounds and access routes have been allocated for the diversion and the removal of the existing lines. The existing field accesses from the L1285 would be used to access the agricultural land areas. New lines would also need to be installed to reconnect the properties off the L1285 road. The L1285 and several of the local roads off it would need to be reduced in width under traffic management for the duration of the works in that area, likely for several weeks.

Parallel overhead line - South of Skerries (UG-PDV7)

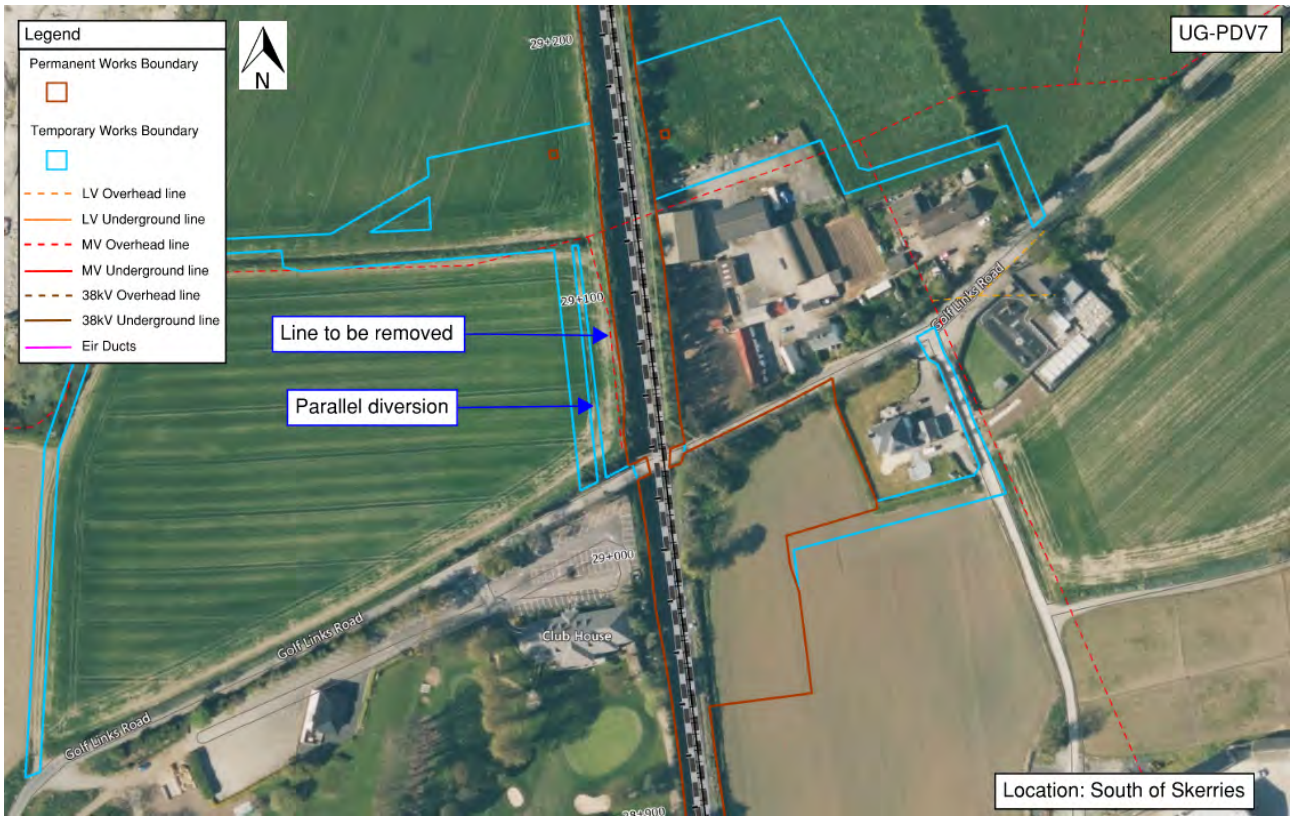

Image 5-76 UG-PDV7 – South of Skerries (Ch. 29,040-29,160)

The MV line that runs parallel to the railway in this location is planned to be diverted to the west. As shown in the image, a work area has been allocated for the diversion. The existing field access from the local road would be used to access the agricultural land areas.

Overhead line - South of Skerries (UTX 7)

Image 5-77 UTX 7 – South of Skerries (Ch. 29,140)

The MV line that crosses the railway in this location to the North of OBB49 carrying Golf Links Road is planned to be diverted via a new UTX. As shown in Image 5-77, a work area, compounds and access routes have been allocated for the diversion and the removal of the existing lines. The existing field accesses would be used to access the agricultural land areas.

Parallel overhead line – Skerries (UG-PDV8)

Image 5-78 UG-PDV8 – Skerries (Ch. 30,030-30,160)

The LV line that runs parallel to the railway in this location is planned to be diverted underground. As shown in Image 5-78, a work area has been allocated for the diversion. The existing station access would be used to access the work area.

Parallel overhead line – Skerries (OH-PDV9)

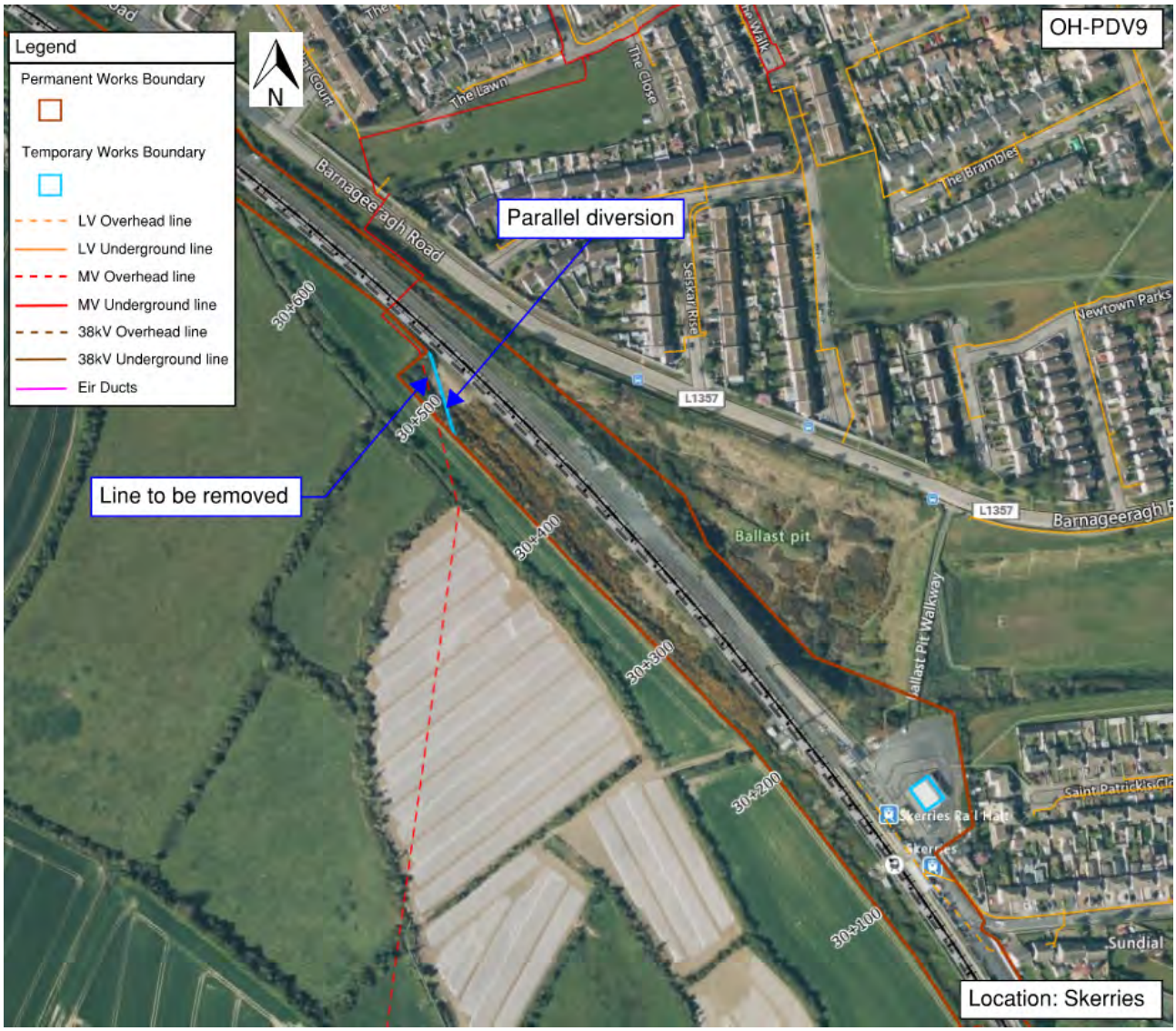

Image 5-79 OH-PDV9 – Skerries (Ch. 30,440-30,550)

The MV line that runs parallel to the railway in this location is planned to be diverted to the west. As shown in Image 5-79, a work area has been allocated for the diversion. The existing field access from the local road to the south would be used to access the agricultural land areas.

Overhead lines - North of Skerries (UG-DV2, UG-DV6 and OH-DV6)

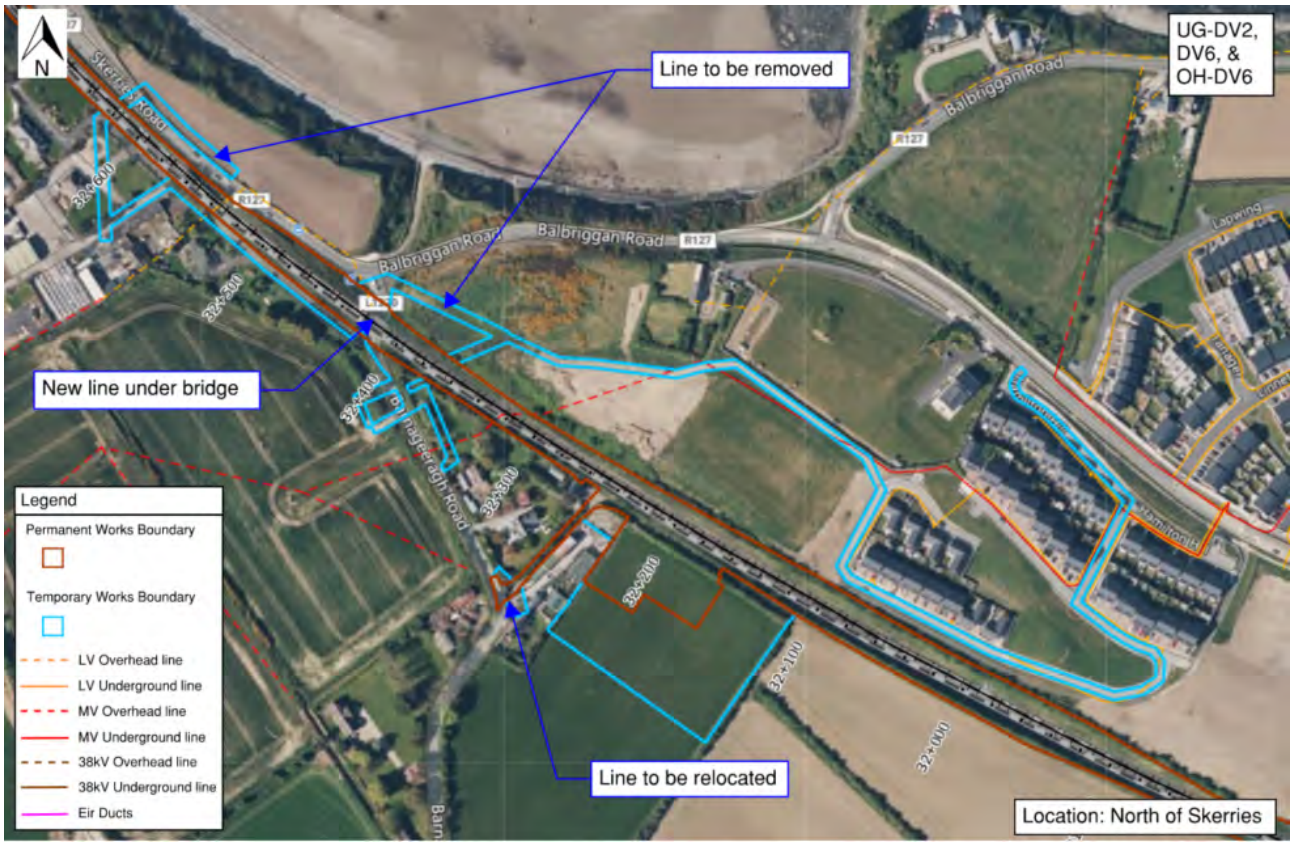

Image 5-80 UG-DV2 and UG-DV6 – North of Skerries (Ch. 32,380)

The lines that cross the railway in this location to the North and South of UBB53 are planned to be diverted under UBB53. As shown in Image 5-80, work areas and access routes have been allocated for the diversion and the removal of the existing lines. The existing field accesses would be used to access the agricultural land areas. The road under UBB53 would likely need to be closed under traffic management for approximately one week. The Skerries Road (R127) would also have to be under traffic management for a few days to remove the existing line. The overhead line and pole is planned to be diverted at the corner of Barnageeragh Road. As shown in Image 5-80, work areas and access routes have been allocated for the diversion and the removal of the existing lines.

Overhead lines – South of Balbriggan (UTX 5 and UTX 6)

Image 5-81 UTX 5 and UTX 6 – South of Balbriggan (Ch. 34,120 and Ch. 34,840)

The lines that cross the railway in this location to the south of Balbriggan are planned to be diverted via UTXs. As shown in Image 5-81, a work area, compounds and access routes have been allocated for the diversion and the removal of the existing lines. The existing field accesses off Skerries Road and Tanners Water Lane would be used to access the agricultural land areas. The new cable route partially follows the R127 which would need to be reduced to a single lane under traffic management for the duration of the works in that area, likely several weeks. To decommission the existing line to the north, the back garden of a property on Derham Park will need to be accessed and the R127 will need to be under traffic management. Similarly, the R127 will need to be under traffic management to decommission the line to the South.

Parallel overhead line – Balbriggan (UG-PDV10)

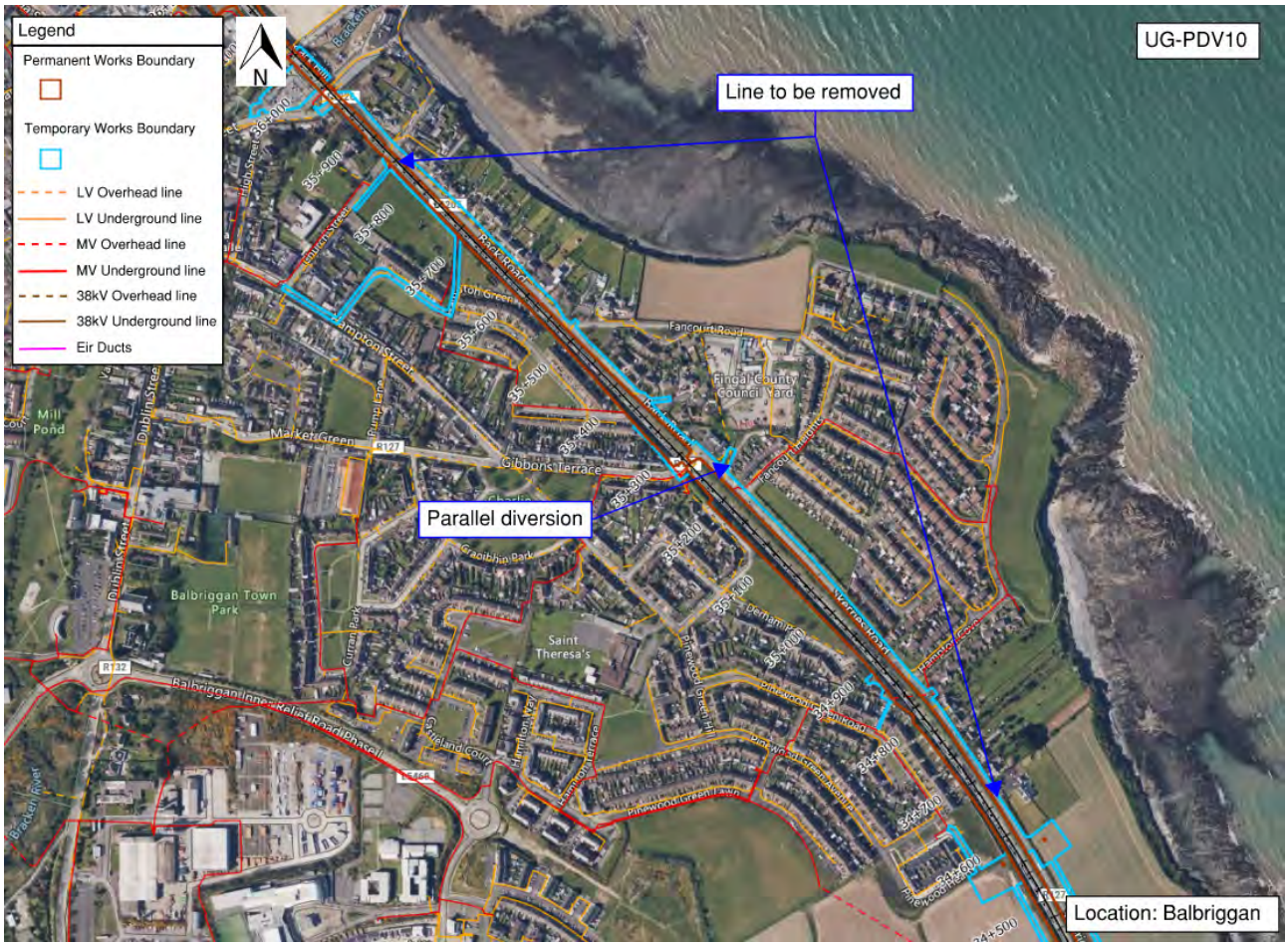

Image 5-82 UG-PDV10 – Balbriggan (Ch. 34,670-35,860)

The LV line that runs parallel to the railway in this location is planned to be diverted underground. As shown in Image 5-82, a work area has been allocated for the diversion mainly on the Skerries Road (R127), Fancourt Road and Seapoint Lane. These roads will require traffic management for the duration of the works, likely several weeks.

Parallel overhead line – Balbriggan (UG-PDV11)

Image 5-83 UG-PDV11 – Balbriggan (Ch. 35,280-35,330)

The MV line that runs parallel to the railway in this location is planned to be diverted underground. As shown in Image 5-83, a work area has been allocated for the diversion mainly off Skerries Road (R127). The road will require traffic management for a portion of the work, likely several days.

Overhead line – Balbriggan (OH-DV7)

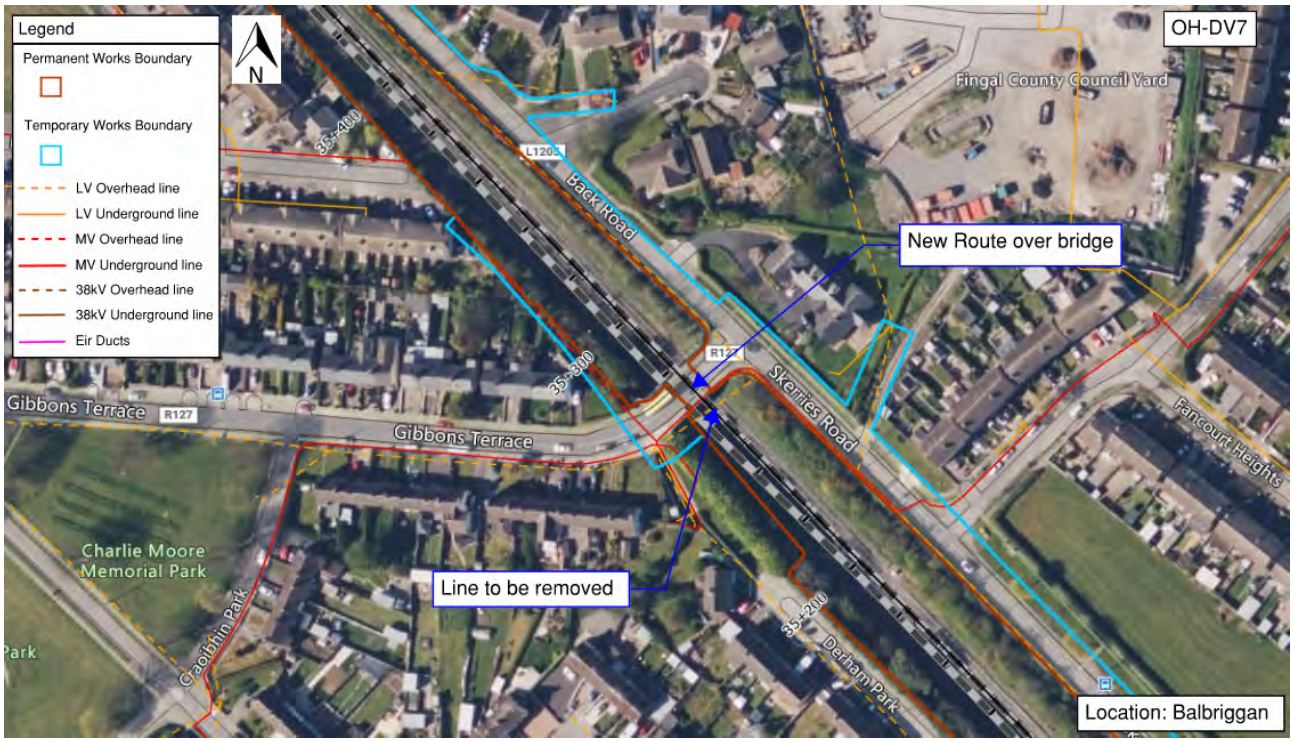

Image 5-84 OH-DV7 –Balbriggan (Ch. 35,626)

The line that crosses the railway in this location to the south of OBB55 in Balbriggan is planned to be diverted over OBB55. As shown in Image 5-84, a work area has been allocated for the diversion and the removal of the existing lines. The R127 would likely need to be partially closed to enable the works for approximately one week.

Parallel overhead line – Balbriggan (UG-PDV12)

Image 5-85 UG-PDV12 – Balbriggan (Ch. 35,700-35,840)

The MV line that runs parallel to the railway in this location is planned to be diverted underground via Church Street and Hampton Street. As shown in Image 5-85, a work area has been allocated for the diversion. These roads will require traffic management for the duration of the works, likely several weeks. Access will also be required into the land the existing line runs in to remove it.

Overhead lines – Balbriggan (UG-DV4)

Image 5-86 UG-DV4 – Balbriggan (Ch. 35,845)

The lines that cross the railway in this location in the south of Balbriggan are planned to be diverted along Quay Street. As shown in Image 5-86, a work area has been allocated for the diversion and the removal of the existing lines. Stretches of the L1205, Church Street and Quay Street will need to be closed under traffic management in phases to install the new line and remove the existing ones.

Parallel overhead line – Balbriggan (UG-PDV13)

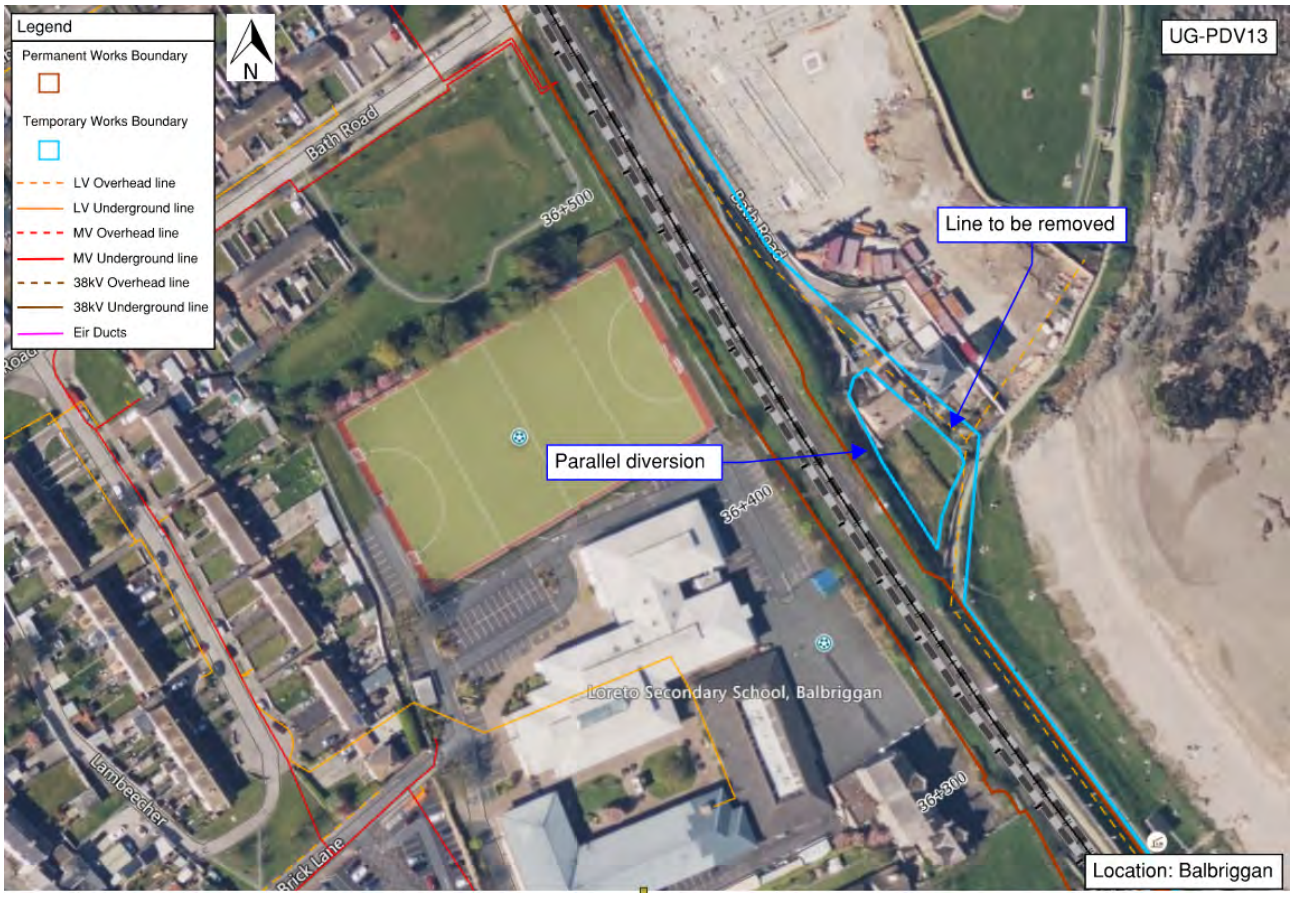

Image 5-87 UG-PDV13 – Balbriggan (Ch. 36,230-36,560)

The LV line that runs parallel to the railway in this location is planned to be diverted underground. As shown in Image 5-87, a work area has been allocated for the diversion. Access will also be required into the land in which the existing line is located, in order to remove it.

Overhead line - North of Balbriggan (OH-DV3)

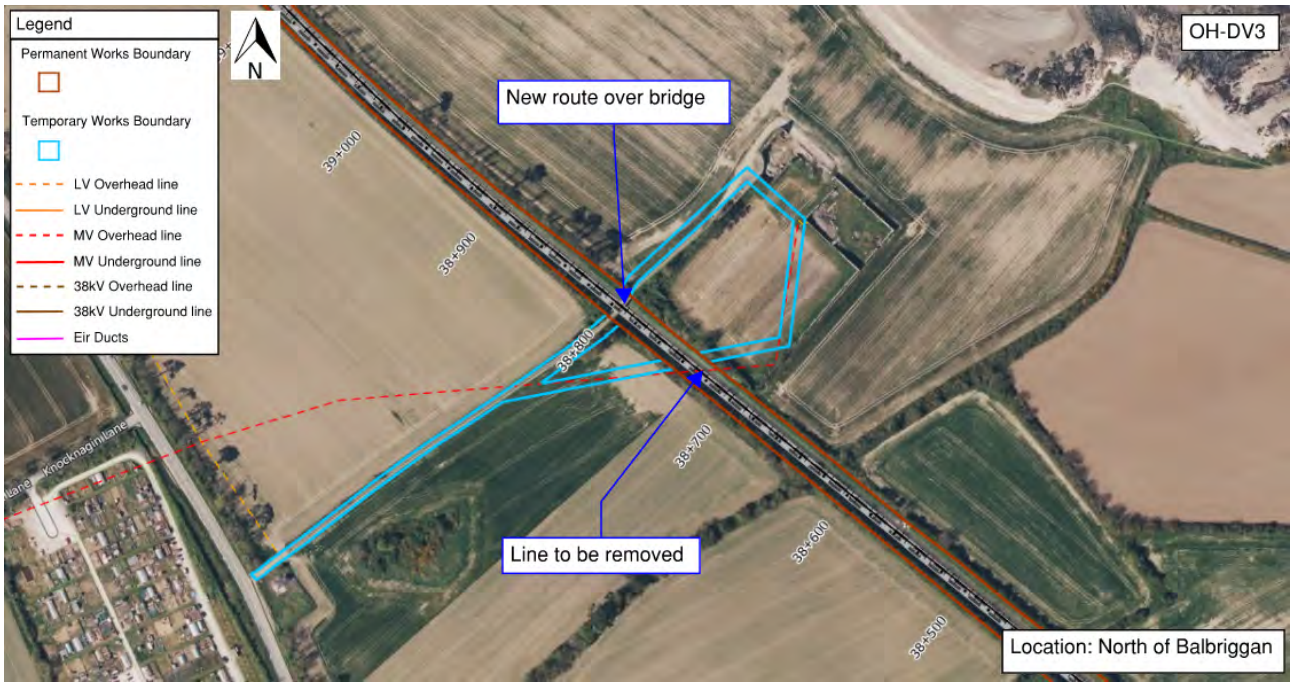

Image 5-88 OH-DV3 – North of Balbriggan (Ch. 38,730)

The line that crosses the railway in this location to the south of OBB63 is planned to be diverted over OBB63. As shown in the image, a work area and access route have been allocated for the diversion and the removal of the existing lines. The existing field accesses would be used to access the agricultural land areas.

5.6.12.2 Telecommunications

Vodafone, Eir, Virgin Media, Enet and BT are identified as having existing telecommunication assets in this zone. BT telecommunications ducts run adjacent to the track throughout the length of the zone. Four Eir telecom infrastructure crossings over the railways have been identified for diversions.

Overhead line – Donabate Station (UG-UDV1)

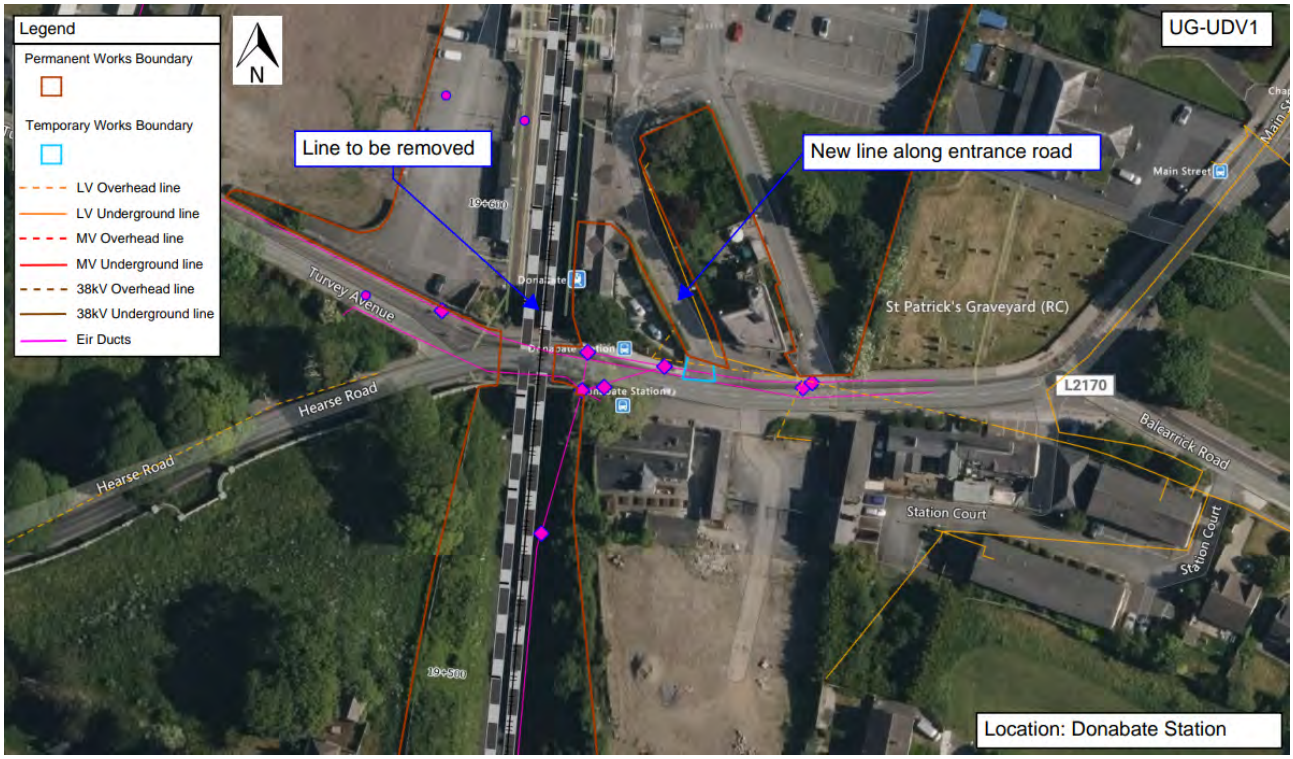

Image 5-89 UG-DV1 – Donabate Station (Ch. 19,609) Occupation Rd

An existing Eir cable crosses the railway at Donabate station, and an alternative underground route is planned that connects to the main cable in the footpath of Chapel View Road and follows the existing station access route, Turvey Avenue. This section of Turvey Avenue will have to be temporarily narrowed or closed for the duration of the diversion works and traffic management set up to control the flow of traffic into the station car park, likely for approximately a week.

Overhead line – North of Donabate (UG-UDV2)

Image 5-90 UG-UDV2 – North of Donabate (Ch. 20,915)

An existing Eir cable crosses the railway just to the south of the overbridge (OBB35) carrying the access road for Beaverstown Golf Club. This needs to be diverted underground. A temporary work area is required to either side of the bridge as shown in the image above. The road will need to be temporarily closed under traffic management for the duration of the diversion, likely for approximately a week.

Overhead line – North of Rush and Lusk Station (UG-UDV3)

Image 5-91 UG-UDV3 – OBB41 North of Rush and Lusk Station (Ch. 24,126)

An existing Eir cable crosses the railway just to the south OBB41, which is just to the north of Rush and Lusk Station. This needs to be diverted underground. A temporary work area is required to either side of the bridge as shown in the image above. The road will need to be temporarily closed under traffic management for the duration of the diversion, approximately one week.

Overhead line – South of Rush and Lusk Station (UG-UDV4)

Image 5-92 UG-UDV4 – OBB38 South of Rush and Lusk Station (Ch. 23,050)

An existing cable crosses the railway to the north of OBB38, which is just to the south of Rush and Lusk Station. This needs to be diverted underground. A temporary work area is required to either side of the bridge as shown in the image above. The road will need to be temporarily closed under traffic management for the duration of the diversion, approximately one week.

5.6.12.3 Gas

No conflicts or diversion requirements with the existing gas infrastructure assets have been identified in this area.

5.6.12.4 Sewer and watermains

No conflicts or diversion requirements with the existing sewer and watermain infrastructure assets have been identified in this area.

5.6.13 Line-wide Construction Compounds

As described in Section 5.3.3.3, there are some line-wide Construction Compounds required within this zone, which will be located at, or adjacent to, existing IÉ maintenance compounds. In Zone C these are at Donabate (CC-19800) and Skerries Stations (CC-30200), in addition to those already mentioned at Donabate Substation (CC-18800), Rush and Lusk substation (CC-23500) and Balbriggan substation (CC-37700). The location and access routes for the Donabate and Skerries Station line-wide Construction Compound locations are identified in the following images.

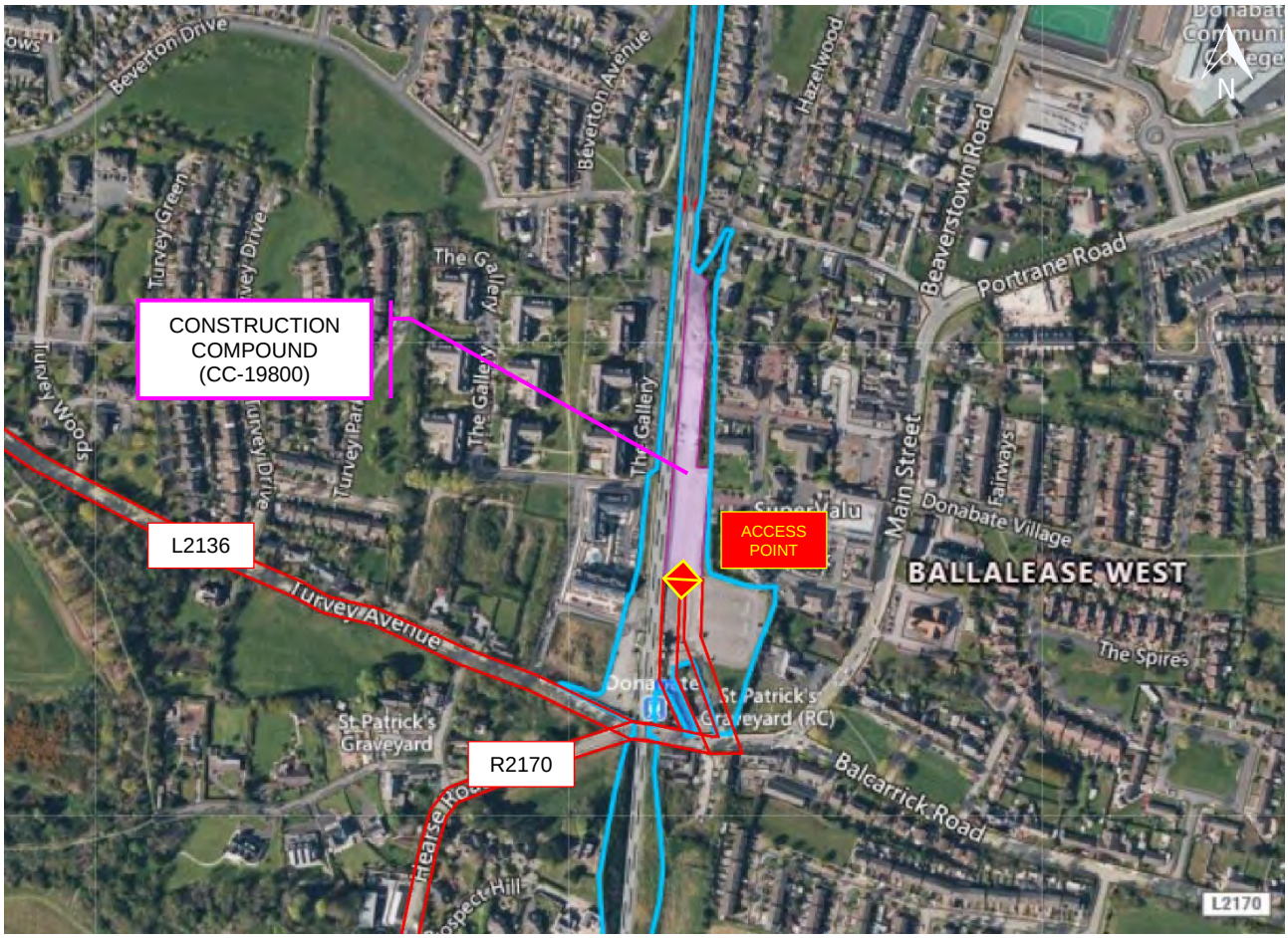

Image 5-93 Donabate Station – Proposed Line-wide Construction Compound and Access Route (Source: ESRI)

Image 5-94 Skerries Station – Proposed Line-wide Construction Compound and Access Route (Source: ESRI)

5.7 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. This zone includes Gormanston and Laytown Stations. Zone D lies within the Meath County boundary, bordering Fingal to the south and Louth to the north. Zone D covers Chainage 39+400 to 50+700.

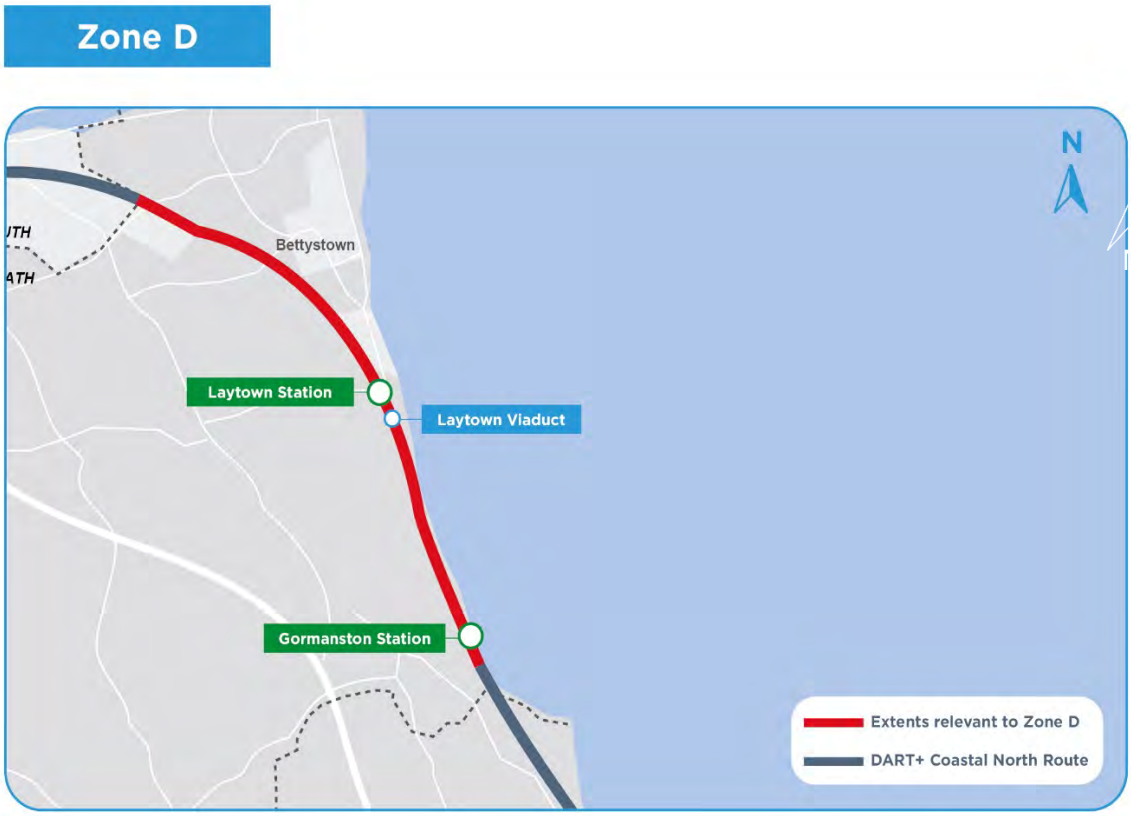

Image 5-95 Overview of Zone D (Source: ESRI)

Construction Phase works within Zone D will include:

- 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:
- OBB68 (Irishtown)
- OBB77 (Colpe East), and
- OBB78 (carrying Colpe Road),
- Pedestrian footbridge parapet modifications for compliant safety standards to:
- OBB74A (Laytown Station footbridge), and

- Utility diversions.

More detail on the works required within this zone is given in Sections 5.7.1 to 5.7.6. For further information on the listed parapet modifications refer to Section 5.3.7.1.

5.7.1 Gormanston Substation

5.7.1.1 Overview of works required

The new Gormanston Substation will be in a rural area on lands currently owned by the Department of Defence adjacent to the railway. This new substation will be constructed to provide power to the OHLE.

Image 5-96 Gormanston Substation Construction Compound

5.7.1.2 Construction methodology

Construction of the substation will follow the scheme outlined in Section 5.3.8.1. The general duration of the works at this location will be as follows:

- Civil works 3 months
- Equipment installation 3 months

Most of the disruptions will come from the civil works, whereas the installation of the equipment and the tests will be less disruptive.

5.7.1.3 Construction Compounds and Construction Access Routes

The land take required to construct the substation will be slightly larger than the permanent land take. This area of land will be used as the Construction Compound (CC-41400). The nearest road link of strategic importance in this area is the R132 which connects with the M1 in the south-west.

This road should be suitable to serve construction traffic. Site access will be via the new section of road off Irishtown, which will serve as substation access in the permanent case.

Image 5-97 Access to Gormanston Substation Construction Compound

Image 5-98 Gormanston Substation Construction Compound pictures (Source: Arup)

5.7.2 Laytown Viaduct works

5.7.2.1 Overview of works required

Laytown Viaduct is a 74m long viaduct over the River Nanny. The structure comprises five spans, with side spans measuring 9.5m long and central spans at 18.3m long. A separate pedestrian footbridge runs parallel to the viaduct.

The viaduct has four piers along its length with two new OHLE proposed gantries being installed on piers A and D. The piers comprise wrought iron cylinders filled with concrete and braced with plate girders. The existing beams are wrought iron girders with some elements replaced by steel elements in recent years.

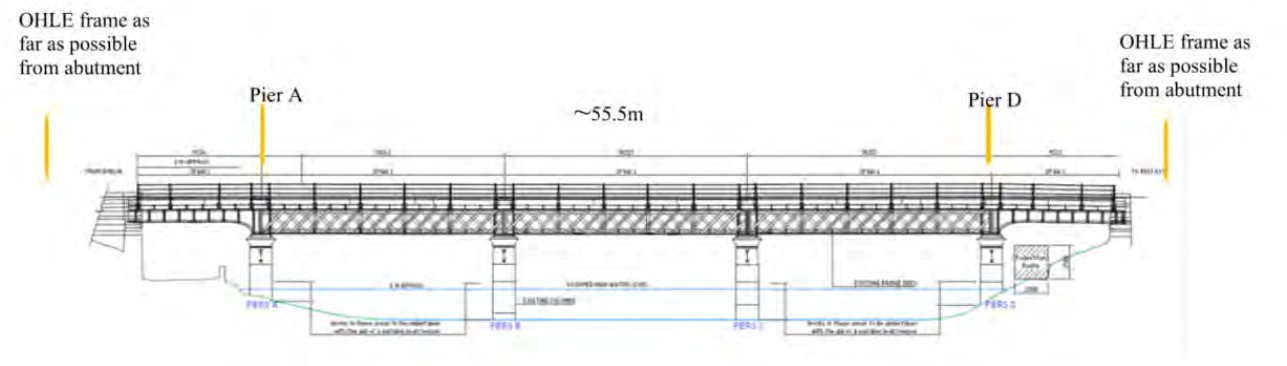

Image 5-99 Longitudinal profile of Laytown Viaduct with proposed gantry installation locations

New structural steel supports for the OHLE gantries will be fixed onto the existing piers.

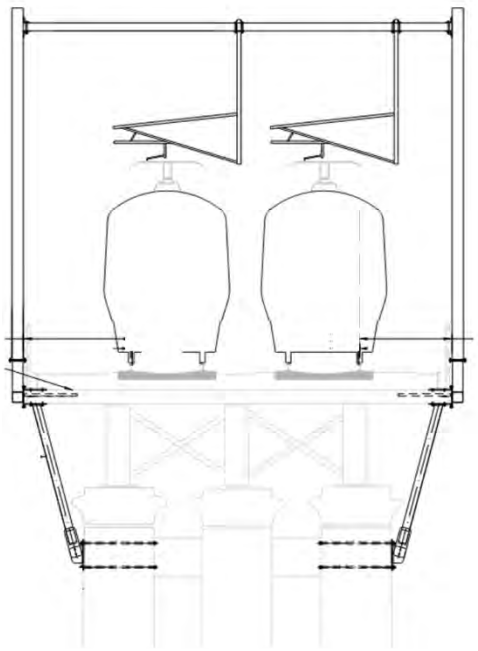

Image 5-100 Cross section of gantry installation

The OHLE support structure will utilise the following members:

1. OHLE post (part of the OHLE portal frame).
2. Existing transverse girders – Two existing girders at each refuge area will be utilised.
3. Proposed transfer beam – Connecting the existing transverse girders to the vertical post of the OHLE portal structure.
4. Proposed diagonal struts – Connecting the transfer beam and transverse girders to the existing pier supports.
5. Proposed plan cross bracing – Elements to be connected to the existing transverse girders.
6. Existing pier support – Existing columns at each pier location will be utilised.

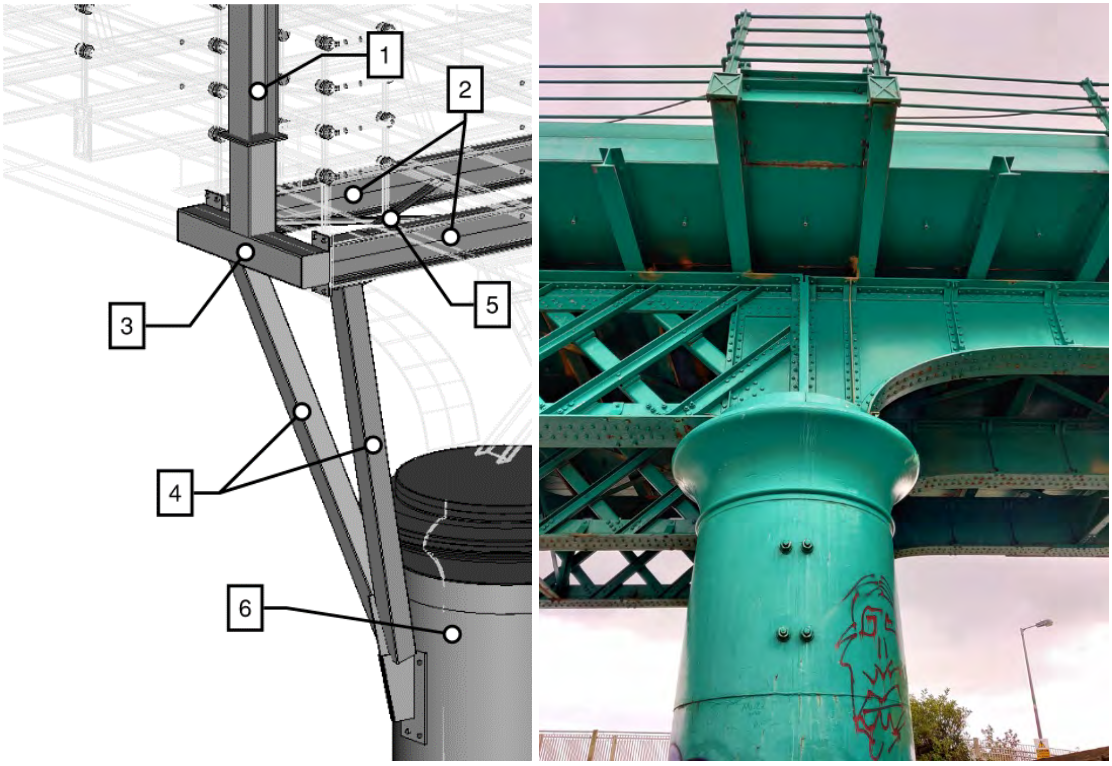

Image 5-101 Isometric view of proposed OHLE support alongside view of existing pier.

5.7.2.2 Construction methodology

The following construction sequence is envisaged:

1. Scaffolding is installed at both pier locations to facilitate the works.
2. The existing guardrail and end plate supports would be removed from the refuge area.
3. New connection plates added to existing transverse beams and piers.
4. The proposed OHLE structure will be assembled in parts (brought in by road or lowered from the track above).
5. Reinstate parapets (modified to suit).
6. Dismantle access scaffold.

Image 5-102 Example of previous scaffolding access (Source: IÉ)

5.7.2.3 Construction Compounds and Construction Access Routes

There will be worksites immediately around the piers to be modified as well as Construction Compounds supporting the work nearby.

The Construction Compound for the north pier (CC-44700) is in open ground to the west of the railway line. There may be a need to widen the footpath which currently links this area to the south pier if the structural steel is transported from the compound to the pier rather than delivered by rail.

The Construction Compound for the south pier (CC-44600) is in a layby and some open ground adjacent to the Coastview Cottages road (CC-44500).

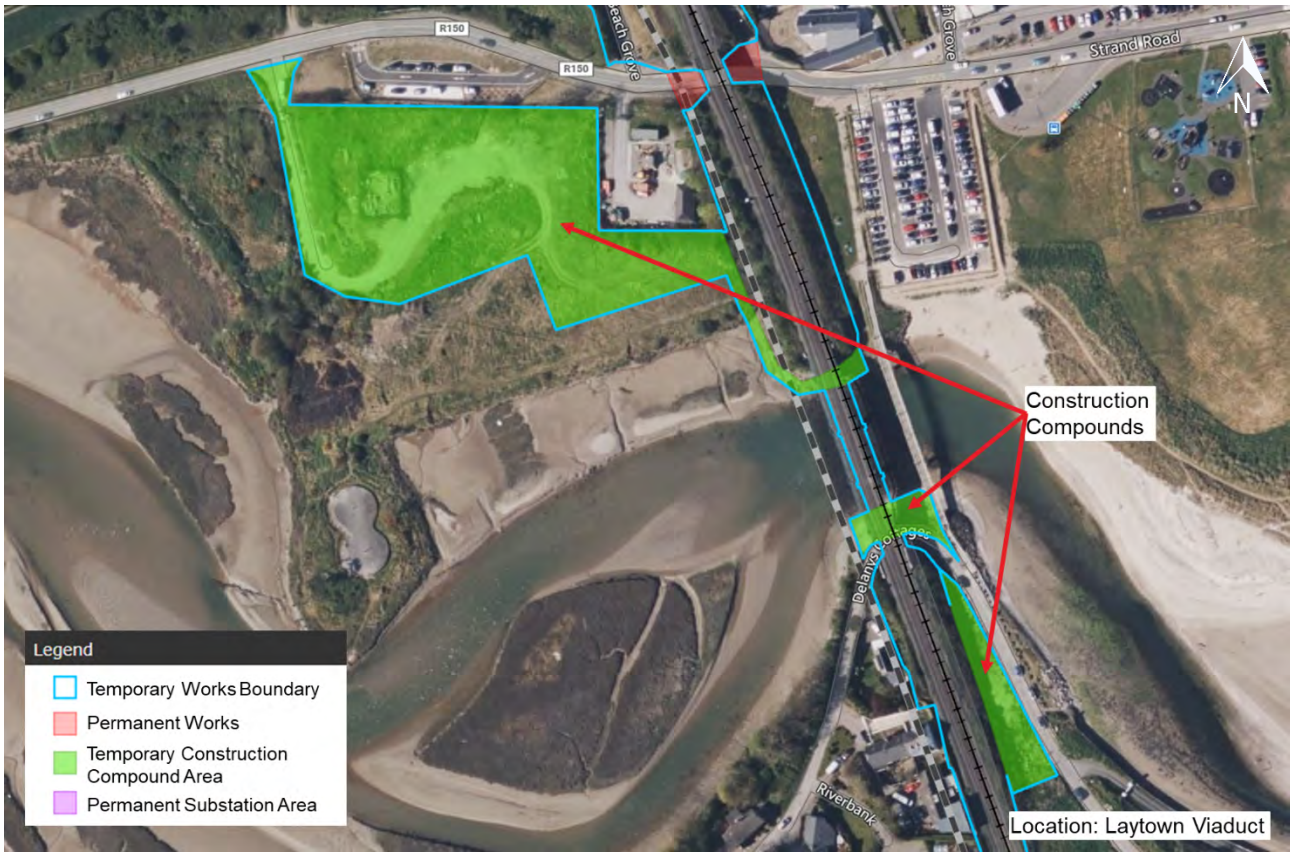

Image 5-103 Laytown viaduct proposed Construction Compounds

Image 5-104 Proposed north Construction Compound (CC-44700) (Source: Arup)

Image 5-105 Proposed south Construction Compound (CC-44500) (Source: Arup)

Image 5-106 Access for vehicles to Construction Compounds

The site is accessible from the regional road (R150) from the north or via Coastview Cottages, a local road from the south. The regional road is approximately 6m wide and the local road is narrow at approximately 3m width. The regional road to the north connects Julianstown and Laytown villages. The nearest road link of regional importance is the R132 Dublin Road that connects with the M1 in the south-west.

The southern local access road is narrow and would require additional traffic management measures to accommodate two-way construction traffic volumes. The clearance under the viaduct on this road is 4.26m which would limit the use of HGV. Therefore, where possible and subject to agreement between the contractor and IÉ, rail would be used as an alternative means for delivering large construction materials such as the steel beams, whilst light goods vehicles (LGVs) would be used to deliver smaller items.

5.7.3 Bettystown Substation

5.7.3.1 Overview of works required

The new Bettystown Substation will be located to the southwest of Bettystown close to a residential area adjacent to the railway.

Image 5-107 Bettystown Substation – Proposed Construction Compound (Source: ESRI)

5.7.3.2 Construction methodology

Construction of the substation will follow the scheme outlined in Section 5.3.8.1. The general duration of the works at this location will be as follows:

- Civil works 3 months
- Equipment installation 3 months

Most of the disruptions will come from the civil works, whereas the installation of the equipment and the tests will be less disruptive for the residents.

5.7.3.3 Construction Compounds and Construction Access Routes

The land take required to construct the substation will be slightly larger than the permanent land take. This area of land will be used as the Construction Compound (CC-46900).

The nearest road link of strategic importance in this area is the R132 which connects with the M1 in the south at Junction 7 and the R150. Site access will be via a new section of road which would need to be constructed off Narroways Road (L5362). The proposed site access is shown in Image 5-108.

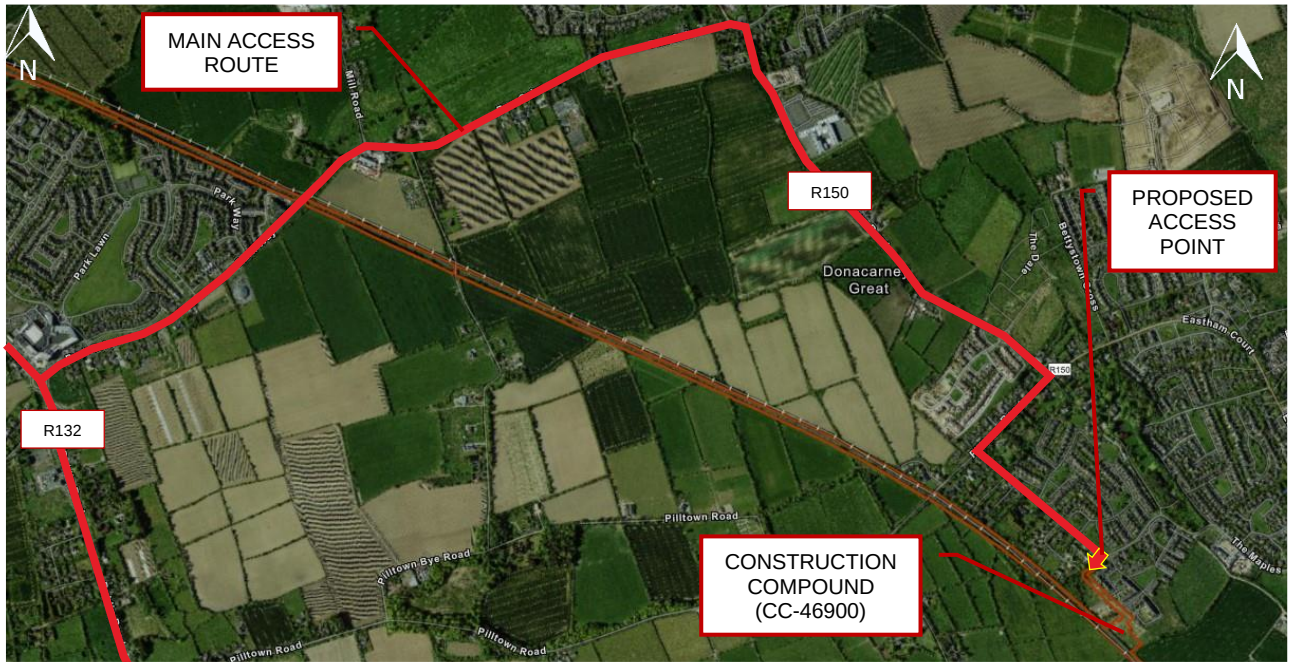

Image 5-108 Access to Bettystown Substation Construction Compound (CC-46900)

5.7.4 Colpe Road Bridge track lowering works

5.7.4.1 Overview of works required

Colpe Road Bridge is located on the south side of Drogheda on the edge of a built-up residential area. Works are required to lower the track level by approximately 0.1m under the bridge.

Image 5-109 OBB78 track lowering Construction Compound

5.7.4.2 Construction methodology

The track lowering works will follow the construction methodology proposed in Section 5.2.3.2 lowering one track at a time over a weekend closure whilst utilising the other track for access. The overall duration of the works will depend on the availability of weekend possessions.

Image 5-110 Existing elevation of OBB78 from track level (Source: IÉ)

5.7.4.3 Construction Compounds and Construction Access Routes

The proposed Construction Compound (CC-49600) is located to the south-west of OB78 in agricultural land outside the IÉ land boundary. The bridge is surrounded by suitable fields, but the site shown is deemed to minimise the impact to residents to the north of the bridge. The nearest road of strategic importance is the R132 which joins the M1 to the south-west near Gormanston. The Colpe Road joins the R132 at the small roundabout to the East.

Image 5-111 Access to OBB78 track lowering works Construction Compound

Image 5-112 Existing field access to be used to access OBB78 Construction Compound

5.7.5 Utility Diversions

Below is a brief overview of the utility diversions required in this zone. Further details of the diversions required are described in Chapter 4 (Description of the Proposed Development) and assessed in Chapter 18 (Material Assets: Utilities) in Volume 2 of this EIAR.

5.7.5.1 Electricity

Existing electricity infrastructure has been identified in the zone, comprised of MV and LV distribution lines operated by ESB. Diversions for MV and LV assets are required in this zone. Where feasible, diversions have been designed to limit the extent of intervention necessary at the track interface, primarily using existing bridges/underpasses and existing electricity infrastructure already present on the opposite side of the track crossing.

One overground diversion and one underground diversion for MV and LV assets are required that are capable of being conducted via standard means. Horizontal directional drilling is required for four diversions in this zone. Additionally, there is an instance where overhead LV assets run parallel to the tracks and may need to be diverted in this zone.

The temporary land take required to carry out the diversions is summarised in the following images. The land take includes an allowance for construction access routes, space for vehicles to pass and turn around on site and space to remove the existing lines.

Parallel overhead line – Gormanston (OH-PDV14)

Image 5-113 OH-PDV13 – Gormanston (Ch. 39,480-39,620)

The LV line that runs parallel to the railway in this location is planned to be diverted to the east. As shown in Image 5-113, a work area has been allocated for the diversion. Access will also be required into the land within which the existing line is located in to remove it.

Overhead lines - Gormanston Station (UTX11)

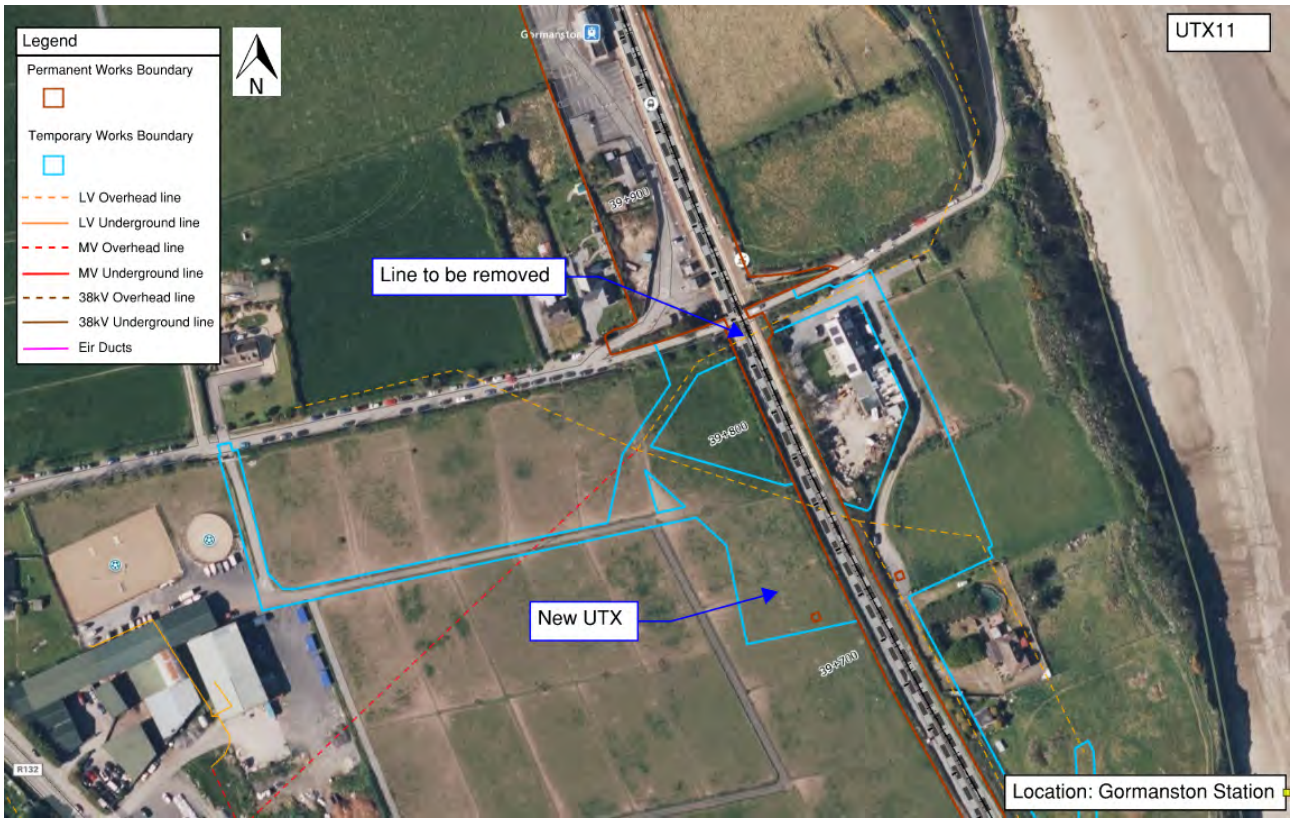

Image 5-114 UTX11 – Gormanston Station (Ch. 39,830)

The line that crosses the railway in this location at Gormanston Station is planned to be diverted Underground in a UTX. As shown in Image 5-114, a work area and access route have been allocated for the diversion and the removal of the existing lines. The existing field accesses would be used to access the agricultural land areas. Any work on Station Road would have to be done under traffic management.

Overhead lines – South of Laytown (UTX 4)

Image 5-115 UTX4 – South of Laytown (Ch. 44,390)

The lines that cross the railway in this location to the south of Laytown are planned to be diverted via UTXs. As shown in Image 5-115, a work area, compounds and access routes have been allocated for the diversion and the removal of the existing lines. The eastern compound is situated between two local football pitches and accessed off Coastview Cottages road. The western compound is situated on agricultural land and accessed via a track on private land from Coastview Cottages road. The northern access route's width is limited by the property's entrance gates so the western route would be preferred for any larger vehicles.

Overhead line – Laytown (UTX 3)

Image 5-116 UTX 3 –Laytown (Ch. 45,200)

The line that crosses the railway in this location in Laytown is planned to be diverted via UTX. As shown in Image 5-116, a work area, compounds and access routes have been allocated for the diversion and the removal of the existing lines. The eastern compound would be in the open area at the end of Alverno Heights Road and the western compound would be the planned line wide Construction Compound at Laytown station accessed from the R150. The existing field access off the R150 would be used to access the agricultural land areas to the west of the railway. The existing line's eastern pole is in the back garden of a property on Alverno Court and access would be needed to decommission the line.

Overhead line - Bettystown (UG-DV1)

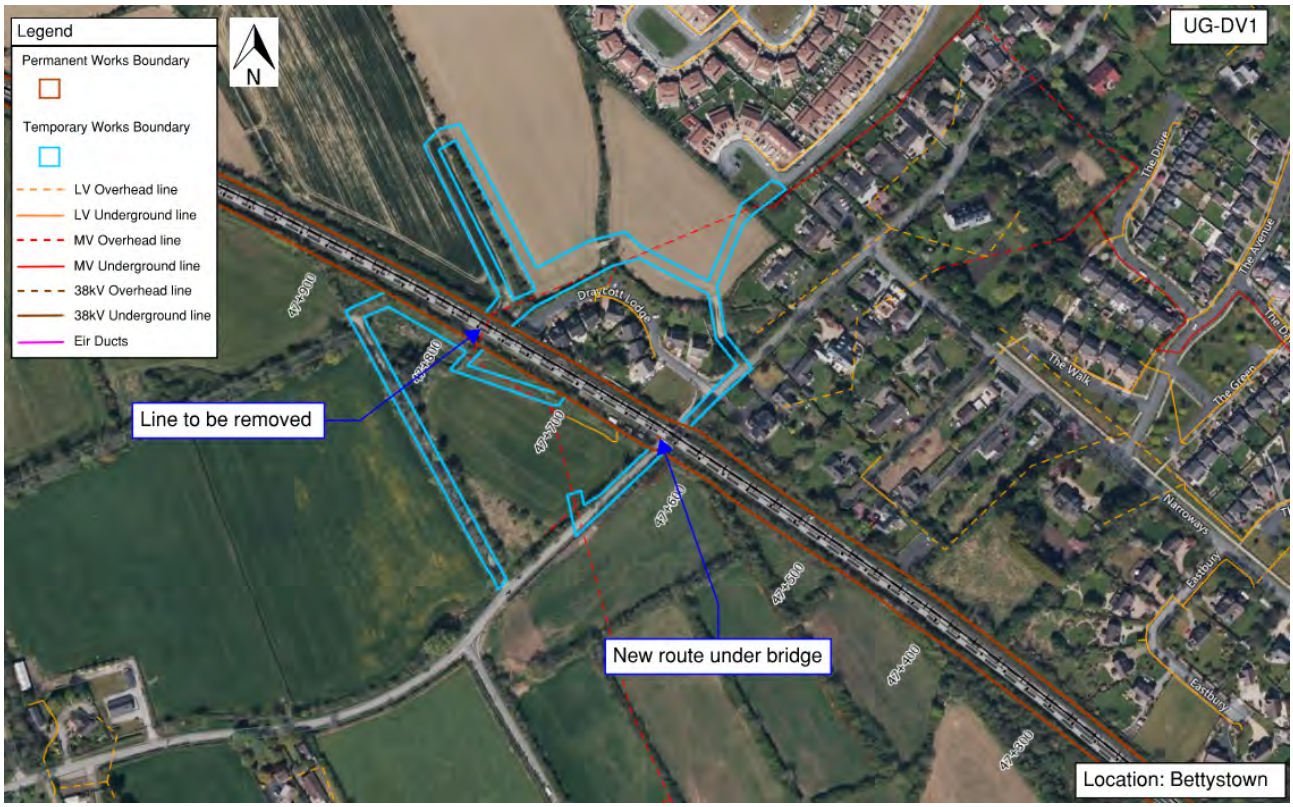

Image 5-117 UG-DV1 – Bettystown (Ch. 47,770)

The line that crosses the railway in this location to the north of UBB76 is planned to be diverted under UBB76. As shown in Image 5-117, a work area and access routes have been allocated for the diversion and the removal of the existing lines. The existing field accesses would be used to access the agricultural land areas. The L5615 would need to be under traffic management for several weeks to divert the cable along the road.

Overhead line – South of Drogheda (OH-DV1)

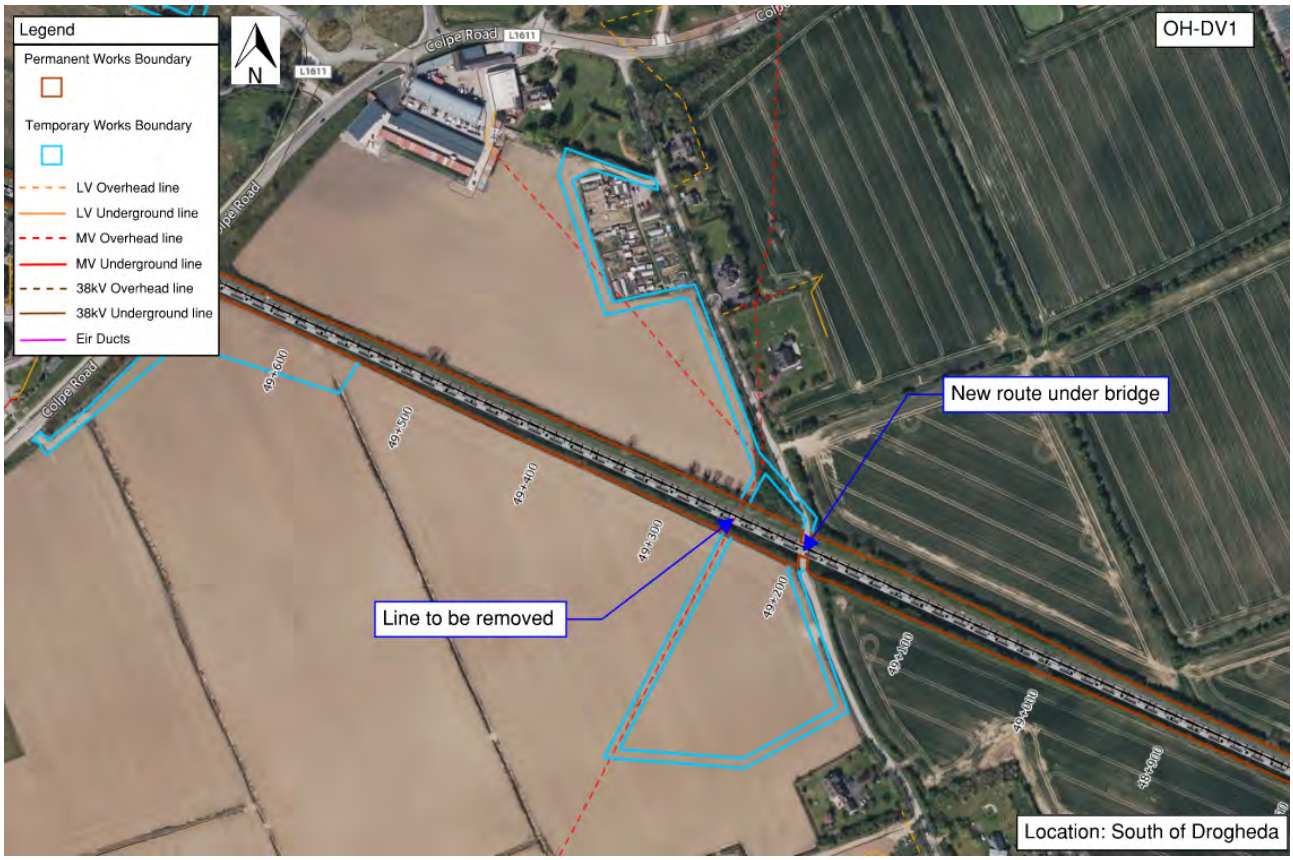

Image 5-118 OH-DV1 – South of Drogheda (Ch. 49,250)

The line that crosses the railway in this location to the north of OBB77 is planned to be diverted over OBB77. As shown in Image 5-118, a work area and access routes have been allocated for the diversion and the removal of the existing lines. The existing field accesses would be used to access the agricultural land areas. The local road would need to be closed for approximately a week to divert the line.

Overhead line - Drogheda (UTX 2)

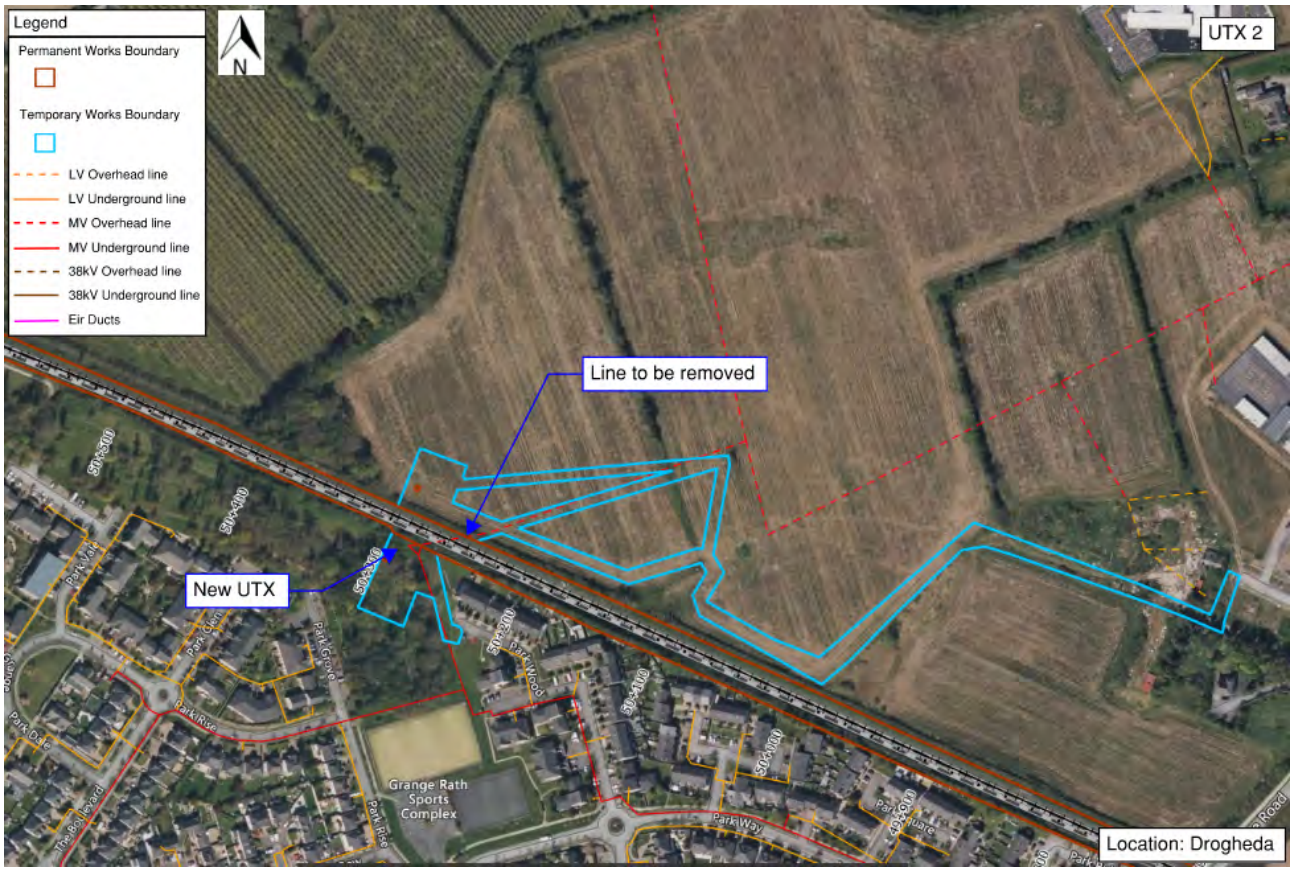

Image 5-119 UTX 2 – Drogheda off Park Wood Road (Ch. 50,270)

The line that crosses the railway in this location is planned to be diverted via UTX. As shown in Image 5-119, a work area, compounds and access routes have been allocated for the diversion and the removal of the existing lines. The existing field access would be used to access the agricultural land areas to the north. The southern compound would be accessed off Park Wood Road. Some vegetation clearance may be necessary to accommodate these works.

5.7.5.2 Telecommunications

Vodafone, Eir, Virgin Media, and BT were identified as having existing telecommunication assets in this zone.

Overhead lines - Gormanston Station (UDV-7)

Image 5-120 UDV 7 – Drogheda off Park Wood Road (Ch. 50,270)

An existing Eir cable crosses the railway in this location at Gormanston Station and is planned to be diverted underground. As shown in Image 5-119 a temporary work area is required to either side of the bridge. The road will need to be temporarily closed under traffic management for the duration of the diversion, likely for approximately a week.

5.7.5.3 Gas

No conflicts or diversion requirements with the existing gas infrastructure assets have been identified in this area.

5.7.5.4 Sewer and watermains

No conflicts or diversion requirements with the existing sewer and watermain infrastructure assets have been identified in this area.

5.7.6 Line-wide Construction Compounds

As described in 5.3.3.3, there are some line-wide compounds located at existing maintenance compounds rather than at isolated works Construction Compounds. In Zone D these are at Gormanston Station (CC-41400) and Laytown Station (CC-44900). Their locations and access routes are identified in Image 5-121 and Image 5-122.

Image 5-121 Gormanston Station Line-wide Construction Compound and Access Route

Image 5-122 Laytown Station Line-wide Construction Compound and Access Route

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

Zone E encompasses Drogheda MacBride Station and the station surrounds including the area around the Dublin Road Bridge (UBK01) and extending to the Louth/Meath border. This zone lies within Louth County, bordering Meath to the south. Zone E covers Chainage 50+700 to 52+750 on the Northern Line.

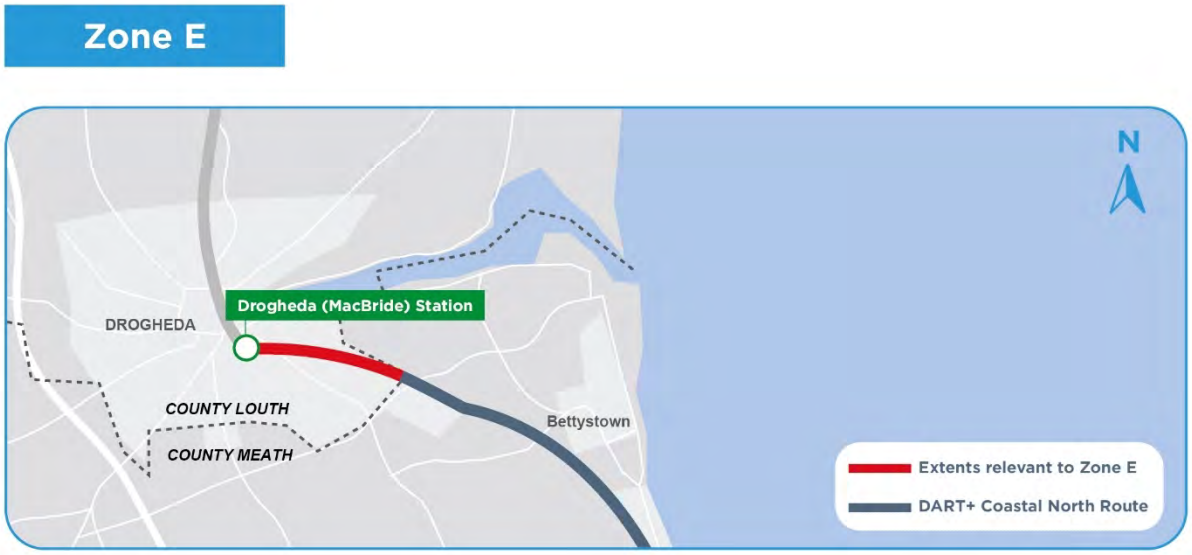

Image 5-123 Overview of Zone E (Source: ESRI)

Construction Phase works within Zone E will include:

- Demolition and replacement of the triple span Railway Terrace Bridge (OBB80/80A/80B);
- Realignment of Railway Terrace and McGrath's Lane;
- Reconstruction of R132/Dublin Road Bridge (UBK01);
- Reconstruction of Drogheda Station Footbridge (OBB81);
- 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;
- Reprofiling 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.

More detail on the works required within this zone is given in the Sections 5.8.1 to 5.8.8. For further information on the listed parapet modifications refer to Section 5.3.7.1.

5.8.1 McGraths Lane Bridge (OBB80/80A/80B)

5.8.1.1 Overview of works required

The existing three-span McGraths Lane Bridge does not provide enough clearance to allow installation of the OHLE needed for electrification. It is proposed therefore to demolish and replace this bridge with a new bridge in the same location. The proposed replacement bridge is a three-span, reinforced concrete structure. It will have piled foundations, wingwall retaining walls and parapets.

Image 5-124 McGrath's Lane Bridge – Overview of Proposed Works (source: ESRI)

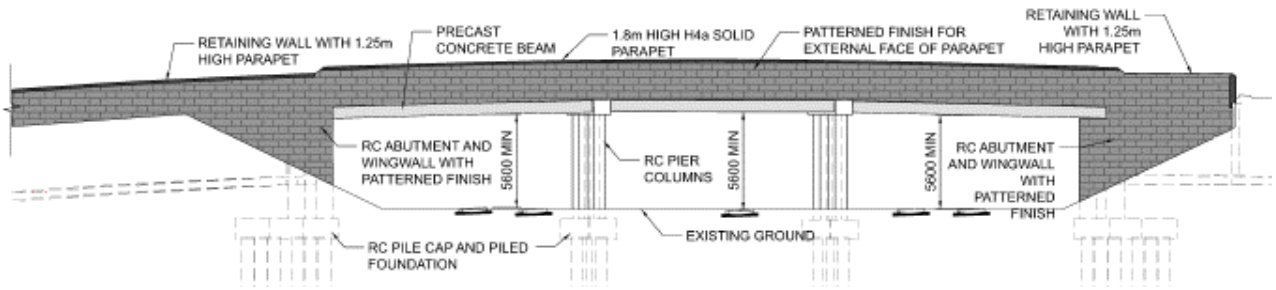

Image 5-125 Elevation of the proposed bridge

5.8.1.2 Construction methodology

Given the location of the bridge, much of the work will need to be done during track possessions. It is planned that these will be a combination of weekend and night-time possessions. Presently the weekend possessions are assumed to be “long weekends” of four days duration each, occurring twice per year.

5.8.1.2.1 Phase 1: Enabling works

The main Construction Compound to serve the replacement of this bridge will be located off McGrath’s Lane to the north, as shown in Image 5-126. A smaller compound is also planned off the northern end of Railway Terrace, close to the bridge site. In addition to setting up compounds, enabling works will also involve vegetation removal, utility diversions and SET equipment relocation as required. A temporary access road will be constructed to the north linking to Marsh Road (R150) to facilitate access to properties on McGraths Lane, to support the northern compound and to provide road vehicular access to the bridge site.

5.8.1.2.2 Phase 2: Demolition

Demolition will take place predominantly from track level, with some works on the embankments as well. The majority of the works are planned to take place for one four-day weekend possession, to be coordinated with various train movements in the vicinity. Some preparatory works are also envisaged during non-disruptive night possessions and extended Saturday night possessions. Access for the works will be from both north and south directions, though predominantly from the north side of McGraths Lane. The sequence of demolition will be planned to ensure safety of all aspects including stability of the adjacent earth slopes. The railway tracks will be protected before breakers, excavators, cranes, and other construction plant are positioned over them and alongside the bridge. Demolition arising may be removed by rail or road, depending on arrangements with relevant parties. Some excavation of present foundations will take place, with a possible requirement of localised ground stabilisation measures such as sheet piling (especially if there is a risk of track movements).

Control of noise and vibration from demolition is addressed in Appendix A5.1 (CEMP) in Volume 4 of this EIAR as well as in Chapter 14 (Noise and Vibration). It is recognised that there are residential properties in the vicinity of the works, on both sides of the railway, so works will be planned with that in mind.

5.8.1.2.3 Phase 3: Foundations, piers, and abutments

The new bridge foundations will be piled from track level with the intention of minimising disruption to the railway. The phases will be planned with available track possessions in mind, this anticipated to focus primarily on one or more long weekends due to the time it takes to position relevant construction plant and tidy all matters away before reopening the tracks. It is expected that not all tracks will need to be possessed for the same duration, this depending on detailed position of construction plant.

Construction of the concrete pile caps, piers and abutments will follow, some during track possessions due to their proximity to the tracks. These track possessions are likely to focus on the non-disruptive night periods available, especially extended Saturday nights. There may be efficiencies to be gained by using precast columns and abutment blocks.

5.8.1.2.4 Phase 4: Deck

The bridge deck will be formed with precast concrete beams. A crane will be set up to lift each beam off a lorry and into place. This would be done during one or more track possessions, most likely over a long weekend. The deck would then have precast concrete planks placed between beams, during one or more possessions, allowing a concrete deck to be formed above during normal working hours. Parapets would be lifted in and secured once sufficient deck has been formed, this being the final main operation requiring track possessions. Completion of the deck would follow during normal working hours.

5.8.1.2.5 Phase 5: Finishing works

As the bridge deck is being constructed, the approach roads on each side will be formed. Drainage, signage, landscaping, and surface finishes will also be applied. Ultimately, all temporary worksite areas and access routes will be returned to their former use, this being after the new bridge has been opened to the public.

5.8.1.3 Construction Compounds and Construction Access Routes

Image 5-126 McGrath's Lane Bridge – Proposed Construction Compounds (Source: ESRI)

A Construction Compound (CC-51800) will be established alongside the northern verge of the adjacent McGrath's Lane, outside of the current IÉ land ownership boundary. This compound will feed workstreams at the McGraths Lane bridge and line-wide works to both north and south. The compound will be accessed by a new temporary access road to be built off the R150 Marsh Road, this access road also being used by residential properties at each end of McGrath's Lane.

A minor compound (CC-51900) is also planned adjacent to the southern abutment of the McGraths Lane Bridge, within IÉ land, on a plot that will be shared with the construction of a new signal equipment building (SEB). Temporary provision for vehicle turnaround will be provided within this site during the phases where Railway Terrace becomes a cul-de-sac.

The nearest road link of strategic importance to the McGraths Lane Bridge is the R150 which connects with the M1 in the south via Colpe Road and the R132. Access to the main compound is planned to be via a new temporary road, just westward of a road recently built for a new housing development in the area. Although limited, some construction access is also likely to be required along Railway Terrace, part of this in conjunction with the installation of a signal equipment building (SEB) near to the bridge. Construction traffic would approach Railway Terrace via the R132 to the south to avoid traffic routing through the centre of Drogheda.

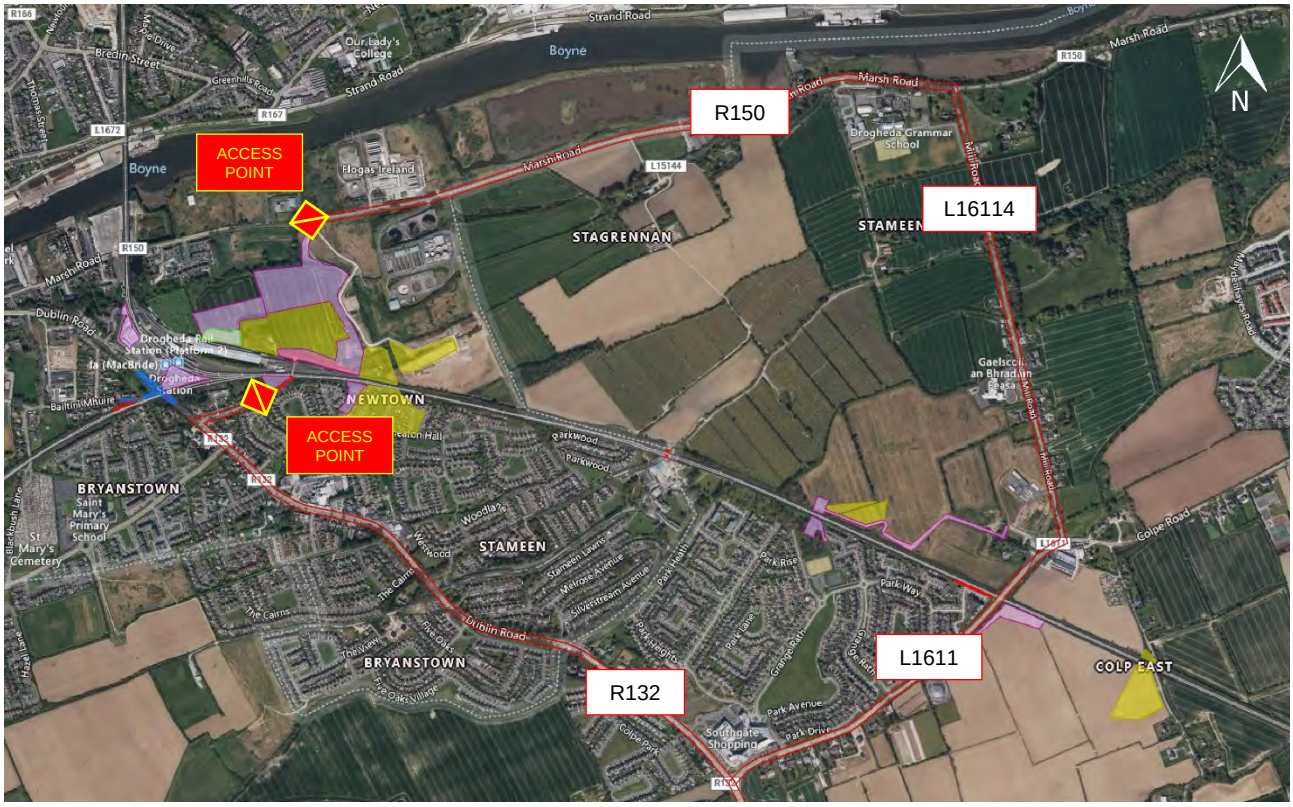

Image 5-127 McGraths Lane Bridge – Proposed Construction Access Route (Source: ESRI)

Image 5-128 Three views along Railway Terrace (Source: Arup)

Image 5-129 Proposed access from Marsh Road (R150) (Source: Arup)

5.8.2 Dublin Road Underbridge (UBK01)

5.8.2.1 Overview of works required

The railway bridge (UBK01) over the R132 Dublin Road is to be widened in two phases. A new span with one track is to be added to the south side first, and then the deck of the existing bridge will be removed, and a new deck installed with the new Platform 4 extending over. No change to the alignment of the Dublin Road beneath is proposed.

Image 5-130 Existing Dublin Road Bridge (Source: Arup)

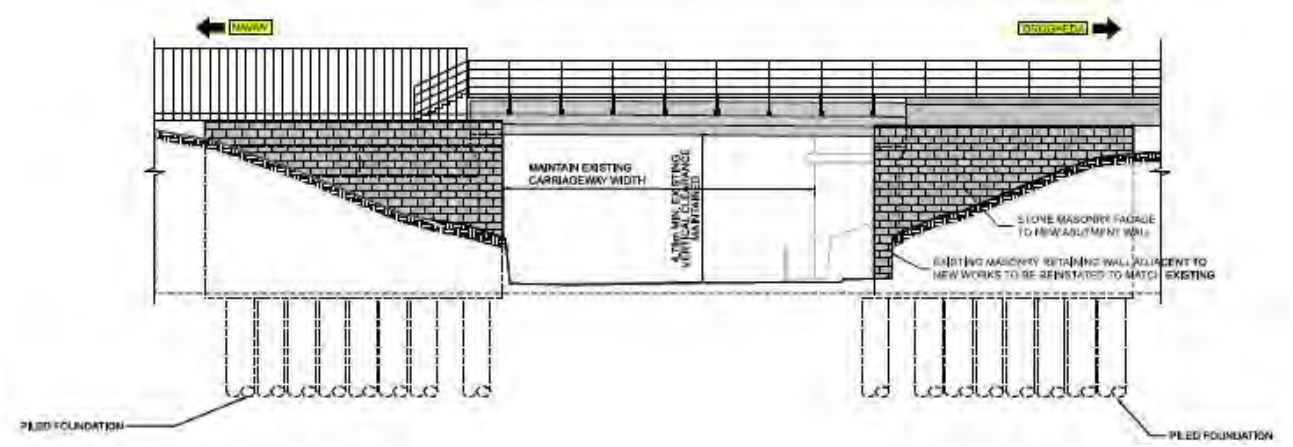

Image 5-131 Elevation of proposed new bridge UBK01

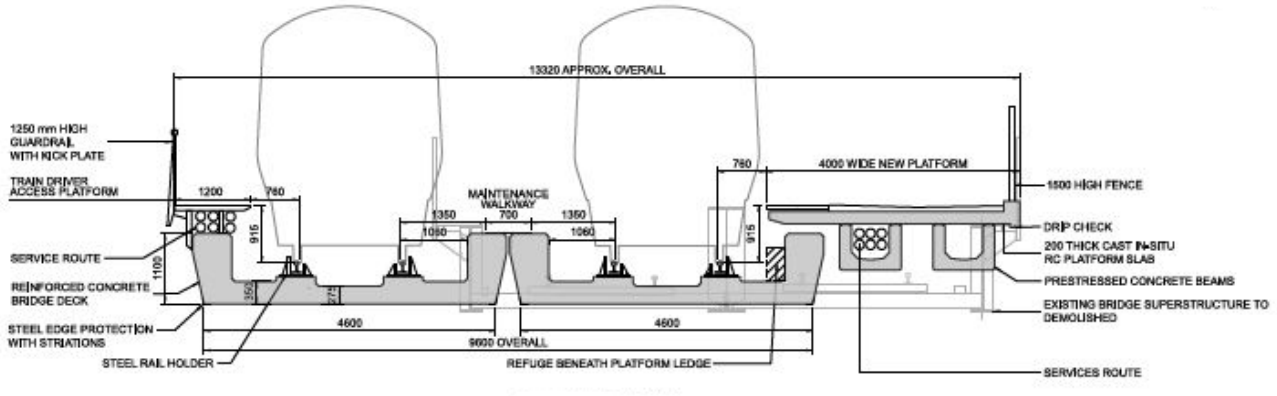

Image 5-132 Section through proposed new bridge UBK01 deck structure

5.8.2.2 Construction Methodology

This worksite is constrained by vegetated slopes on both sides of the railway (Drogheda Freight Sidings) and by a main road (the R132 Dublin Road) passing through it. There will be some weekends where full closure of the road will be required and other extended periods where the road will be reduced to a single lane under a traffic light contra-flow system. Removal and installation of bridge deck units is when total closure will be required; work on abutments is when single lanes will need to be put into operation. The Drogheda Freight Sidings itself will need to be closed for intermittent periods leading up to the installation of a new bridge deck when closure may be required for a small number of weeks. Meantime it is planned to retain as much functionality of the railway line as reasonably possible during the works, dropping services down to one track at a time (as opposed to full closure) where safe to do so.

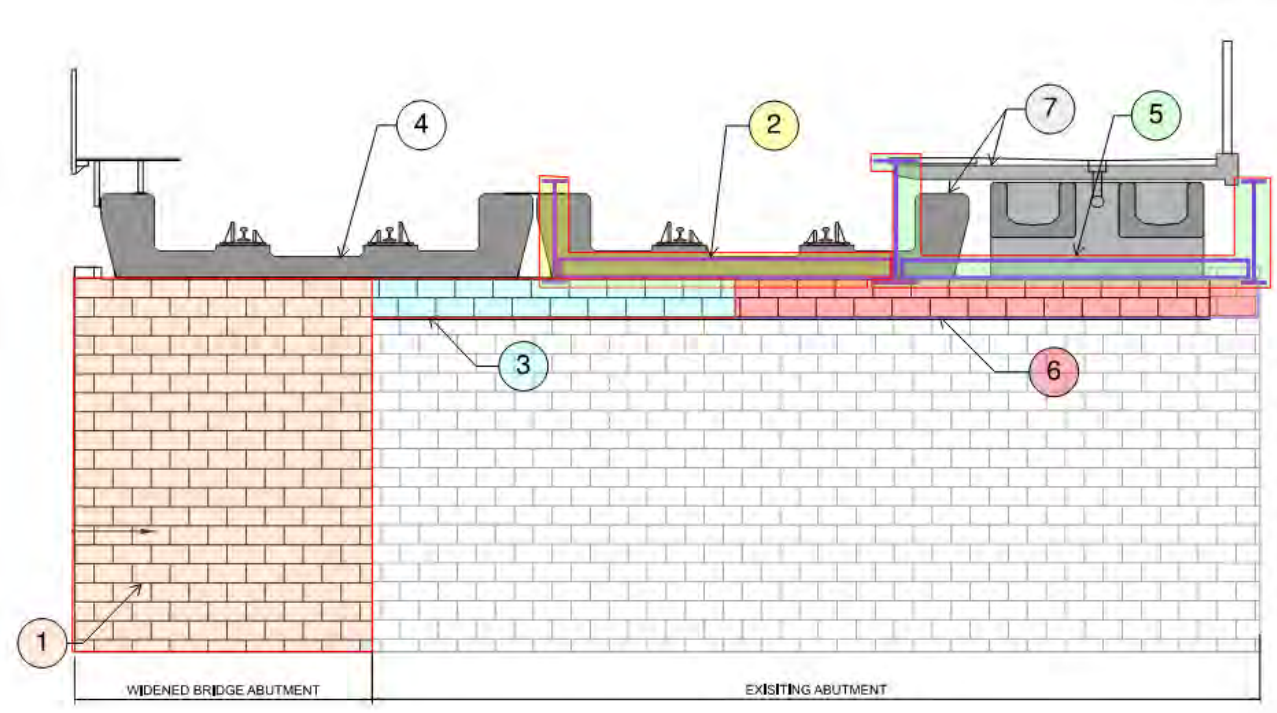

Image 5-133 Section of proposed works for Dublin Road Bridge (UBK01)

The proposed construction sequence for the Dublin Road Bridge (UBK01) modification works is as follows (see Image 5-133 for graphical representation):

1. Prepare the site by removing vegetation and excavating in to each abutment location to allow for pilling rig access with stabilising slopes where needed. Construct first one new abutment extension on the south side of bridge and then the second abutment extension: piles, abutment wall, capping beam and wingwalls. Back fill in behind the abutment extensions and reinstate excavation. Meantime restrict the Dublin Road R132 to a single lane contra-flow system to enable safe operation of all construction plant both at road level and from the higher track level.
2. Close the southern railway line and remove associated tracks, sleepers, ballast, and deck troughing. Thereafter close both railway tracks and road below, remove the southern side of the existing bridge deck including the outer steel girder, and then reopen the road and remaining rail track after checking for structural stability of the remaining bridge span.
3. Break down the top of the existing masonry abutments and excavate to the underside of the proposed new bed stones. Install a new precast concrete bed stone onto each abutment, grouting into position.
4. With the Dublin Road fully closed to traffic, lift in the new southern span precast concrete beams, and construct the new in-situ reinforced concrete bridge deck supported off permanent steel formwork. Reopen the road below when it is safe to do so. Complete embankments on each side of the road (this could potentially be under lane restricted traffic light control). Lay ballast and new railway track on new bridge section and open to trains.
5. Close then remove the northern tracks over the bridge, followed by ballast. Close the Dublin Road fully to traffic then demolish the remaining (northern) bridge span.
6. With one side of Dublin Road open to traffic (on alternate flow), break down the top of one abutment on the north side of the bridge to the underside of the proposed bed stone level and install a new precast concrete bed stone. Repeat for the other abutment.
7. Construct the new northern side of the bridge deck in a similar fashion to the south side, albeit with a wider arrangement that includes a platform structure.

Whilst one track will be able to remain open at times, there will be periods when both railway lines on the Drogheda Freight Sidings will need to be closed for safety reasons. Examples of situations are when large elements are being lifted into position or away from the bridge, or when one track is being used to supply construction plant or materials to the other track.

5.8.2.3 Construction Compounds and Construction Access Routes

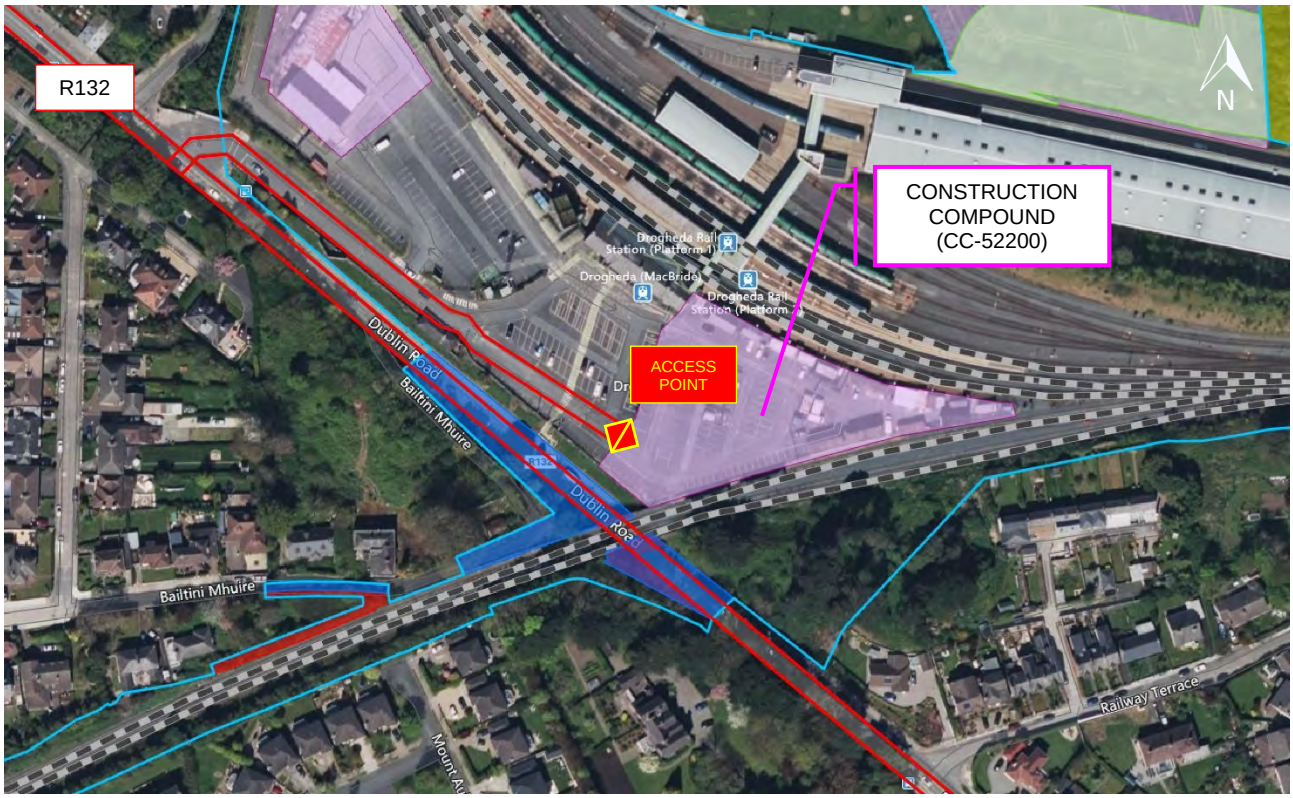

Image 5-134 UBK01/OBB81/Platform 4 – Proposed Construction Compound and Access Routes (Source:ESRI)

The main Construction Compound for the works on the Dublin Road Bridge will be within the station car park (CC-52200), as shown in Image 5-134. The actual bridge worksite area will fluctuate to follow the construction sequence described above, and to fit with traffic management requirements. As part of this, St. Mary's Villas may have periods of closure where it leads down onto Dublin Road, depending on detailed methodology planning and traffic management layouts.

The nearest road link of strategic importance in this area is the R132 which connects with the M1 in the south, avoiding routing construction traffic through the centre of Drogheda. Clearance under UBK01 is 4.87m and hence any traffic needing greater clearance would need to access the site from the M1 in the west via Donore Road and the R132.

The R132 Dublin Road will need to be reduced to a single lane, with bi-directional flow operating under traffic lights throughout much of the works, anticipated to be over several months. At times, such as during demolition, the road will need to be closed completely, during which a traffic diversion will be in place. These periods are likely to be for only a few days at a time, probably over weekends. Whenever there is at least one lane of traffic open under the bridge it is planned that there will be a public footpath too. This will be closed when the road is totally closed, for safety reasons.

Traffic management will be established based on latest regulations to ensure the safety of all road users (including cyclists), pedestrians and mobility impaired people. Where footpaths or off-road cycle tracks are affected by construction, a safe route will be provided past the works area where practicable. A Construction Traffic Management Plan (CTMP) is included in the CEMP (Appendix A5.1). This CTMP will be further developed by the Contractor and will detail, in agreement with the relevant authorities, appropriate arrangements for traffic management.

5.8.3 Drogheda Station Footbridge

5.8.3.1 Overview of works required

The deck of Drogheda Station Footbridge will be replaced as the existing structure does not provide sufficient clearance for the proposed OHLE for electrification. Image 5-135 and Image 5-136 present the existing structure and the proposed replacement structure.

Image 5-135 Existing Drogheda Station Footbridge (Source Arup)

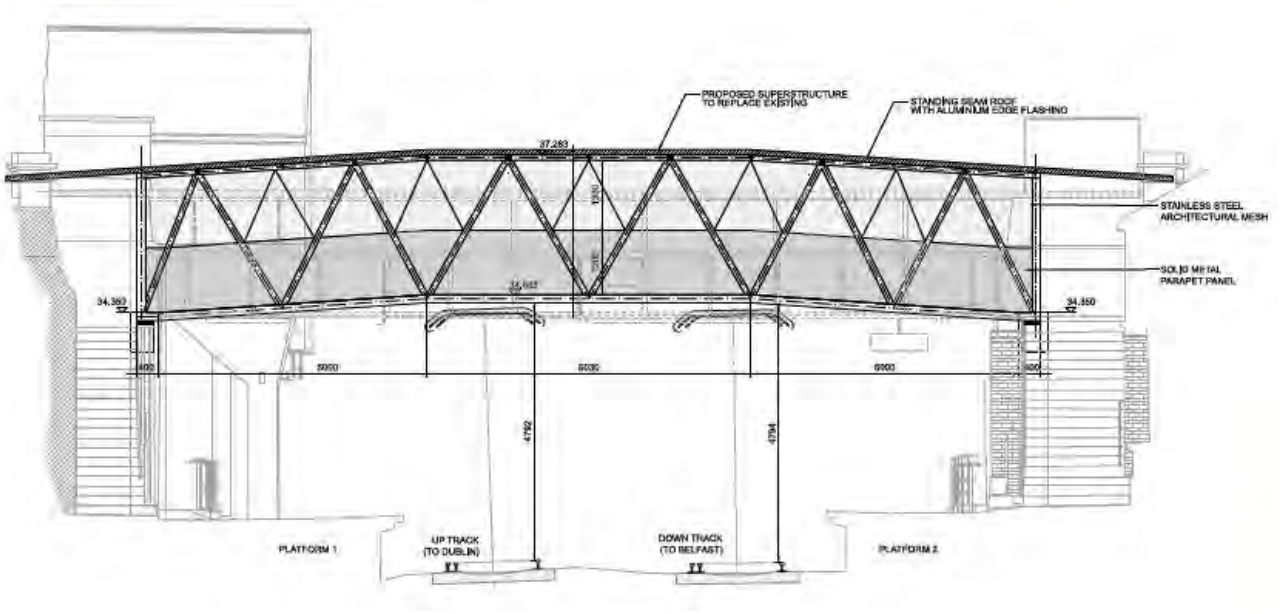

Image 5-136 Elevation of proposed replacement span for OBB81

5.8.3.2 Construction Methodology

The construction of this bridge includes two primary phases, namely the removal of the existing bridge superstructure and the construction/erection of the new superstructure.

5.8.3.2.1 Demolition and Removal of the Existing Bridge:

The primary issue associated with the demolition phase is to ensure that the existing heritage fabric of the station is not damaged and that there is minimal disruption to the railway services during construction.

The demolition sequencing proposals are as follows:

1. Identify suitable area to position crane and space for landing the superstructure (possible location within the car park area),
2. Remove all electrical cables and services interfacing with the construction works,
3. Dismantle roof canopy,
4. Locally break back the reinforced concrete deck slab from the stair landing,
5. Remove the nuts from the anchor bolts at the girder support locations,
6. Identify suitable lifting points on the existing superstructure (additional temporary bracing may be required for lifting),
7. Lift whole superstructure out (approximately 17 Tonne lifting weight),
8. The structure could then be dismantled on site or removed to a suitable location for dismantling and recycling of the materials (note, due to the modifications carried out on the southern girder, it is unlikely that this bridge could be used elsewhere on the network without substantial additional works).

The crane can be located within the parking lot along with the additional necessary space to land the bridge superstructure.

Image 5-137 Example of existing bridge being lifted out and proposed site for mobile crane

5.8.3.2.2 Erection of New Bridge:

Prior to installing the new superstructure, some modifications are required to the support columns and concrete landing. These will require some concreting works to set the bearing supports at the correct level and reconnect the columns to the landings. Once completed, the new bridge can be lifted into position.

The new superstructure will be lighter than the existing bridge. Hence, it is possible to lift in the completed structure (approximately 15 Tonnes including concrete deck slab) using the same crane configuration. Alternatively, it is possible to erect the structural steel truss independently if there was an advantage to reduce lifting weights at this stage of the operation. The deck slab could then be cast in-situ once the bridge is in position. Similarly, the parapet panels could either be erected in advance or at a later stage. It is envisaged that the roofing will be installed once the bridge is in position.

5.8.3.3 Construction Compounds and Construction Access Routes

The Construction Compounds and access routes will be shared with UBK01, and the work will be phased such that work on one does not disrupt the other.

5.8.4 Platform 4, Drogheda Freight Sidings

5.8.4.1 Overview of works required

A new platform, Platform 4, is to be constructed at Drogheda in conjunction with turnback works on the Drogheda Freight Sidings. This entails not only trackwork and platform works but the installation of ticketing gates, CCTV, protected waiting areas, fencing and rearranged parking areas.

5.8.4.2 Construction Methodology

The East Branch Siding (non-platform) track would need to be slewed first. The first part of this will require removal of the walkway and cable trough. New ballast, sleepers, and track are laid, along with the new cable trough and walkway. Note that the Dublin Road Bridge works need to be coordinated with these track works, as the modified bridge needs to be able to receive the new track alignment.

The new platform would then be built by preparing the ground and then lowering precast units into place with either a small crane or excavator. Ductwork, pipework, and cabling would then be installed, and the second (northern) track slewed across.

Meantime the raised concourse area alongside will have been constructed, starting with the relocation of existing buildings, cabinets, and utilities on the footprint of the new platform and surrounding support area. Some works will take place at weekends to minimise disruption to weekday station activities. Once the new facilities are in place (ticketing gates, CCTV, protected waiting areas, fencing and rearranged parking areas), and all systems commissioned, the northern track will ideally have been commissioned and approved ready to open to the public.

The track works will be undertaken during weekend and night-time possessions.

Works to install most lineside civil works will be undertaken using a variety of trackside construction plant. Where this is not feasible, for example fencing being too far away at the top of a cutting, localised arrangements with landowners will be needed for temporary alternative construction access arrangements. Where works are undertaken from trackside, these will need to be performed during track possessions.

5.8.4.3 Construction Compounds and Construction Access Routes

Construction of these works will be served by a Construction Compound in the station car park (CC-52200). This Construction Compound will be broadly the same as that shown for the works on the Dublin Road Bridge.

5.8.5 Drogheda Substation

5.8.5.1 Overview of works required

The new Drogheda Substation will be in agricultural land adjacent to the existing depot. The new substation will be constructed to provide power to the OHLE. There are residential properties approximately 60m from the proposed works and therefore consideration of suitable mitigation to ensure impacts on these residents are minimised during construction have been included where necessary. Refer to Appendix A5.1 (CEMP) in Volume 4 of this EIAR for further details on the controls to reduce impacts during the Construction Phase.

5.8.5.2 Construction Methodology.

Construction of the substation will follow the scheme outlined in Section 5.3.8.1. The general duration of the works at this location will be as follows:

- Civil works 3 months
- Equipment installation 3 months

Most of the disruptions will come from the civil works, whereas the installation of the equipment and the tests will be less disruptive for the residents.

5.8.5.3 Construction Compounds and Construction Access Routes

The land take required to construct the substation will be slightly larger than the permanent land take. This area of land will be used as the Construction Compound (CC-52050). Contractors will predominantly use an access route through the west end of the station car park for construction access, through the constrained tunnel under the railway and then along the north side of the depot building. An alternative route could be from the east, via McGrath's Lane, though this is at risk of hindrance from the OBB80 McGrath Lane bridge works.

Image 5-138 Drogheda Substation – Proposed Construction Compound and Access Routes (Source: ESRI)

5.8.6 Depot Light Maintenance Roads and UFC facility

5.8.6.1 Overview of works required

The Light Maintenance Roads in Drogheda Depot numbered 8 and 9 are proposed to be modified. These works can be summarised as:

- Train door replacement;
- Roof access gantry additions for Depot Protection System (DPS);
- OHLE, for Roads 8 and 9;
- Installation of DPS; and
- Installation of Under Frame Cleaning (UFC) screen.

5.8.6.2 Construction Methodology.

Additional overhead electrification (OHLE) will be installed on Roads 8 and 9 of the depot to cater for the new BEMU and EMU fleets. This will be phased around the movements and requirements of the fleets using the depot, with periods of extended workspace to be agreed with the depot maintenance team.

The Depot Protection System (DPS) installation will be phased in a similar way to the OHLE works, inclusive of roof access gantry additions. The precise interfacing between activities will be developed at a later stage.

The train door replacement will be phased to suit other works and train movements.

The UFC screen will be erected alongside the eastern end of the depot building at a time to fit in with other activities, including construction.

Image 5-139 presents the extent of worksite areas planned for the Light Maintenance Roads works, in the depot. Space within and immediately around the depot will be restricted by other station activities thus will need to be phased to suit. As a result, an additional area is required in the car park, primarily as a storage area and/or site office/welfare to cater for construction works. There may be opportunity to increase worksite space immediately to the east of the depot building for a while when McGrath Lane Overbridge (OBB80) is being rebuilt. This is because during some of this time trains will not be able to approach the depot building directly from the east. Access will be via the same route as shown for the substation.

5.8.6.3 Construction Compounds and Construction Access Routes

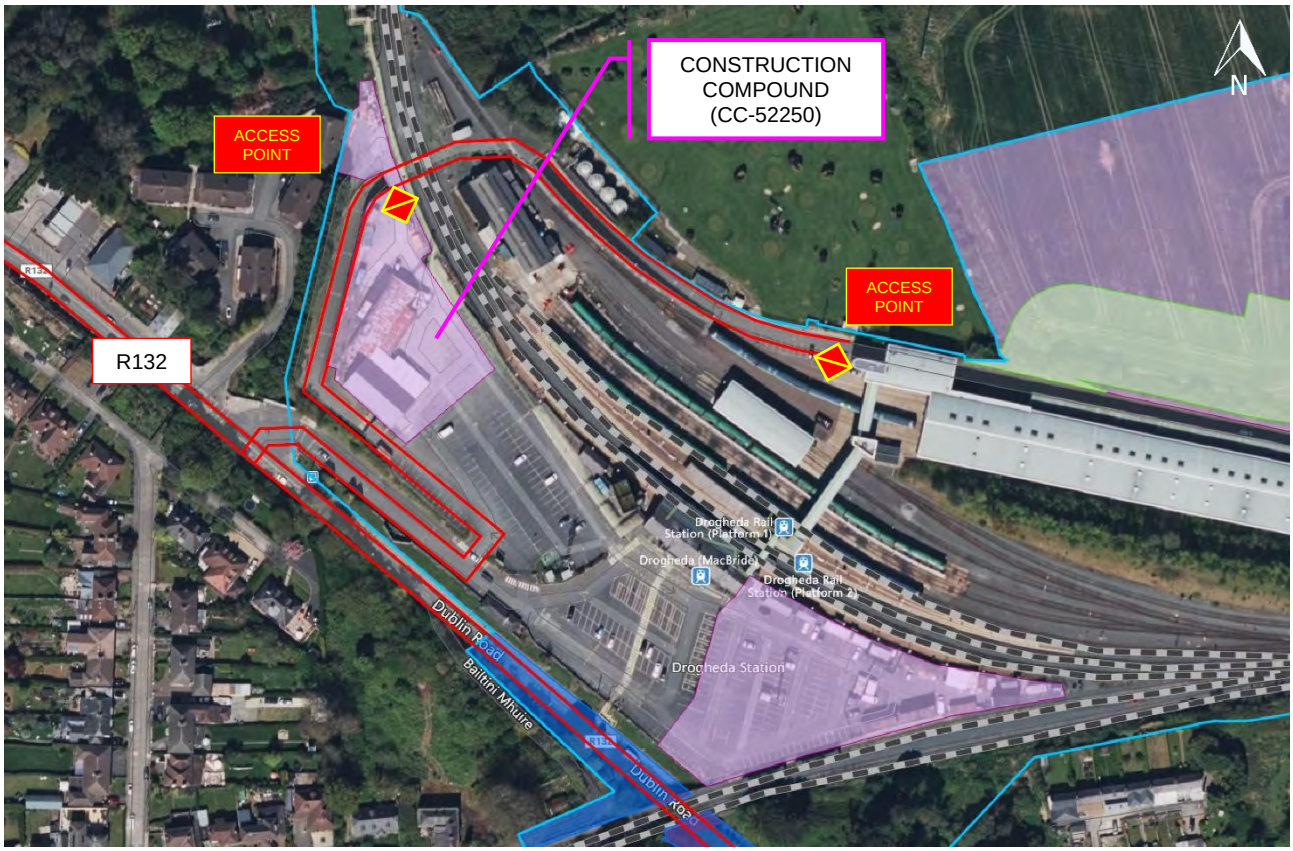

Image 5-139 Drogheda Depot – Proposed Construction Compound and Access Route (Source: ESRI)

5.8.7 Drogheda Depot External Civils Works

5.8.7.1 Overview of works required

The proposed works at the Drogheda depot include:

- New drivers' and cleaners' provision by creating Stabling Road 7B to the north of the existing Stabling Road 7A by reprofiling the adjacent bund;
- Modification to civils items affected by the new track works for Stabling Roads 7A and 7B; and
- New drivers' and cleaners' provision for the Northern Headshunt.

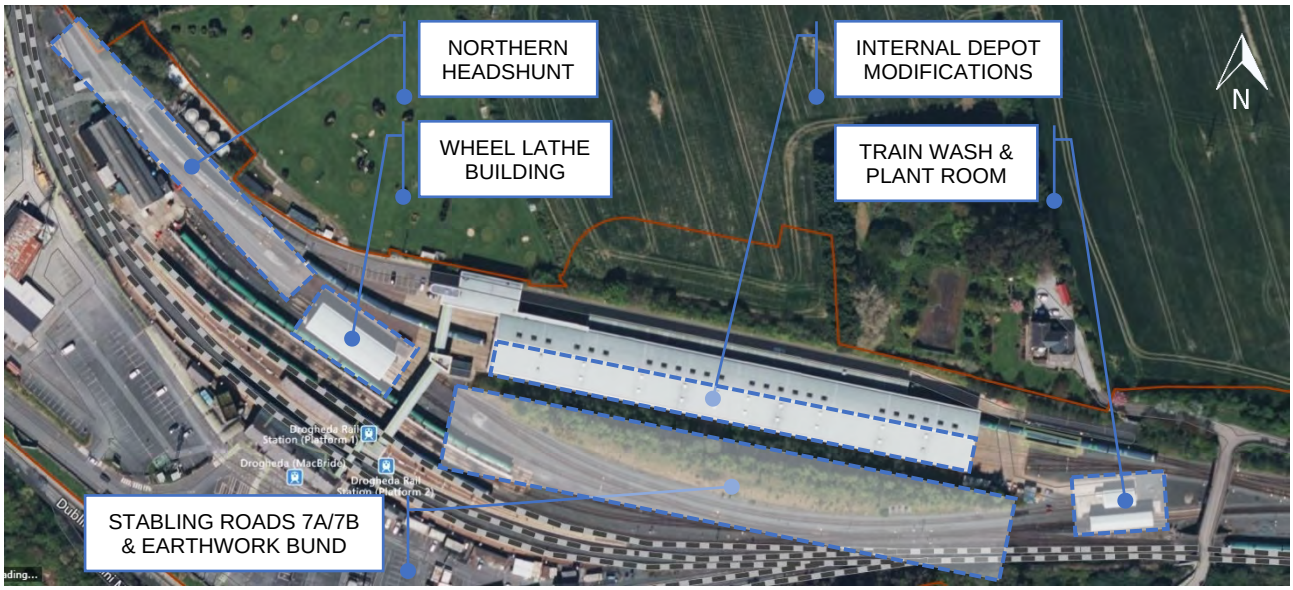

Image 5-140 Proposed locations of external civils works at the depot

Image 5-141 Depot viewed from McGraths Lane Bridge (Source Arup)

5.8.7.2 Construction Methodology

The stabling road works will involve vegetation clearance over part of the existing bund and earthworks to reprofile, after which drainage, ballast and track will be laid and the new walkways and cleaning facilities installed. Some services relocation will be required. The laying of trackwork will need to be coordinated with train movements in and out of the western end of the depot building.

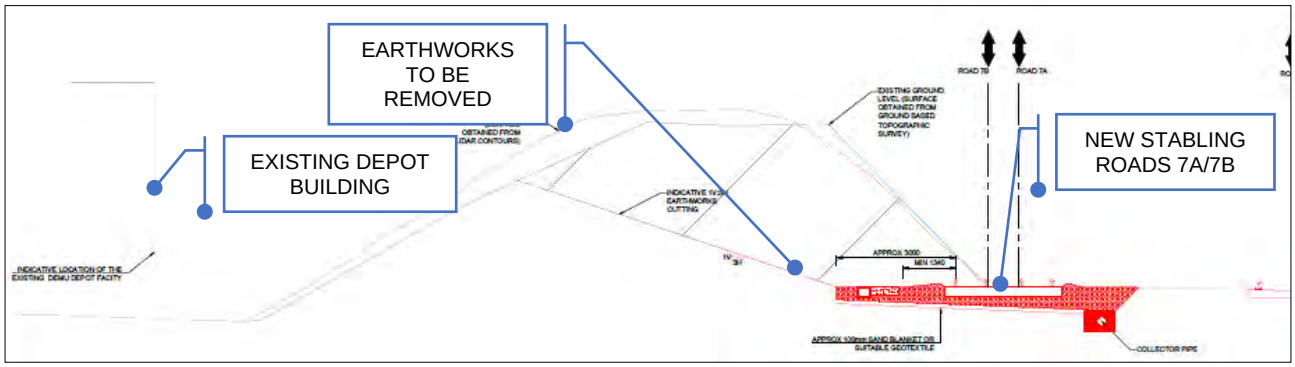

Image 5-142 Section of proposed new stabling roads 7A and 7B looking south east

Works to the head shunt are smaller in scope and will involve the construction of a new walkway, cleaning facilities and drainage.

5.8.7.3 Construction Compounds and Construction Access Routes

The worksite space will need to be constrained to the footprint of the works, with contractor access available from both the western and eastern ends. This will need to be coordinated with other works in and around Drogheda Station. The new tracks will be fed from the west, branching off other tracks just south of the depot eastern end. Access will be via the same routes as for the substation works.

5.8.8 Utility Diversions

Below is a brief overview of the utility diversions required in this zone. Further details of the diversions required are described in Chapter 4 (Description of the Proposed Development) and assessed in Chapter 18 (Material Assets: Utilities) in Volume 2 of this EIAR.

5.8.8.1 Electricity

Existing electricity infrastructure has been identified in the zone, comprised of HV transmission lines and MV and LV distribution lines operated by ESB. Diversions for MV and LV assets are required in this zone.

Conflicts with the existing electricity infrastructure have been established, relating to two 38kV HV and one MV overhead assets. Two diversions are required, which would see both 38kV HV overhead assets and the MV asset diverted under the tracks using horizontal directional drilling. The temporary land take required to carry out the diversions is summarised in the following image. The land take includes an allowance for construction access routes, space for vehicles to pass and turn around on site and space to remove the existing lines.

Overhead lines – Drogheda (UTX 1)

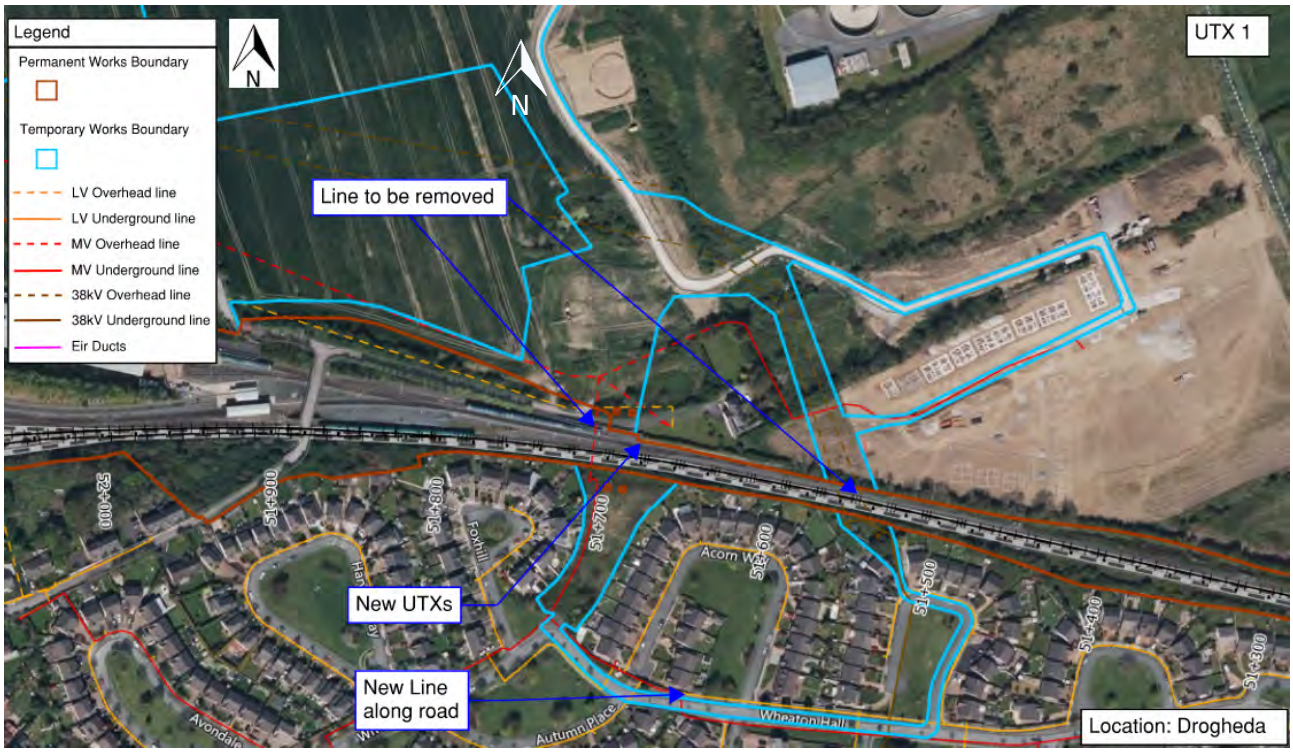

Image 5-143 UTX 1 – Drogheda (Ch. 51,560)

The lines here that cross the railway in Drogheda are planned to be diverted via UTX. As shown in the image, a work area, compounds, and access routes have been allocated for the diversion of the existing lines. The northern compound for UTX 1 would be the large compound in the agricultural land to the north planned to support the reconstruction of OBB80/80A/80B accessed off the R150 and the southern compound would be the open scrubland off Wheaton Hall Road. Traffic management would be required along Wheaton Hall Road for the work to link the new HV line back to the existing alignment, for approximately a week.

5.8.8.2 Telecommunications

BT and Eir were identified as having existing telecommunication assets in this zone.

Underground lines – Drogheda Station (UG-UDV5)

Eir ducts are present in the existing car park of the station. Diversion of this existing infrastructure would be required (UG-UDV5) to facilitate the proposed new platform. This would be possible through multiple underground diversions.

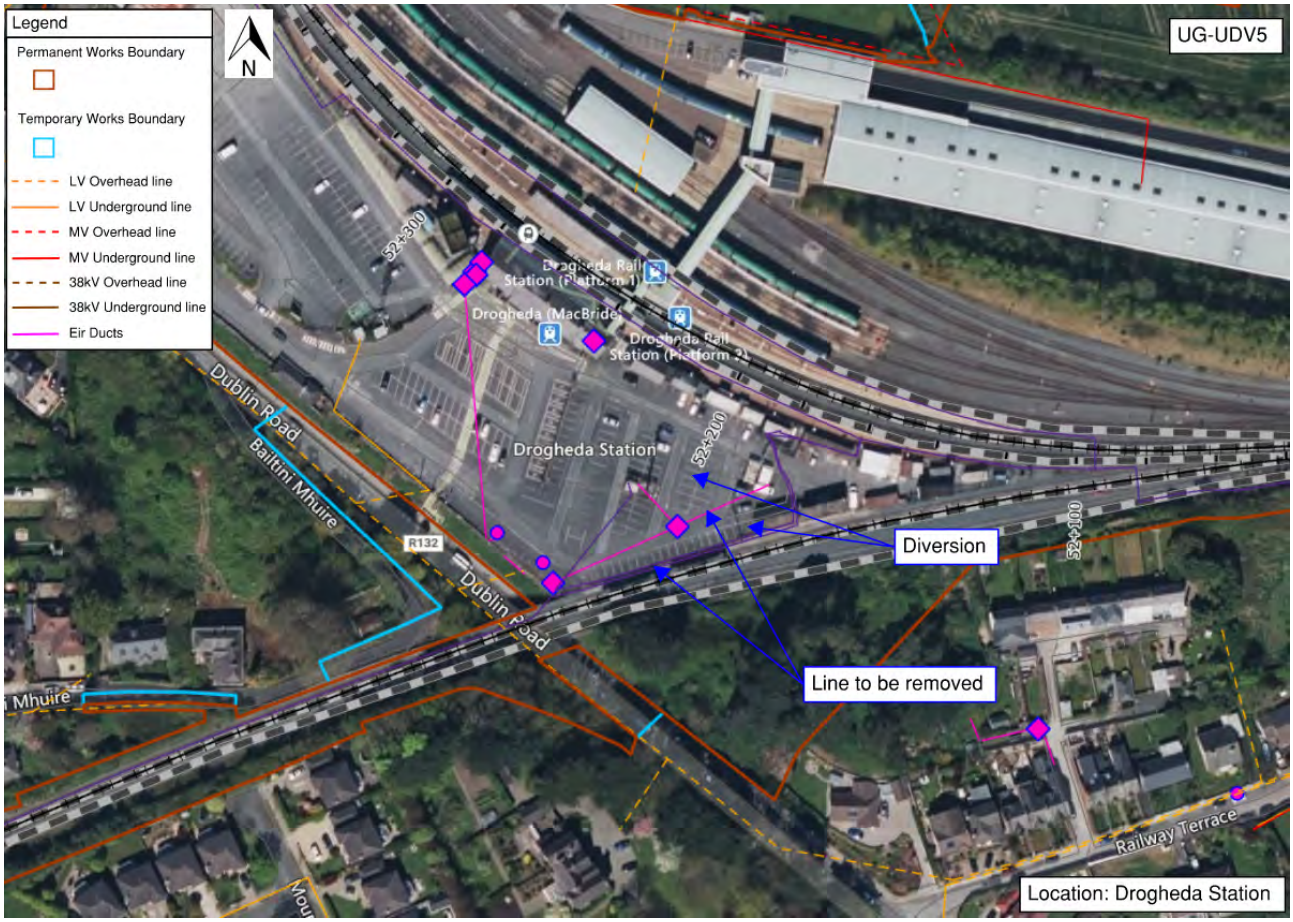

Image 5-144 UG-UDV5 – Drogheda Station (Ch. 52,200)

5.8.8.3 Gas

No conflicts or diversion requirements with the existing gas infrastructure assets have been identified in this area.

5.8.8.4 Sewer and watermains

No conflicts or diversion requirements with the existing sewer and watermain infrastructure assets have been identified in this area.

5.9 Testing and Commissioning of the System

The testing and commissioning of the system will consist of a set of tests applied to the subsystems (SET, Permanent way, Civils, Stations, and Depots) and integration tests to prove that the subsystems and the system accomplish their requirements, including external interfaces such as the rolling stock. As the project is largely on an existing live railway line, some of the tests will be undertaken at night to minimise the impact on the commercial railway traffic. A period of approximately 9 months is allowed for testing and commissioning at the end of the programme, but this will also be ongoing throughout construction.

5.10 Construction Environmental Management Plan (CEMP)

A CEMP has been prepared and is included in Appendix A5.1 in Volume 4 of this EIAR. The CEMP describes what is anticipated to be the Contractor's overall environmental management strategy and form of administration for the construction project. Details under the following headings will be required to be expanded upon by the Contractor once they have been appointed:

1. Details of working hours and days.
2. Details of emergency plan - in the event of a fire, chemical spillage, cement spillage, collapse of structures or failure of equipment or road traffic incident within an area of traffic management. The plan must include contact names and telephone numbers for Local Authority (all sections/departments); Ambulance; Gardaí and Fire Services.
3. Details of chemical/fuel storage areas (including location and bunding to contain runoff of spillages and leakages).
4. Details of construction plant storage, temporary offices.
5. Further development of the Construction Traffic Management Plan including details of routing of network traffic; temporary road closures; temporary signal strategy; routing of construction traffic; programme of vehicular arrivals; on-site parking for vehicles and workers; road cleaning; other traffic management requirements.
6. Truck wheel wash details (including measures to reduce and treat runoff).
7. Dust management to prevent nuisance (demolition and construction).
8. Site run-off management.
9. Noise and vibration management to prevent nuisance (demolition and construction).
10. Landscape management.
11. Management of demolition of all structures and assessment of risks for same.
12. Stockpile management.
13. Project procedures and method statements for:
    - Demolition and removal of buildings, services, pipelines, ballast, and other infrastructure (including risk assessment and disposal).
    - Diversion of services.
    - Excavation (through peat, soils, and bedrock).
    - Piling.
    - Construction of pipelines.
    - Temporary hoarding and lighting.
    - Borrow pits and location of crushing plant.
    - Storage and treatment of peat and soft soils.
    - Disposal of surplus geological material (peat, soils, rock etc.).
    - Earthworks material improvement.

- o Protection of watercourses from contamination and silting during construction.

14. Site Compounds.

The CEMP will be developed further by the contractor prior to the Construction Phase, including incorporation of any commitments notified in statutory approvals.

5.10.1 Construction and Demolition Waste Management Plan (CDWMP)

The CDWMP sets out the Contractor's proposals regarding the treatment, storage and disposal of waste including demolition waste. The plan will be a live document that will be amended and updated to reflect current conditions on-site as the project progresses. The obligation to develop, maintain and operate a CDWMP will form part of the contract documents for the project. The CDWMP will include details such as:

- Details of waste storage to be provided for different waste;
- Details of where and how materials are to be disposed of - landfill or other appropriately licensed waste management facility;
- Details of storage areas for waste materials and containers;
- Details of how unsuitable excess materials will be disposed of where necessary; and
- Details of how and where hazardous wastes such as soils, oils, diesel and other hydrocarbon or other chemical waste are to be stored and disposed of in a suitable manner.

The CDWMP is included in Appendix A5.1 (CEMP), sub-appendix E, in Volume 4 of this EIAR.

5.10.2 Environmental Operating Plan (EOP)

The EOP is a project management tool. It outlines procedures for the delivery of environmental mitigation measures and for addressing general day-to-day environmental issues that can arise during the construction phase of developments. The EOP will be developed and updated by the Contractor during the project construction stage.

Before any works commence on site, the Contractor will be required to prepare an EOP. The EOP will set out the Contractor's approach to managing environmental issues associated with the construction of the scheme and provide a documented account of the implementation of the environmental commitments set out in the EIAR and measures stipulated in the planning conditions. Details within the plan will include:

- All environmental commitments and mitigation measures included as part of the planning approval process and any requirements of statutory bodies such as the National Parks Wildlife Service and Inland Fisheries Island as well as a method documenting compliance with the measures;
- Iarnród Éireann operating procedure documents;
- A list of all applicable environmental legislation requirements and a method of documenting compliance with these requirements; and
- Outline methods by which construction work will be managed to avoid, reduce, or remedy potential adverse impacts on the environment.

To oversee the implementation of the EOP, the Contractor will be required to appoint a suitably competent Site Environmental Manager to ensure that the mitigation measures included in the EIAR, the EOP and the statutory approvals are executed in the construction of the works and to monitor that those mitigation measures employed are functioning properly.

The EOP contains the Incident Response Plan, which describes the procedures, lines of authority and processes that will be followed to ensure that incident response efforts are prompt, efficient, and appropriate to the circumstances. It will provide the information that each worker may need, to respond to an emergency and to handle it effectively.

The EOP is included in Appendix A5.1 (CEMP), sub-appendix D, in Volume 4 of this EIAR.

5.10.3 Construction Traffic Management Plan (CTMP)

The purpose of the construction traffic management plan (CTMP) is to provide the basis for the management of traffic expected during construction and operation of the project based on the designs shown in the planning documents. The contractor will be required to prepare a CTMP that maximises the safety of the workforce and the public and minimises traffic delays, disruption and maintain access to properties.

The traffic management plan will also address temporary disruption to traffic signals, footpath access and the management of pedestrian crossing points. The contractor shall provide an appropriate information campaign for the duration of the construction works.

The CTMP will be prepared for the Construction Phase of the Proposed Development, which will be included within the CEMP and developed further by the main contractor.

The CTMP is included in Appendix A5.1 (CEMP), sub-appendix G, in Volume 4 of this EIAR.

5.10.4 Construction Material Management

The project proposes to reuse as much of the excavated material as fill material as possible. However, it should be noted that from an engineering point of view not all material is suitable for reuse. Material that cannot be reused must be sent to an authorised disposal site. The reuse of excavated materials from other parts of the project has been considered where possible. Refer to Chapter 9 (Land and Soils) and Chapter 19 (Material Assets: Resources and Waste Management) in Volume 2 of this EIAR for further details.

5.10.5 Construction Surface Water Management Plan (SWMP)

The Construction Surface Water Management Plan (SWMP) incorporates information on the control and management measures taken in order to avoid, prevent, or reduce any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Development.

During the Construction Phase of the Proposed Development, the control and management measures outlined in the SWMP correspond to the best practice approaches that can be used to ensure construction does not increase pollution of water course or flood risk in line with River Basin Management Plans (RBMP) for Ireland.

The SWMP is included in Appendix A5.1 (CEMP), sub-appendix H, in Volume 4 of this EIAR.

5.11 References

(BSI) British Standard (BS) 5837:2012 (2012). Trees in relation to in relation to design, demolition, and construction - Recommendations.

NRA (2006) Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes.