Chapter 3
Alternatives

CONTENTS

3. ALTERNATIVES

3.1 Introduction

This chapter of the Environmental Impact Assessment Report (EIAR) describes how the DART+ Coastal North project ("the Proposed Development") was planned and designed through a staged process as applied to all major transport projects. This chapter presents an overview of the reasonable alternatives studied during the development of the project which have been informed by relevant policy/plans, previous studies and have been developed and refined as part of the ongoing design development and Environmental Impact Assessment (EIA) process.

This consideration of alternatives has been informed by the relevant national, regional and local policy context and need for the project as described in Chapter 2 (Policy Context and Need for the Project). The assessment has been undertaken in accordance inter alia with Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011 on the assessment of the effects of certain public and private projects on the environment as amended by Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 (the EIA Directive), the Transport (Railway Infrastructure) Act 2001 (the 2001 Act) (as amended and substituted, in particular, by the and the European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No 743 of 2011).

3.1.1 EIA requirements

Article 5(d) of EIA Directive provides that the information to be provided by the developer shall include:

> "*a description of the reasonable alternatives studied by the developer, which are relevant to the project and its specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment*".

This requirement has been transposed into Irish law by Section 39 of the 2001 Act as inserted by Section 49(b) of the Planning and Development (Strategic Infrastructure) Act 2006 and as amended and substituted by the European Union (Railway Orders) (Environmental Impact Assessment) (Amendment) Regulations 2021 (S.I. No. 743/2021) which *inter alia* provides that:

The applicant shall ensure that an environmental impact assessment report-

(a) is prepared by competent experts.
(b) subject to Section 39(3), contains-
  (i) a description of the proposed railway works comprising information on the site, design, size and other relevant features of the proposed works;
  (ii) a description of the likely significant effects of the proposed railway works on the environment;
  (iii) the data required to identify and assess the main effects which the proposed railway works are likely to have on the environment;
  (iv) a description of any features of the proposed railway works, and any measures envisaged, to avoid, prevent or reduce and, if possible, offset likely significant adverse effects on the environment;

(v) a description of the reasonable alternatives studied by the applicant which are relevant to the proposed railway works and their specific characteristics, and an indication of the main reasons for the option chosen, taking into account the effects of the railway works on the environment;

(vi) a summary in non-technical the above information.

and

(c) takes into account the available results of other relevant assessments under European Union or national legislation with a view to avoiding duplication of assessments.

The Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022) states the following in respect of alternatives:

> *"The objective is for the developer to present a representative range of the practicable alternatives considered. The alternatives should be described with 'and indication of the main reasons for selecting the chosen option'. It is generally sufficient to provide a broad description of each main alternative and the key issues associated with each, showing how environmental considerations were taken into account in deciding on the selected option. A detailed assessment (or 'mini-EIA) of each alternative is not required".*

3.2 Approach to alternatives

Policy influence, project history as well as the previous studies that have led to the development of the DART+ Programme have influenced the design of the Proposed Development. The sections below set out the evolution of the DART+ Programme to where we are today.

3.2.1 Policy influence

For a description of the policy influence at a European, national, regional and local level for the DART+ North project, refer to Chapter 2 (Policy Context and Need for the Project). A summary of the key decisions and influences the policies have had for the DART+ Programme are as follows:

The advancement of priority elements of DART+ Programme was promoted under the National Development Plan (NDP) 2018-2027. As discussed in Chapter 2, the NDP outlines the scope of the DART+ Programme to include investment in new rolling stock, new infrastructure and the electrification of the Sligo line to Maynooth and M3 parkway, the Northern line to Drogheda and the Kildare line to Celbridge/Hazelhatch to create a full metropolitan area DART network with all lines linked and connected.

The Eastern and Midland Regional Spatial & Economic Strategy (2019-2031) supports a feasibility study for the provision of high-speed rail links between Dublin and Belfast and enhanced rail services including the extension of the DART services to Drogheda.

The Transport Strategy for the Greater Dublin Area, 2022-2042, documents the intention to implement the DART+ Programme, which will provide DART services as far north as Drogheda; to Hazelhatch on the Kildare Line; to Maynooth in the west and to the M3 Parkway. It proposes that the DART services will operate to a high frequency with adequate capacity to cater for the passenger demand. It is anticipated that DART services in the city centre section of the network will operate to a regular ten minute service frequency in the peak hours from 2016 and will transition to a five minute service frequency following the completion of the DART+ Programme.

3.2.2 Relevant project history

The Dublin Area Rapid Transit (DART) has its origins dating back to the 1970s and was delivered as Phase 1 of the Rail Improvement Strategy. It was a heavy rail upgrade and electrification programme, delivered in 1984 with the opening of the original DART line from Howth to Bray. Subsequent phases of rail improvement and electrification were planned but deferred due to the economic recession of the 1980s. In the 1990s exchequer funding was preferred for the development of the motorway network.

The publication of the draft Transport Policy Document 'A Platform for Change' in 2001 (Dublin Transportation Office (DTO), 2001), reinvigorated investment focus in heavy rail and formalised the benefit of using heavy rail as the spine of an integrated public transport scheme. Since 2001, Iarnród Éireann (IÉ) has progressed railway improvement projects in accordance with the objectives of DART Expansion as funding permitted.

IÉ's previous priority was to deliver, as early as possible, the DART Underground tunnel link beneath the city centre tunnel. This was fundamental to increasing capacity on the radial routes. Design and planning for DART Underground was progressed and a Railway Order was made by An Bord Pleanála in December 2011 and perfected by the High Court in March 2014.

However, in September 2015 the Government deferred authorisation for construction of DART Underground and instructed IÉ to examine the current design with an objective of delivering a lower cost technical solution, whilst retaining the required rail connectivity for the DART Expansion. Between September 2015 and the publication of the National Development Plan (NDP) in February 2018, IÉ and the National Transport Authority (NTA) worked collaboratively in the assessment of lower cost technical solutions thus defining the DART+ Programme.

3.2.3 Previous studies

The design team has carried out a review of, and has accepted, the conclusions of the previous studies and advanced the design development on the basis of the conclusions and project data included in these reports. The sections below outline the previous studies that have set the foundation of the DART+ Coastal North project design development.

3.2.3.1 DART Expansion Programme Options Assessment (2018)

The DART Expansion Programme Options Assessment Report presented an options selection study carried out by Jacobs Systra, on behalf of the NTA, in respect of the proposed DART Expansion consistent with the extent of proposed electrified railway network as set out in the Greater Dublin Area Transport Strategy 2016-2035. It examined six alternative network design options with a view to optimising train service specification and demand.

The study carried out a comparative modelling assessment of the options in accordance with the Common Appraisal Framework. Based on the assessment and a KPI evaluation, Scheme Bundle 6 came out as the preferred DART Expansion Scheme Bundle, as it will provide substantial benefits to the rail network and passengers, significantly boosting passenger numbers.

Scheme Bundle 6 consists of:

- Closing Glasnevin Junction to the crossover of services from The Phoenix Park Tunnel (PPT) and Maynooth lines;
- Upgrading of Newcomen Junction to a permanently open Junction through the installation of a Canal Drop Lock;
- Re-opening of East Wall Junction to commuter and DART services;
- Re-opening of North Strand Junction to commuter and DART services;
- Re-configured Connolly Station;
- New Docklands Station further to the south;
- Upgrading of Tara Street Station; and
- A new turnback facility at Dun Laoghaire or Bray stations.

Image 3-1 illustrates Bundle 6 as conceived in the final stages of the study:

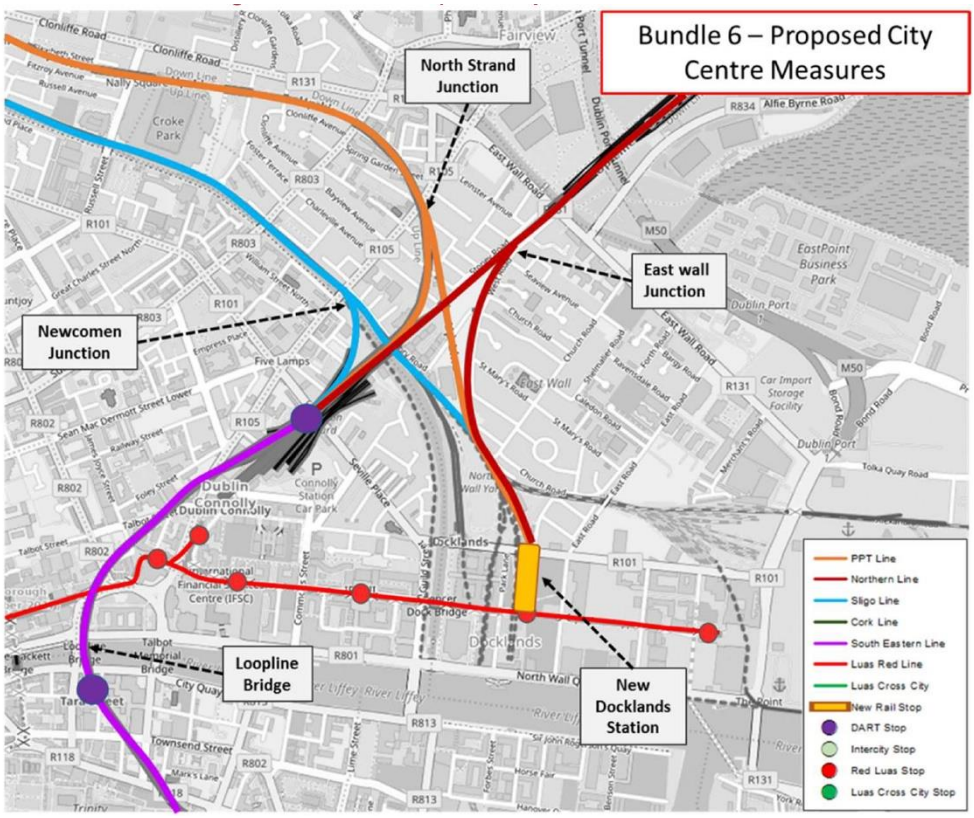

Image 3-1 Bundle 6 Details: City Centre

3.2.3.2 NTA DART Expansion Programme future patronage modelling

The DART Expansion Programme Future Patronage Modelling Report (NTA, 2020) represents a further development of the study presented in Section 3.2.3.1. Prepared by Jacobs Systra on behalf of the NTA, it presents considerations of future demand on the expanded DART network by undertaking strategic transport modelling using the preferred option: Scheme Bundle 6 and Train Service Specification Option 2.

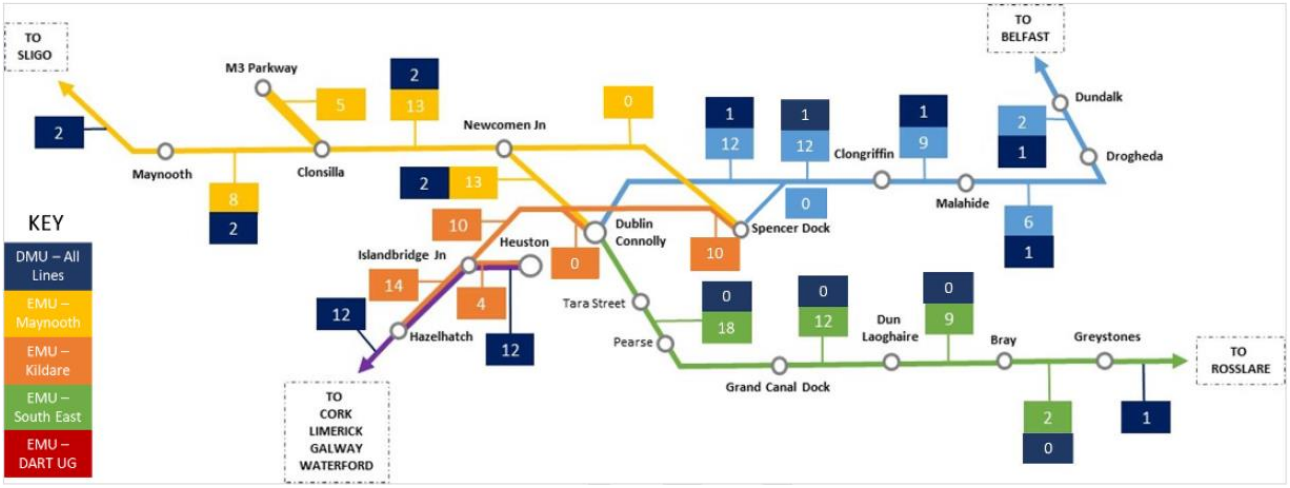

Image 3-2 Train service specification Bundle 6 – TSS Option 2

The service specification incorporates trains per hour per direction (TPHPD) arriving in Docklands as follows: Maynooth Line - 0, Phoenix Park Tunnel Line - 10, Northern Line - 0.

The study implements 2028 and 2043 unlimited rail scenarios to explore the latent demand which may be present along each of the principal lines associated with the project with TPHPD arriving in Docklands as follows: Maynooth Line - 0, Phoenix Park Tunnel Line - 10, Northern Line - 0.

The modelling study made the following conclusion in relation to DART Coastal North:

- Latent demand exists on the Maynooth, Northern and Southern Lines; and
- For the Northern Line, there is a peak latent demand of 4,378 (25% of total NDP boarders) on the line in 2028, and peak latent demand of 6,121 (30% of total GDA Strategy boarders) in 2043.

3.2.3.3 Train service specification (TSS)

In 2018 the DART Expansion Programme Options Assessment (NTA / Irish Rail, 2018a) by Jacobs and Systra recommended that the DART Expansion Programme (now DART+ Programme) be delivered by enhancing the existing rail network in the short to medium term (Scheme bundle 6). This recommendation followed modelling of the bundle options using the NTAs Eastern Regional Model (ERM), which allowed for the performance and attractiveness of the bundles to be analysed by considering how transport demand is served by the rail system within a multi modal network (i.e. including the public transport modes of rail, bus, Luas, Metro, as well as car, walking and cycling).

In 2018, the DART Expansion Programme Options Assessment Addendum (NTA / Irish Rail, 2018b) was published (also by Jacobs and Systra). It detailed the strategic modelling outputs of a revised TSS Option 1 – Balanced City Centre Distribution of the preferred options (i.e. Scheme Bundle 6).

Building on the work undertaken by Jacobs and Systra, the DART+ West Multi-disciplinary Consultant (MDC) undertook feasibility and robustness analysis to demonstrate whether the desired level of service is feasible / achievable, and the effects of each key element of the infrastructure on performance. The analysis provided a set of recommendations for further enhancements and considerations to improve the capacity of the network and obtain a more robust and predictable service pattern. The main outcome of the assessment is the definition of the TSS, which is the 'desired' number of train services to have on each branch of the DART network (i.e. TPHPD). The specific recommendation from TSS for the Northern Line is shown in Image 3-3.

The TSS calls for increased service frequencies that are the same in both directions. Where there are existing DART services, nine DART services will operate in each direction to Clongriffin, with seven in each direction continuing on to Malahide. In peak hours, five DART services in each direction will extend north from the current terminus at Malahide to Drogheda MacBride Station. These will be accompanied by two DMU (diesel multiple unit) commuter services an hour from Dublin Connolly to Dundalk in each direction, stopping at all stations. During the peak period the TSS accommodates a further one intercity Enterprise service in each direction per hour between Dublin Connolly and Belfast, stopping only at Drogheda MacBride and Dundalk stations between Dublin and the border. On the Howth Branch, peak services will run as a shuttle between Howth and Howth Junction & Donaghmede stations, with frequencies doubling compared to existing service levels. In the TSS, train frequencies will become more regular, and peak periods will extend further throughout the day.

DART+ Coastal North has reviewed the analysis, and it has been addressed during the design development. Analysis of a range of specific infrastructure intervention possibilities has been undertaken at Clongriffin, Malahide, Howth Junction & Donaghmede, and Drogheda MacBride stations.

DART+ Coastal North will serve as a part of a highly integrated network and will directly interface with DART trains from DART+ South West and DART+ West in the East Wall Junction / Tolka River area. The city centre route section, starting at this point and going south to Pearse Station, is part of the DART+ West project and is therefore outside of the scope of the DART+ Coastal North project.

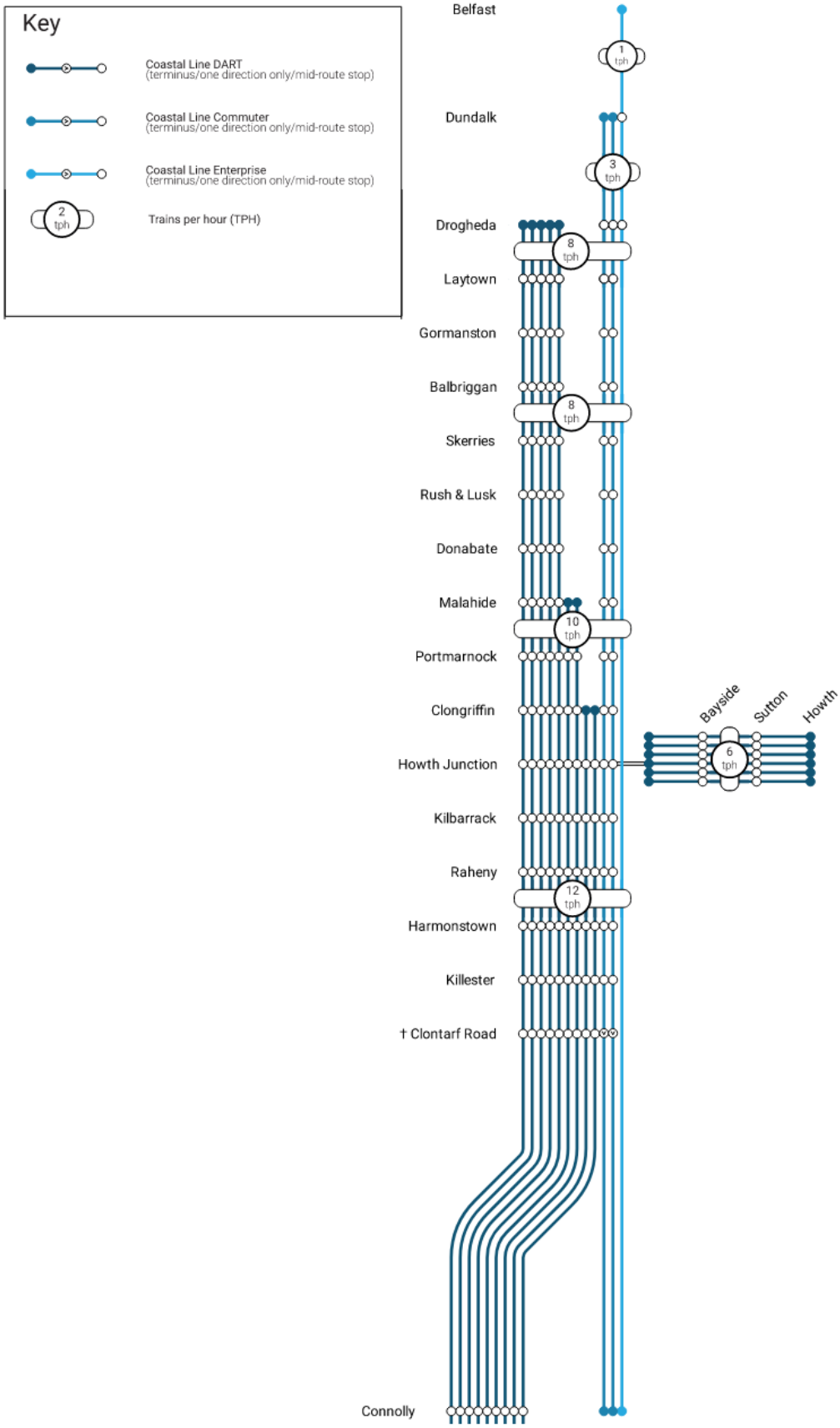

Image 3-3 Number of trains per hour (TSS)

3.2.3.4 DART Expansion - rail electrification assessment

The DART Expansion – Rail Electrification Assessment Report (NTA / Irish Rail 2019) was prepared by Jacobs Systra in 2019. The report considered Iarnród Eireann's strategic objectives around future rail electrification as part of the DART Expansion (now DART+ Programme), and addressed the following:

- Development of a short, medium and long-term electrical energy strategy both for DART Expansion (now DART+ Programme) and the main-line inter-city rail network;
- Establishment of a preferred approach for the electrification of rail lines in the Greater Dublin Area for both new and existing electrified lines; and
- The future procurement of long term assets such as rolling stock and infrastructure.

The report sought to identify the issues and solutions associated with the electrification of the GDA rail network with specific consideration given to two electrification options: 1500 V DC and 25 kV AC. The difference between the options is based on the type of source supply system that is used while powering the electric locomotive options.

A pros and cons assessment was undertaken for 1500 V DC and 25 kV AC to highlight the positive and negative elements of both options when compared to one another in the context of GDA rail electrification.

OPTION	PROS	CONS
1500 V DC	• Overall, the 1500 V DC system is estimated to cost €100.8M less to install, operate, and maintain over the first 30 year period than a full 25 kV AC System. • The 1500 V DC system is estimated to cost €53M less to install, operate, and maintain over the first 30 year period than electrifying new lines in 25 kV AC and retaining the existing 1500 V DC network. • The capital cost is estimated to be €133m less for full implementation of 1500 V DC, when compared to full 25 kV AC. • The capital cost is estimated to be €53m less for newly electrified lines only, when conversion of the existing 1500 V DC to 25 kV AC is not included in the cost for the 25 kV AC scenario. • There will be no significant impact on the existing electrified section of the DART network, with little or no service disruption during extension works anticipated. • Existing fleet and new rolling stock units will be able to operate with flexibility across the DART network • Iarnród Éireann has significant in-house experience of 1500 V DC systems so expansion of the same system should not create technical issues unknown to them. • Traction substation compounds are smaller with overall site compound including roads likely to be 1000m2 • Generally, there is greater flexibility to deal with N-1 degraded conditions in case of incident at a substation.	• The system is estimated to cost €0.89M more to operate and maintain per annum based on O&M cost estimates. This will increase further when dual voltage or bi-mode rolling stock are no longer required for the 25kV AC Option. • A higher number of traction substations are required, estimated at 31 substations in total. • The commissioning of a high number of traction substations, estimated at 18, may create scheduling issues for connection, commissioning and energisation works carried out by ESB. • Intercity electrification at 25 kV AC can still be delivered, however, this will result in a global electrified rail system, GDA and InterCity, in two types type of electrification. • Stray currents need to be assessed for newly electrified line, however, Iarnród Éireann is familiar with these requirements due to experience of the existing 1500 V DART Network.

Image 3-4 Pros and Cons Assessment for 1500 V DC (Source: NTA / Irish Rail 2019)

OPTION	PROS	CONS
25 kV AC	• The system is estimated to cost €0.89M less to operate and maintain per annum. The running cost savings can be expected to increase further when dual voltage fleet are replaced with 25kV AC EMUs following full conversion to 25kV AC. • Requires substantially fewer traction substations, likely to be 4-5 for a 1 x 25 kV AC scenario. • Less maintenance work is required overall due to the smaller number of traction substations. • 25kV AC technology is most suited for longer distance trips and is compatible with longer term electrification of InterCity services without the need for dual voltage technology. • Provides an opportunity for further expansion of the DART network, to Sallins as an example, without the need to deliver additional traction substations. • Provides an opportunity for a global electrified rail system, GDA and InterCity, in one type of electrification. This is beneficial from a resourcing and asset management perspective.	• Overall, a full 25 kV AC system is estimated to cost €100.8M more to install, operate, and maintain over the first 30 year period. • Electrifying new lines in 25 kV AC and retaining existing 1500 V DC network is estimated to cost €53M more to install, operate, and maintain over the first 30 year period than a 1500 V DC network. • The capital cost is estimated to be €133m more for full implementation of 25 kV AC, when compared to 1500 V DC option. • The capital cost is estimated to be €53m more for newly electrified lines only, when conversion of the existing 1500 V DC to 25 kV AC is not included in the cost for the 25 kV AC scenario. • Iarnród Éireann are not familiar with 25 kV AC systems. The introduction of a new system may result in technical issues that are currently unknown to them. • Requires a strategy where 25kV AC and 1500 V DC co-exist on the network. This requires the inclusion of three 1500 V DC/ 25kV AC neutral zone interfaces. • New dual voltage or bi-mode rolling stock units are required to ensure interoperability for units across the network. • Depots at Maynooth and Drogheda need to accommodate dual voltage rolling stock or bi-mode rolling stock • A mitigation measure is required where existing fleet continue to be maintained at Fairview Depot. This measure is retained until the existing fleet become ready for scrappage from 2035 onwards. • There may be significant disruption to existing DART services as a result of the conversion works. Existing masts could potentially be retained but other components (arms, insulators, head spans, etc) need replacement. The resolution of sub-optimal clearance issues will involve works to approximately 20 structures. The gradual phasing of these works could help mitigate against this disruption. • Traction substation compounds are larger with overall site compound including roads likely to be 3000m2. • EMC Interference for 25 kV AC systems is higher and mitigation measures are required. Existing DART infrastructure will need to be immunised. • 25 kV AC systems result in unbalanced loads on the system that need to be managed. • Generally, there is less flexibility to deal with N-1 degraded conditions in case of incident at a substation. • The 2 x 25 kV AC system requires two substations. This means that all newly electrified lines must be commissioned at the same time to provide traction substation redundancy associated with N-1 degraded conditions. This is not considered a feasible option due to the need for all lines to be electrified simultaneously

Image 3-5 Pros and cons assessment for 25 kV AC (Source: NTA / Irish Rail 2019)

At an early stage of development of DART+ Programme discussions with the ESB resulted in the 1500 V DC system being chosen by IÉ to be implemented on the DART+ Programme.

3.3 Overview of alternatives considered

The reasonable alternatives considered at option selection stage were framed within the following scenarios for each significant intervention required.

3.3.1 Do-Nothing

The Do-Nothing - 'Do-Nothing' represents a scenario where infrastructure works and interventions to meet the Project Objectives and Requirements are absent.

3.3.2 Do-Minimum

The Do-Minimum - This represents the least burdensome option to maintain an intervention. In some cases (e.g. where legal commitments are in place) this can act as the Base Case.

3.3.3 Do-Something 'Preferred Option'

The Do-Something – Where interventions are required in order to meet the Project Objectives and Requirements, a number of 'Do-Something' options were developed and assessed.

The Do-Something "Preferred Option" is that option which best provides for the Proposed Development to go ahead and for the project objectives to be met while also minimising the impacts outside the rail corridor. The Preferred Option scenario is described in Chapter 4 (Description of the Proposed Development). The following sections of this chapter, provide detail on the option selection process undertaken and by which the preferred option was derived.

3.3.4 Options selection process

A clearly defined appraisal methodology has been used in the selection of the Preferred Option for the proposed DART+ Coastal North project. Consistent with other NTA projects, the appraisal methodology applied is based on 'Guidelines on a Common Appraisal Framework for Transport Projects and Programmes' (CAF) published by the Department of Transport, Tourism, and Sport (DTTAS), March 2016 (updated 2020), TII's Project Management Guidelines (TII PMG 2019) and the NTA's Project Approval Guidelines 2020[1]. The process comprises of a two-stage approach, as appropriate:

- Stage 1 – Preliminary Appraisal (sifting) of a long list of options; and
- Stage 2 – Multi-Criteria Analysis (MCA) of a shorter list of feasible options.

In keeping with the principles of the CAF Stage 1 Preliminary Appraisal approach, the purpose of the sifting is to subject a range of options to a preliminary appraisal, before subjecting a smaller number of options to a more detailed MCA. The option selection methodology is summarised in Image 3-6.

[1] The CAF was replaced by the Transport Appraisal Framework (TAF) in June 2023, but was the relevant guidance in place at the time of the options assessment.

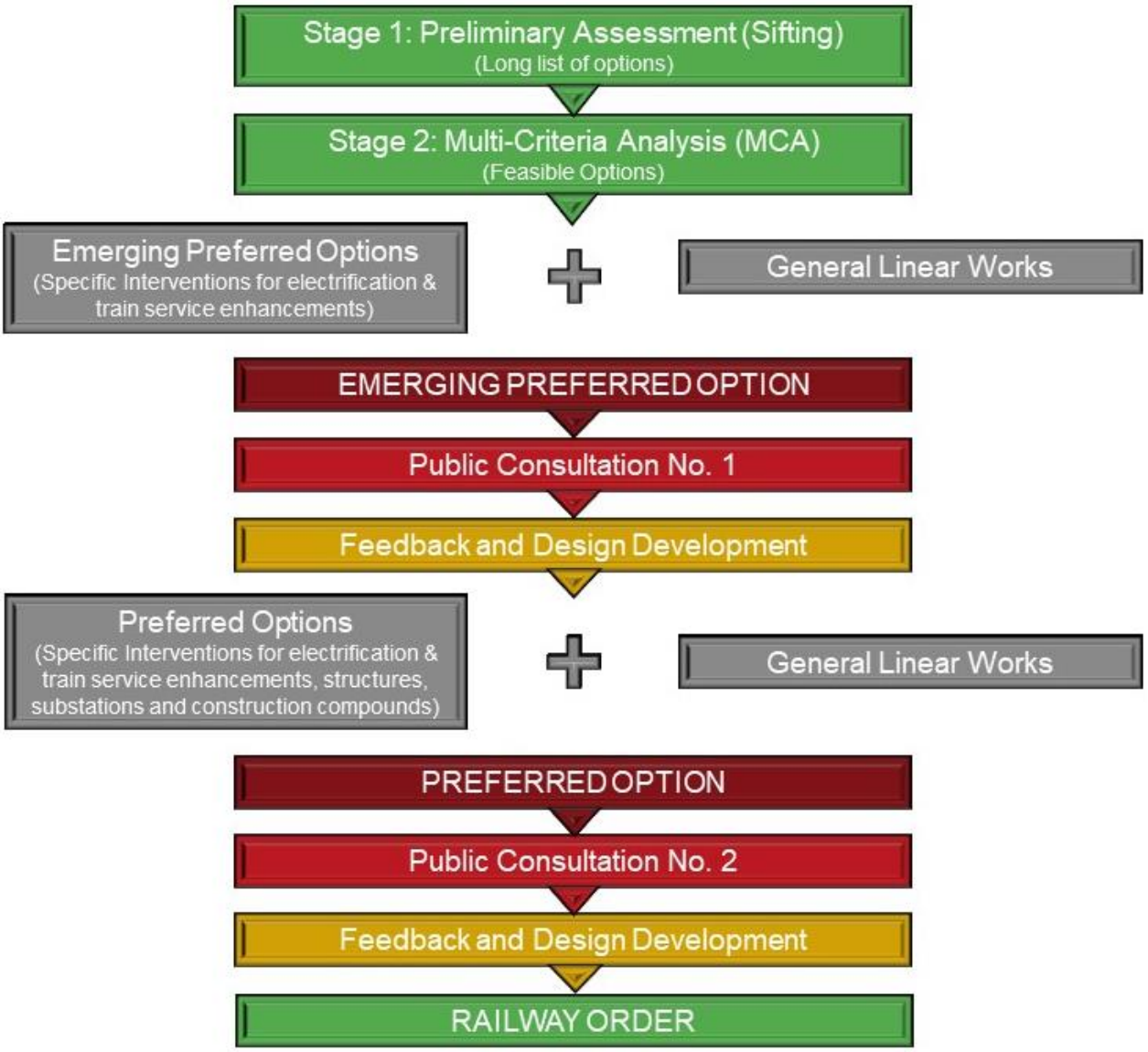

Image 3-6 Option selection process (emerging preferred option and preferred option stages)

3.3.5 Stage 1 – Long listing of options (sifting)

The CAF framework allows shortlisting of possible options as part of a preliminary appraisal, having sifted through a longlist of options:

> *'For some schemes, a large number of Do-Something options may present themselves. In order to keep the appraisal process manageable, it is appropriate to adopt an approach which subjects a large number of options to a preliminary appraisal, before subjecting a smaller number to a more complete appraisal'.*

If only 1 possible option was identified at the sifting stage, Stage 2 – MCA methodology does not need to proceed. Also, where the Do-Nothing or Do-Minimum options suffice, the optioneering process can be completed at this stage.

The sifting process considered the project objectives and project requirements. Each possible option was assessed on its ability to meet the project objectives and requirements.

A pass / fail approach was utilised. A failure against any of the project objectives and project requirements resulted in that option not being taken forward to the Stage 2 MCA stage.

It should be noted that for some design elements of the Proposed Development a Stage 1 assessment was sufficient and resulted in arriving at a preferred option. Where a Do Minimum option was not identified as the Preferred Option at Preliminary Appraisal stage, feasible options were brought forward to Stage 2 MCA for further detailed analysis.

3.3.6 Stage 2 - Multi-Criteria Analysis (MCA)

In some cases, an MCA is required. The Stage 2 MCA examined the shortlisted options from Stage 1 in greater detail in order to determine a preferred option. The same general selection process is followed for both Stage 1 and Stage 2. However, in the Stage 2 MCA additional design development / further studies and subsequently more detailed analysis / assessment is undertaken.

MCA methodology

The Multi-Criteria Analysis (MCA) technique used to inform the option selection process that has been applied to determine the end-to-end preferred option of the Proposed Development has been informed by the Common Appraisal Framework (CAF) for Transport Projects and Programmes (Department of Transport Tourism and Sport, March 2016 and updated October 2020). The CAF Guidelines require projects to undergo an MCA under a common set of six CAF criteria. These criteria are listed and summarised in Table 3-1.

As referenced in Section 3.1.1 herein, the EIA Directive requires that the developer provides *'an indication of the main reasons for the option chosen, taking into account the effects of the project on the environment'*. The CAF parameters as detailed below in Table 3-1 and Table 3-3 set out the environmental criteria considered in the MCA assessment and how environmental factors influenced the selection of the preferred option and the design development of the Proposed Development.

Table 3-1 CAF parameters

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

The information required to carry out the MCA is set out in Table 3-2 with the proposals in respect of the Proposed Development.

Table 3-2 Information required to carry out MCA

Information Needed	Project Approach
The options to be analysed	Component options are presented for each.
The evaluation criteria that will be used to analyse the options	The above criteria are broken into sub-criteria each of these are used to carry out a comparative assessment of the options.
The importance of these criteria	For individual scheme components a qualitative and or quantitative. Mechanism has been used dependent on the perceived appropriateness for each component.
The evaluation of the options on the different criteria. These evaluations can be given a numerical or ordinal (comparative) scale	The evaluations are on the basis of colour coding as described in Table 3-4.

The common set of six CAF criteria has been identified for the Proposed Development. Sub-criteria are developed under each of the distinct design elements as appropriate to meet the project objectives. The six CAF criteria and sub-criteria are presented in Table 3-3.

Table 3-3 CAF criteria employed for MCA of DART+ Coastal North

Criteria	Sub-Criteria	Example Considerations	Assessment Type
Economy	Capital Expenditure (CAPEX): Construction, land acquisition, temporary works	Estimate high level cost of construction of option. Extent and type of third party lands required permanently. Extent and type of third party land required temporarily for temporary works during construction.	Quantitative Assessment

Criteria	Sub-Criteria	Example Considerations	Assessment Type
	OPEX: Operational costs (IÉ or other entities), Technology advancements and future proofing / obsolescence	Cost to maintain the infrastructure over the whole life. Effects of infrastructure maintenance to services. Provision of ways of undertaking routine inspections and maintenance activities while minimising the effect on service to customers.	Qualitative Assessment Quantitative Assessment on key differences between options
	Train Operations Functionality/Economic Benefit	Potential improvement or deterioration of the operation conditions of the line (reduction or increase of the risk of interruption of service). Increased DART service improving connectivity and economy (leading to increased competition in economy, increased output of firms, increased tax revenue).	Qualitative Assessment
	Traffic functionality and associated economic activities and opportunities	Potential benefit to vehicular traffic flows in the vicinity of the works during construction and associated economic activities and opportunities in the vicinity. Consideration of duration of traffic disruption and length of diversions. To minimise the impacts on traffic and transportation during the construction and operational stages.	Qualitative Assessment
Safety	Employer's Safety	To reduce safety risks associated with construction maintenance and operations. To reduce the potential for incidents or near misses for IÉ/construction staff.	Qualitative assessment
	Public safety	To reduce safety risks associated with passengers at platforms, public adjacent to the railway and road, pedestrian and cycle users at level crossings. To reduce the potential for accidents for members of the public/passengers on railway infrastructure. To reduce the potential for conflict between rail and road users.	Qualitative assessment
Environment	Landscape and Visual Quality	To avoid / minimise impact on designated amenities, landscapes, protected trees or views. To avoid / minimise visual impact on properties & amenities. To avoid / minimise removal of trees / hedgerows. To avoid / minimise impact from light pollution. To provide opportunities to enhance the local amenity and green infrastructure.	Qualitative assessment

Criteria	Sub-Criteria	Example Considerations	Assessment Type
	Biodiversity	To consider effects on biodiversity of the area and/, such as impacts on specific flora or fauna, or on defined habitats. To provide opportunities to enhance biodiversity. To ensure that impacts on nature conservation resources are prevented and mitigated. These can occur through direct loss or damage to habitat or specific species, creation of barriers to population movement or indirect effects resulting from, for example, changes in water quality of levels, air quality or noise and light levels.	Qualitative assessment
	Noise and Vibration	To provide minimum levels of noise and vibration.	Qualitative assessment
	Water resources	To minimise impact or provide opportunities to enhance the quality of surface waters and associated floodplains, ground waters and coastal waters.	Qualitative assessment
	Archaeology, Architectural and Cultural Heritage	The construction, presence and operation of transport infrastructure can impact directly on such cultural heritage resources through physical impacts resulting from direct loss or damage, or indirectly through changes in setting, noise and vibration levels, air quality, and water levels. To minimise the impact on cultural heritage such as on below ground archaeological remains, historic buildings (individual and areas), and historic landscapes and parks.	Qualitative assessment
	Geology and Soils	To consider the impacts on designated areas of geological interest, unstable natural ground and ground contamination. To consider the impacts on agricultural soil and sensitive or vulnerable soils and material resources, including the reuse of site won materials.	Qualitative assessment
	Agricultural and non-agricultural	Qualitative appraisal of impacts on valued resources either from a human or natural origin with value arising for economic or cultural reasons. These assets can be existing utilities or non-renewable resources.	Qualitative assessment
	Air Quality & Climate Change	Impacts of Construction Traffic. Improvements in air quality through use of EMUs over DMUs. Improvements in greenhouse gas emission through modal shift from road to rail. Improvements in greenhouse gas emission through use of EMUs over DMUs. Reduction in greenhouse gas emissions. Preservation or enhancement the local air quality.	Qualitative assessment

Criteria	Sub-Criteria	Example Considerations	Assessment Type
Accessibility and social Inclusion	Accessibility	Capacity of options to facilitate the movement of people (either within, on to or across the rail system). Impact on the wellbeing of the passenger and public. Positive impact on passenger and public experience. Improve accessibility to key facilities, such as employment, education, transport and healthcare to satisfy transport demand for all trip types.	Qualitative assessment
	Social Inclusion	Positive impact towards vulnerable groups. Positive impact to deprived geographic areas. Improvement of accessibility to public transport facilities, in particular from deprived geographic areas.	Qualitative assessment
Integration	Adaptability in the future	Allowance for future internal transport links within Ireland.	Qualitative assessment
	Transport Integration	Similarity of systems with other DART+ Programmes. The solution proposed should integrate with other transport systems such as DART+ West, Metrolink and light rail lines, local and national traffic road systems, walkways, and cycleways.	Qualitative assessment
	Land Use Integration	Integration with land use policies and objectives. Integration with regional and local land use plans. Adhesion to regional and local plans and policies.	Qualitative assessment
	Geographical Integration	Integration with land use policies and objectives. Integration with regional and local land use plans.	Qualitative assessment
	Government policy Integration	Integration with national and international plans and policies.	Qualitative assessment
Physical Activity	Walking / cycling opportunities	To enable walking and cycling opportunities in a safer environment in the communities along the route. To create a healthy environment conducive to active travel.	Qualitative assessment

Criteria

The criteria and sub-criteria are the measures of performance by which the options were assessed. It is appropriate that the approach should reflect the project objectives and the infrastructural element under consideration. The CAF Guidelines are used as a basis to inform the development of the respective sub-criteria which are adapted based on the individual infrastructural components under examination. For example, level crossing replacements sub-criteria may be different to the substations sub-criteria or Construction Compounds, etc. and are amended in the respective MCA methodology as appropriate.

This approach allows for consistency but also appropriate flexibility in the approach to the options assessment process. In some cases, some criteria are scoped out – if they are not deemed relevant to the option assessment under examination.

Comparative assessment

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

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

A comparative assessment was undertaken for each option developed, where in general, for each positively scored option there must be an opposing negatively scored option. Table 3-4 provides an overview of the comparative colour coded scale for assessing the criteria and sub-criteria. For illustrative purposes, this scale is colour coded with advantageous options graded to 'dark green' and disadvantaged options graded to 'orange'.

Table 3-4 Comparative colour coded scale for assessing the CAF criteria and sub-criteria

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

For each individual assessment the parameter and associated criteria and sub criteria are considered and options are compared against each other based on the comparative scale, ranging from having '*significant advantages over other options'* to having *'significant comparative disadvantages over other options*.' Options that are comparable were assigned 'comparable across all other options'. Options were compared under each criterion, before those criteria are aggregated to give a summary score for each parameter. The aggregated assessment considers the sub-criteria/assessment methodology and potential impacts and significance of those impacts when compared with the other options being assessed. The aggregated scores are compared to establish the options with more advantages over other options arriving at the preferred option. The MCAs are presented in the MCA matrices contained in the individual chapters in this report.

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

3.4 Consultation

Stakeholder engagement and consultation during the design process and development of alternatives is a key element to the delivery of major infrastructure projects such as the DART+ Coastal North project. The purpose of these consultations is to engage the public in the scheme's delivery process, inform the public of the statutory process and likely timescales, seek the public's cooperation and understanding of the project and to capture local knowledge to inform the design, Environmental Impact Assessment (EIA) and Railway Order (RO) process.

The main public participation stages in the project development are illustrated below:

- Non-statutory public consultation No.1 Emerging Preferred Option (Spring 2022); and Non-statutory public consultation No.2 Preferred Option (early Summer 2023).

The findings reports relating to PC1 and PC2 can be found in Appendix A3.1 (Public Consultation No.1 Consultation Findings Report), and Appendix A3.2 (Public Consultation No. 2 Consultation Findings Report) in Volume 4 of this EIAR, respectively.

The process of establishing the Preferred Option evolved in the following stages:

- A Preliminary Option Selection Report was concluded in January 2022 setting out the initial options and concluding with the identification of an Emerging Preferred Option. This report can be found on the www.dartplus.ie webpage;
- A first round of non-statutory public consultation (PC1) was undertaken on the 'Emerging Preferred Option' from the 24 February 2022 to the 8 April 2022. The Option Selection Report can be found on the www.dartplus.ie webpage[2] (this is also included as Appendix A3.3 in Volume 4 of this EIAR);
- Development of the Preferred Option (May 2022 – April 2023). This was informed by the feedback from the first round of public consultation, stakeholder and community engagement and the availability of additional design information with the design of the Emerging Preferred Option evolving with further alternatives considered;
- A second round of non-statutory public consultation (PC2) was undertaken on the Preferred Option (09 May 2023 – 23 June 2023). The Option Selection Report can be found on the www.dartplus.ie webpage[3] (this is also included as Appendix A3.4 in Volume 4 of this EIAR);
- Finalisation of the Preferred Option - informed by feedback from the overall public consultation process, continuing stakeholder engagement and the availability of additional design information, the Preferred Option was finalised.

[2] https://www.dartplus.ie/en-ie/projects/dart-north/public-consultation-round-1/dart-coastal-north-public-consultation-no-1-useful-material-and-downloads

[3] https://www.dartplus.ie/en-ie/projects/dart-north/public-consultation-round-2/dart-coastal-north-public-consultation-no-2-useful-material-and-downloads

The iterative development of the DART+ Coastal North project has been informed by a review of feedback and new information received during each stage of public consultation and as data, such as topographical surveys and environmental information was collected and assessed. Appendices A3.1 (Public Consultation No.1 Consultation Findings Report) and A3.2 (Public Consultation No.2 Consultation Findings Report) describe the communications strategy undertaken to inform the public of the project, the principal concerns and issues raised by the public and how these were addressed.

Additionally, the four local authorities, Dublin City Council, Fingal County Council, Louth County Council and Meath County Council have been consulted and have engaged throughout the design and EIA process. The design team introduced the project, presented the PC1 and PC2 options and have had follow up meetings to include specific items to ensure due consideration and integration into the design and EIA process. A series of pre-application consultation meetings were also held with An Bord Pleanála (ABP). A summary of these meetings can be found in Appendix A1.3 in Volume 4 of this EIAR.

Meetings have also been held with statutory consultees including the Development Applications Unit (DAU) of the Department of Housing, Local Government and Heritage (NPWS).

3.4.1.1 Consultation with Potentially Impacted Property Owners

In addition to the two non-statutory Public Consultations (PC1 and PC2) held in 2022 and 2023, the project has engaged with potentially impacted landowners to create awareness of the Proposed Development and the Railway Order process in advance of submission. This engagement has allowed the project team to gather more information for consideration to further inform the project development. It also gave affected landowners a chance to raise issues of concern in relation to the project. All feedback received has been reviewed and considered prior to the final design noted in Chapter 4 (Description of the Proposed Development) within the EIAR.

3.4.1.2 Matters outside the scope of this project

A number of issues were raised during the public consultations that are outside the scope of the project. These are noted below for completeness. Further information on issues raised during the public consultations can be found within the PC1 and PC2 Findings reports which are within Volume 4 of this EIAR.

Some of the issues raised are noted below:

Inclusion of additional Railway Stations: *A number of submissions called for the DART+ Coastal North Project to include for additional stations at a variety of locations along the Northern Railway Line. These locations include:*

- *Dundalk;*
- *Dundalk South;*
- *Drogheda North;*
- *Dunleer;*
- *Castlebellingham;*
- *Southgate;*
- *North Skerries;*
- *Balbriggan;*

- *Bettystown;*
- *Laytown; and*
- *Reopening the station at Mosney.*

The delivery of new stations is not included as part of the DART+ Coastal North project but will however be considered by IÉ as required, under separately funded projects. The Proposed Development will not preclude the future development of any of the potential new stations referred to above, such as that proposed at Bettystown in the East Meath Local Area Plan, or the reopening of the station at Mosney.

Extending DART services to Navan / Dundalk South / Dublin Airport / Swords Area: *A number of submissions called for the DART+ Coastal North project to include for an extension of DART services to service locations including Navan, Dundalk, Dublin Airport and/or Swords*.

No such extensions are included as part of the DART+ Coastal North project, however, the 'Preferred Option' will be compatible with any future extensions and/or additional links / branches that may be added to the Northern Line as part of any future IÉ projects.

Fares and Future Inclusion of Drogheda in LEAP zone: *Numerous queries related to future fares that will be applicable to the DART extension to Drogheda and to query if the potential exists for the LEAP travel zones to be extended to Drogheda as part of the DART+ Coastal North project*.

The potential extension of the leap card zones to include Drogheda is not included in the DART+ Coastal North project remit. The regulation of fares and fare structures is the responsibility of the NTA for all rail services and indeed all Public Service Obligation (PSO) public transport services.

Provision of toilets on new DART Fleet: *Concerns were raised in relation to the lack of toilet facilities being provided on the new DART+ Fleet carriages. Respondents raised a need for toilet facilities to be provided largely due to the expected journey time from areas such as Drogheda to Dublin City Centre and some passenger requirements for such facilities to allow them to use public transport as a means of travel.*

The DART+ Coastal North Project is responsible for the delivery of rail infrastructure to enable an increased frequency and capacity of rail services between Drogheda and Howth and Dublin City Centre. The initial order of carriages for the new DART+ Fleet was made at the end of 2021 and does not have toilet facilities on board. The feedback received during consultation has been shared with the DART+ Fleet team and consideration will be given to onboard toilet facilities in advance of any future fleet orders.

Conditions at existing Railway Stations and upgrading to existing facilities: *Some concerns were raised in relation to the condition of facilities at existing stations including lifts, toilets, parking, and bicycle facilities.*

Additional parking facilities at stations are not included as part of DART+ Coastal North's project scope, which is focussed on the development of infrastructure to facilitate the increase in train frequency on both the Northern and Howth Branch lines. However, separately to the DART+ Coastal North project and outside the railway order, IÉ is progressing a number of projects including the Multimodal Interchange Project, DART Station Enhancement Project and, Carparks Programme aimed at developing stations to support future needs.

The Multimodal Interchange Project will assess all stations throughout the network with a view of implementing its strategy at stations where there is need for modifications that will have an impact on multimodal travel and station access. The project will assess a variety of multimodal options at stations including but not limited to the provision of secure bicycle parking and shared mobility services. The Strategy relating to this project was completed in 2023 and is currently with the NTA for review and approval. Subject to all necessary approvals the project will move to the next phase and eventual delivery of the solutions identified.

Additionally, the DART Station Enhancements Project is under development. The objective of the project initially is to produce a study that will recommend how DART stations (current and proposed network) should be enhanced into the future to provide an improved customer experience, whilst also considering the increasing passenger demand capacity challenges that will be introduced in the future. It will outline the most effective method to enhance DART stations into the future considering the provision of increased services under the DART+ programme and all other ongoing projects/programmes with an aim of making DART stations more attractive to the customer. The early elements of this project (focusing mainly on capacity issues associated with future passenger numbers) will be progressed in 2024, and subject to all necessary approvals will be progressed thereafter.

A variety of significant modification works are proposed to Howth Junction and Donaghmede Station to both improve the passenger experience generally, and to develop the station to better serve as an interchange station into the future. These are discussed further in Section 3.5.6 and in Chapter 4 (Description of the Proposed Development) of this EIAR.

Provision of 4-tracking or underground to improve rail service: *A number of submissions questioned the potential for the inclusion of 4-tracking, or underground rail construction, as a potential upgrade to the existing Northern Line.*

The provision of additional track for a 4-tracking solution, or the inclusion of any underground construction, is not proposed as part of the Preferred Option for DART+ Coastal North. The main objectives of the DART+ Coastal North project includes delivering a higher frequency, higher capacity, reliable, electrified route to enable an increased DART service frequency between Drogheda and Dublin City Centre and it is currently considered possible to deliver these objectives without the introduction of track installations.

Night Time Services: *A limited number of submissions referred to the need for extended and more frequent night-time services.*

Any amendments to the current timetables will be a matter for IÉ operations and will be considered separately to the DART+ Coastal North project at the appropriate time. Any such future timetable changes will be subject to a separate public consultation process by the NTA.

Car & Bicycle Parking at Stations: *A number of submissions received queried if improvements to existing car and bicycle parking facilities will form a part of the DART+ Coastal North Project. Many submissions cited a lack of existing parking as an issue with the current and proposed services. Some respondents noted that park & ride facilities should be included as part of the project to increase the volume of commuters choosing to avail of the improved DART services.*

Additional parking facilities at stations, or park & ride services, are not included as part of DART+ Coastal North's project scope, which is focussed on the development of infrastructure to facilitate the increase in train frequency on both the Northern and Howth Branch lines. However, separately to the DART+ Coastal North project and outside the railway order, IÉ is progressing a number of projects including the Multimodal Interchange Project, DART Station Enhancement Project and, Carparks Programme aimed at developing stations to support future needs.

The Multimodal Interchange Project will assess all stations throughout the network with a view of implementing its strategy at stations where there is need for modifications that will have an impact on multimodal travel and station access. The project will assess a variety of multimodal options at stations including but not limited to the provision of secure bicycle parking and shared mobility services. The Strategy relating to this project was completed in 2023 and is currently with the NTA for review and approval. Subject to all necessary approvals the project will move to the next phase and eventual delivery of the solutions identified.

Additionally, the DART Station Enhancements Project is under development as noted above. The objective of the project initially is to produce a study that will recommend how DART stations (current and proposed network) should be enhanced into the future to provide an improved customer experience, whilst also considering the increasing passenger demand capacity challenges that will be introduced in the future. It will outline the most effective method to enhance DART stations into the future considering the provision of increased services under the DART+ programme and all other ongoing projects/programmes with an aim of making DART stations more attractive to the customer. The early elements of this project (focusing mainly on capacity issues associated with future passenger numbers) will be progressed in 2024, and subject to all necessary approvals will be progressed thereafter.

Lack of public transport options from Howth to areas such as Dublin Airport: *Respondents noted that due to a lack of viable public transport services from the Howth Area to locations such as Dublin Airport or Swords, there is already a need for residents of the Howth Peninsula to somewhat rely on private car use. It was noted that 'no amount of increased frequency of DART services will address a persons need to travel from Howth to areas other than Dublin City Centre'.*

The wider public transport options which are available to residents of the Howth Peninsula are not considered to be of an acceptable standard to encourage people to make trips by bus over private cars.

This issue falls under the remit of the NTA and shall be passed on to the NTA for its further consideration.

The DART+ Coastal North Project will result in increased connectivity and frequency of Northern Line services which will make it easier for passengers to travel north and to connect with Belfast Enterprise services at Drogheda. Also upgrades as part of DART+ West at Connolly will make switching to other DART+ routes and intercity services more accessible at Connolly Station.

The provision of enhanced capacity and frequency of rail services between Howth & the Northern Line will be developed as part of DART+ Coastal North and will be directly linked to passenger demand going forward.

3.5 Assessment of Alternatives – Do-Something

This section presents an overview of the reasonable preferred option alternatives considered and the process involved in selecting the preferred alternative. These are discussed under the key infrastructural elements of the project under the following headings:

- Works around bridge structures;
- Installation of power supply substations and electrical feeding infrastructure;
- Works around Drogheda MacBride Station;
- Works around Malahide Station;
- Works around Clongriffin Station;
- Works around Howth Junction & Donaghmede Station;
- Depots; and
- Construction Compounds.

3.5.1 Works Around Bridge Structures

3.5.1.1 Background

The following sections describe works on bridge structures relating to the installation of the OHLE. 'Underbridge' is the term used to describe a bridge or viaduct that carries the railway and 'Overbridge' is used to describe a bridge which spans over the railway. Image 3-7 demonstrates the difference between an underbridge and overbridge.

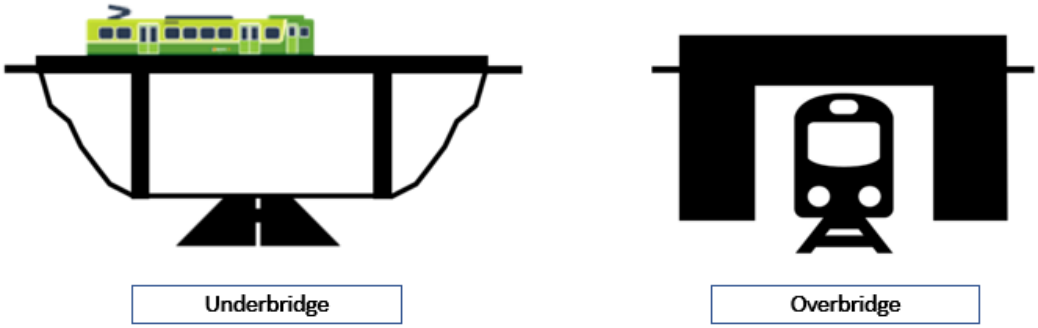

Image 3-7 Underbridge and Overbridge Sketch

3.5.1.2 Installation of OHLE

3.5.1.2.1 Background

The Proposed Development provides for the electrification and re-signalling of the existing railway. To provide electrical power to the trains Overhead Line Equipment (OHLE) and electrical substations will be needed. To facilitate the control of the trains a new signalling system and telecommunications infrastructure will also be needed.

The DART+ Coastal North project will adopt a 1500V Direct Current (DC) system which aligns with the existing DART network for traction power supply. The existing railway corridor between Malahide and Drogheda is not currently electrified, therefore OHLE will be required. In general, the OHLE concept design for the DART+ Coastal North will comprise a pre-sagged simple (2-wire) auto-tensioned system, supported on galvanised steel support structures, which will be adapted in specific locations where needed. While functionally similar to the OHLE on the existing DART network, modern-day design standards will be applied to optimise reliability and safety on the route.

The OHLE arrangement will generally utilise the simplest suspension method compatible with the technical requirements for supplying power to the trains. The design will however, also mitigate the environmental and ecological impacts by utilising the most appropriate solution for sensitive locations e.g. at Malahide Viaduct.

Chapter 4 (Description of the Proposed Development) presents more information on the Proposed Development design.

3.5.1.3 OHLE Structures onto underbridges

Bespoke fixing arrangements for OHLE will be required at some locations where the railway is supported on underbridges. It is envisaged that typical OHLE foundations can be placed either side of underbridges with spans of less than 60m, removing the need to fix OHLE to the bridge. Underbridges with spans around, or in excess of, this value have been subject to further assessment and optioneering. The resulting list of impacted underbridges is as follows:

- UBB30 – Malahide Viaduct;
- UBB36 – Rogerstown Viaduct;
- UBB56 – Balbriggan Viaduct;
- UBB65 – Gormanston Viaduct; and

- UBB72 – Laytown Viaduct.

The alternatives considered at these locations are summarised below.

UBB30 – Malahide Viaduct

Malahide Viaduct is a 176m long viaduct over a tidal estuary. The deck superstructure is comprised of twelve simply supported spans (4 x 12.275m + 8 x 15.860m).

Image 3-8 UBB30 view looking south (Source: IÉ)

3.5.1.3.1 Stage 1: Preliminary Assessment

Four options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-32.

Table 3-5 Summary of long list sifting for UBB30

Option	Description	Screening Result	Summary
"Do-Nothing"	Do-Nothing	**FAIL**	Does not meet requirements. Prevents installation of OHLE over viaduct. Spans for OHLE wires would be in excess of that allowed in system. Failure to electrify the viaduct prevents effective integration with rest of DART route.
Option A	Supported on structure	**PASS**	Meets project objectives and requirements.
Option B1.1	Supported off piers – steel collars	**PASS**	Meets project objectives and requirements.
Option B1.2	Supported off piers – anchors	**PASS**	Meets project objectives and requirements.

Option	Description	Screening Result	Summary
Option C	Independent supports	FAIL	Fails to identify cost-effective solution and utilise existing infrastructure since support can be achieved using the existing viaduct, as opposed to creating independent foundations. Fails to consider adverse environmental impacts during construction as it requires large groundworks in estuary to create mast foundations.

3.5.1.3.2 Stage 2: MCA

Three options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option A – Supported on structure;
- Option B1.1 – Supported off piers – steel collars; and
- Option B1.2 – Supported off piers – anchors.

The summary findings of the MCA are contained in Table 3-6 below:

Table 3-6 Summary of MCA

Criteria Summary	Option A	Option B1.1	Option B1.2
	Supported on structure	Supported off piers - steel collars	Supported off piers - anchors
Economy			
Safety			
Environment			
Accessibility & Social Inclusion			
Integration			
Physical Activity			
Preferred Option	Yes	No	No

Option A was identified as the Preferred Option. The preferred option comprises the attachment of OHLE masts to the parapet edge beam on the recently constructed spans and the installation of concrete foundations placed beneath the ballast under the tracks at other locations which allow the masts to be positioned approximately at the location of the existing parapet.

This option was chosen as the preferred option as it:

- Presents the most favourable option with regards to safety due to removing the need to work within a tidal waterway;
- Has significant advantages over the other options on the environmental impacts, such as landscape and visual quality, biodiversity, and archaeological, architectural and cultural heritage.

UBB36 – Rogerstown Viaduct

Rogerstown Viaduct is a 58.5m long viaduct over a tidal estuary. The deck superstructure is comprised of three spans, each 19.5m in length.

Image 3-9 View of UBB36 deck (Source: IÉ)

3.5.1.3.3 Stage 1: Preliminary Assessment

Five options, excluding the 'Do-Nothing' option, were identified for the viaduct. A summary of the findings of the sifting assessment is provided in Table 3-7.

Table 3-7 Summary of long list sifting for UBB36

Option		Screening Result	Summary
"Do-Nothing"	Do-Nothing	FAIL	Does not meet requirements. Prevents installation of OHLE over viaduct. Spans for OHLE wires would be in excess of that allowed in system. Failure to electrify the viaduct prevents effective integration with rest of DART route.
Option A2	Supported on structure	PASS	Meets project objectives and requirements.
Option B2.1	Supported off abutments – top fixing	PASS	Meets project objectives and requirements.
Option B2.2	Supported off abutments – side fixing	PASS	Meets project objectives and requirements.
Option B2.3	Supported off abutments – top fixing with precast unit	PASS	Meets project objectives and requirements.
Option C	Independent supports	PASS	Meets project objectives and requirements.

3.5.1.3.4 Stage 2: MCA

All five options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option A2 – Supported on structure – aligned with parapets;
- Option B2.1 – Supported off abutments – top fixing with anchors;
- Option B2.2 – Supported off abutments – face fixing;
- Option B2.3 – Supported off abutments – top fixing with precast units; and
- Option C – Independent supports.

The summary findings of the MCA are contained in Table 3-8 below:

Table 3-8 Summary of MCA

Criteria Summary	Option A2	Option B2.1	Option B2.2	Option B2.3	Option C
	Supported on structure – aligned with parapets	Supported off abutments – top fixing with anchors	Supported off abutments – face fixing	Supported off abutments – top fixing with precast units	Independent supports
Economy					
Safety					
Environment					
Accessibility & Social Inclusion					
Integration					
Physical Activity					
Preferred Option	No	Yes	Yes	Yes	No

Initially Option B (supporting off the abutments) was chosen as the preferred option, however following further review of the technical challenges associated with attaching to the existing masonry abutments, Option B2.3 was progressed as the preferred option. This option replaces the existing masonry parapet on the abutment wingwalls with a new concrete parapet wall which supports the OHLE masts above.

UBB56 – Balbriggan Viaduct

Balbriggan Viaduct is a 100m long viaduct adjacent to Balbriggan Harbour. The bridge is comprised of eleven spans, each of approximately 9.15m in length.

Image 3-10 UBB56 aerial photo (Source: Peter Barry Photography)

3.5.1.3.5 Stage 1: Preliminary Assessment

Three options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-9.

Table 3-9 Summary of long list sifting for UBB56

Option	Description	Screening Result	Summary
"Do-Nothing"	Do Nothing	**FAIL**	Does not meet requirements. Prevents installation of OHLE over viaduct. Spans for OHLE wires would be in excess of that allowed in system. Failure to electrify the viaduct prevents effective integration with rest of DART route.
Option A2.1	Supported on structure – aligned with parapets - dowelled	**PASS**	Meets project objectives and requirements.
Option A2.2	Supported on structure – aligned with parapets – precast 'U'	**PASS**	Meets project objectives and requirements.
Option B1.2	Supported off piers	**PASS**	Meets project objectives and requirements.

3.5.1.3.6 Stage 2: MCA

All three options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option A2.1 – Supported on structure – aligned with parapets – dowelled;
- Option A2.2 – Supported on structure – aligned with parapets – precast 'U' shaped unit; and
- Option B1 – Supported off piers.

The summary findings of the MCA are contained in Table 3-10.

Table 3-10 Summary of MCA

Criteria Summary	Option A2.1	Option A2.2	Option B1
	Supported on structure – aligned with parapets - dowelled	Supported on structure – aligned with parapets – precast 'U'	Supported off piers
Economy			
Safety			
Environment			
Accessibility & Social Inclusion			
Integration			
Physical Activity			
Preferred Option	Yes	No	No

Option A2.1 is the preferred option. This option involves the installation of masts fixed off the existing wall located between the walkway and the track by replacing the top proportion of the existing stonework with a new concrete foundation. This option was chosen over the alternatives as it presents the best overall economy option, has the least visual impact on the structure and minimises disruption to train operations and the traffic during the construction phase.

Following further design development, it was identified that placing the masts on the parapets was not feasible at this location due to the proximity to the rail and the minimum safe horizontal clearance requirements. Hence, the solution adopted places the parapets on the adjacent walkway, with the walkway modified to maintain the necessary pedestrian passage.

UBB65 – Gormanston Viaduct

Gormanston Viaduct is a 45m long viaduct over the Delvin River adjacent to Gormanston beach. The bridge comprises three spans, with edge spans measuring 12.65m in length and a central span of 19.5m.

Image 3-11 UBB65 view (Source: IÉ)

3.5.1.3.7 Stage 1: Preliminary Assessment

Three options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-16.

Table 3-11 Summary of long list sifting for UBB65

Option	Description	Screening Result	Summary
"Do-Nothing"	Do Nothing	**FAIL**	Does not meet requirements. Prevents installation of OHLE over viaduct. Spans for OHLE wires would be in excess of that allowed in system. Failure to electrify the viaduct prevents effective integration with rest of DART route
Option B2.1	Supported off abutment – top fixing	**PASS**	Meets project objectives and requirements.
Option B2.2	Supported off abutment – face fixing	**PASS**	Meets project objectives and requirements.
Option C	Independent supports	**PASS**	Meets project objectives and requirements.

3.5.1.3.8 Stage 2: MCA

All three options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option B2.1 – Supported off abutments – top fixing;
- Option B2.2 – Supported off abutments – face fixing; and
- Option C – Independent supports.

The summary findings of the MCA are contained in Table 3-12.

Table 3-12 Summary of MCA

Criteria Summary	Option B2.1	Option B2.2	Option C
	Supported off abutment – top fixing	Supported off abutment – face fixing	Independent supports
Economy			
Safety			
Environment			
Accessibility & Social Inclusion			
Integration			
Physical Activity			
Preferred Option	No	No	Yes

Option C is the preferred option. Option C involves new foundations on the approach embankments either side of the bridge, avoiding the need for structural intervention to the bridge. The OHLE foundations will likely be installed from the track in a similar way to other locations where foundations are required on embankments.

UBB72 – Laytown Viaduct

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.

Image 3-12 UBB72 aerial view (Source: IÉ)

Image 3-13 UBB72 bridge elevation (Source: IÉ)

3.5.1.3.9 Stage 1: Preliminary Assessment

One option, excluding the 'Do-Nothing' option, was identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-13.

Table 3-13 Summary of long list sifting for UBB72

Option	Description	Screening Result	Summary
"Do-Nothing"	Do Nothing	**FAIL**	Does not meet requirements. Prevents installation of OHLE over viaduct. Spans for OHLE wires would be in excess of that allowed in system. Failure to electrify the viaduct prevents effective integration with rest of DART route.
Option A3	Supported on structure – outside of parapets	**PASS**	Meets project objectives and requirements.

As only one option passed the longlist sifting process as feasible, an MCA was not required. As a result, the proposed fixing arrangement outside of the parapets is taken forward as the Preferred Option. This option proposes installation of additional supporting steelwork within the structure to provide sufficient strength for a mast to be fixed.

3.5.1.4 Bridge Clearance Works

Wherever a bridge spans over the railway it is necessary to ensure that the OHLE passes safely below the bridge. This can often mean that the height of the wires needs to be reduced to pass under the bridge. In this case, the wire height will be reduced gradually on approach to the bridge so that the performance of the system is maintained. There is, however, an absolute minimum wire height from top of rail that needs to be achieved.

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

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

The project has undertaken a review of the clearances available at all existing overbridges. Where feasible, compliant electrical solutions have been adopted to pass beneath existing structures. At some locations, it is not possible to provide a purely electrical solution and some form of intervention is required. This involved either lowering of the railway track beneath the bridge or replacement of the bridge structure to allow for the electrification of the track. Lowering the track was considered a preferable option where practicable in order to minimise disruption, however this was not always possible. The bridges requiring partial or full reconstruction are as follows:

- Overbridge OBB80/80A/80B (Drogheda MacBride Station approach carrying Railway Terrace); and
- Overbridge OBB81 (Drogheda MacBride Station footbridge).

Overbridge OBB81 did not require a Stage 2 MCA as the bridge met the criteria for the Do-Minimum option. As such the preferred option only undertook a Stage 1 assessment where it was considered as part of a longlist of six options in total. The preferred option for OBB81 is of simple construction and allows the existing substructure to be retained, giving a cost-effective solution that does not require the construction of new bridge foundations. Only minor works are required to the existing stairs, landing and lifts, minimising the impact on the station and disruption to commuters. The heritage value of the station will be maintained, by retaining the existing stairs and providing a structure that is similar in form to the existing.

For Overbridge OBB80/80A/80B a Stage 2 MCA was undertaken to review the potential alternative options. This is discussed further below.

OBBB80/80A/80B

OBB80 and OBB80A are stone masonry arch structures with single 9.1 m spans, built in the late 1800's as a pair with an earth embankment between. These structures are not protected structures however they are historic structures which contribute to the character and special interest of the station, and which are protected within the curtilage of the station complex. OBB80B was constructed in 2003, to facilitate access to a train wash, with the removal of the embankment between OBB80 and OBB80A and construction of a reinforced concrete bridge of 8.2 m span on piled abutment walls.

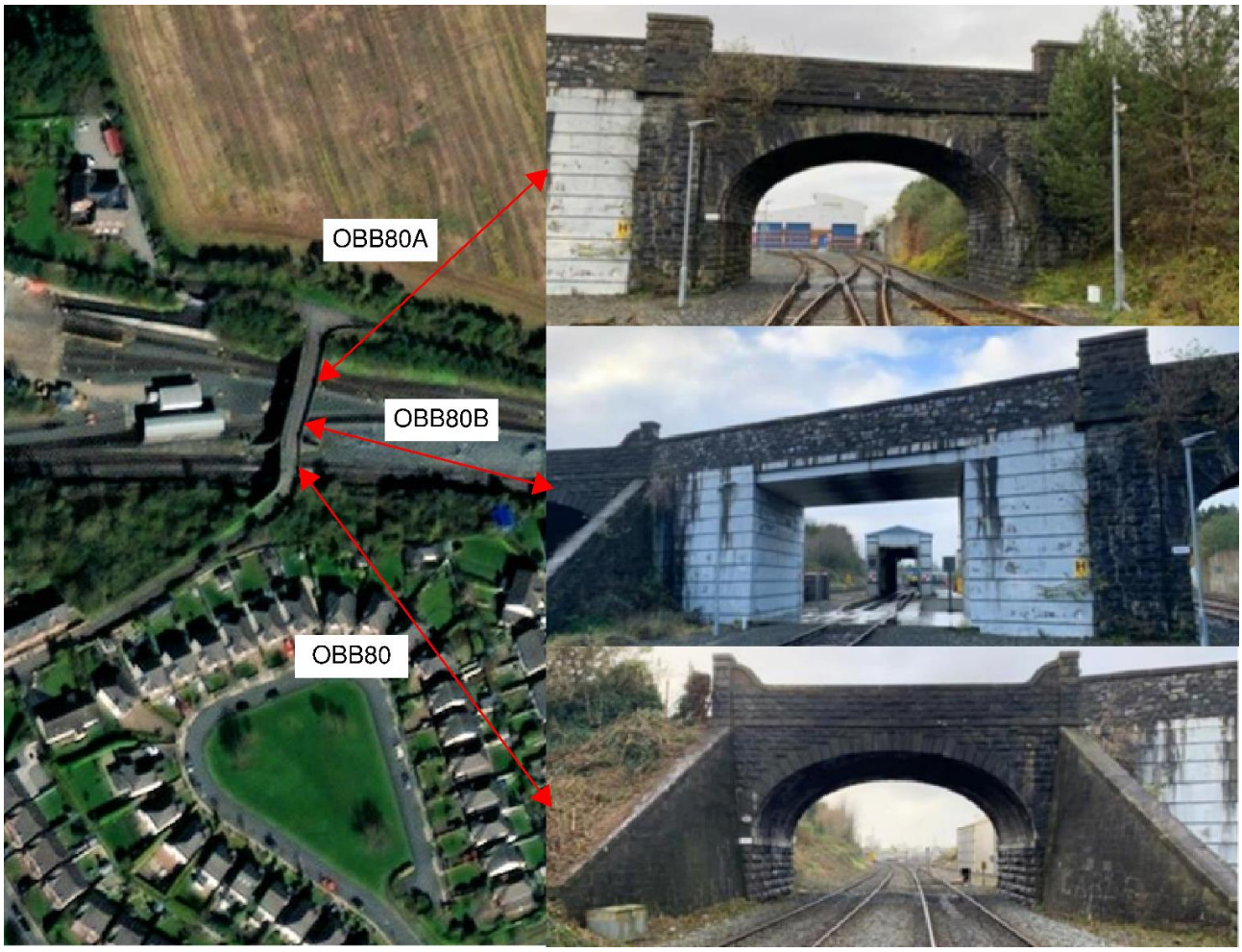

Image 3-14 OBB80/80A/80B bridge elevations and locations

3.5.1.4.1 Stage 1: Preliminary Assessment

Six options, excluding the 'Do-Nothing' option, were identified for this bridge. A summary of the findings of the sifting assessment is provided in Table 3-14.

Table 3-14 Summary of long list sifting for OBB80/80A/80B

Option	Description	Screen Result	Summary
Option O – Do nothing	Do-nothing	FAIL	Option prevents installation of OHLE due to insufficient bridge clearance. Does not meet the requirements of the TSS due to lack of electrification.
Option 1	New bridge in existing location	PASS	Meets project objectives and requirements.
Option 2	New bridge adjacent to existing bridges	FAIL	To accommodate the new road geometry, the ramp to the south will result in the CPO of gardens that back onto Railway Terrace. The resultant road geometry will be undesirable and lead to excessive gradients along Railway Terrace and Marsh Road which are unsuitable for pedestrian / cycle accessibility.
Option 3	New bridge in new location	FAIL	The ramp to the south will result in prominent earthworks next to an existing housing development. The curved ramp to the north will require prominent raised earthworks, which will be imposing on the surrounding lands.
Option 4	Bridge demolition with alternative access road from the north	FAIL	The removal of the bridge will be unacceptable for pedestrian and cycle users for connectivity.
Option 5	Pedestrian/cycle bridge with alternative access road from the north	**PASS**	Meets project objectives and requirements.
Option 6	Track lowering	**PASS**	Meets project objectives and requirements

3.5.1.4.2 Stage 2: MCA

Four options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option 1 – New bridge in existing location;
- Option 5 – Pedestrian bridge with alternative access road from the north; and
- Option 6 – Track lowering.

The summary findings of the MCA are contained in Table 3-15 below:

Table 3-15 Summary of MCA

Criteria Summary	Option 1	Option 5	Option 6
	New bridge in existing location	Pedestrian/cycle bridge with alternative access road from the north	Track lowering
Economy			
Safety			
Environment			
Accessibility & Social Inclusion			
Integration			
Physical Activity			
Preferred Option	Yes	No	No

Option 6 had significant disadvantages as its implementation has impacts that extend into the station, resulting in significant track works that would be disruptive to multiple railway users compared to the other options. Option 5 has the disadvantage of being reliant on sharing a new access road (yet to be built) with an adjoining third party. Options 5 has some comparable advantages over Option 1 when considering construction as it is a narrower replacement bridge, however these were not considered to be significant. Option 1 requires a temporary access road linking the properties to the north during the construction stage.

Option 1 was chosen as the preferred option as it:

- Provides significant advantage over other options as traffic integration for all modes of transport is maintained;
- Has limited impact to the train operations during the construction phase.

3.5.2 Installation of power supply substations and electrical feeding infrastructure

The OHLE system will be supplied with electrical power from the ESB distribution network at regular intervals, as a result new electrical substations will be required at various locations between Malahide and Drogheda. These substations will receive power at voltages up to 38kV AC and transform this into the required 1500V DC for distribution along the OHLE system. The specific voltage to be adopted will be determined at a later date in consultation with the ESB.

Findings from a traction power study has indicated that eight new substations will be required between Malahide and Drogheda to provide power to the network. The general locations along the line are as follows:

- Donabate;
- Rush and Lusk;
- Skerries South;
- Skerries North;
- Balbriggan;
- Gormanston;
- Bettystown; and
- Drogheda.

The siting of each substation within any general area has considered the following:

- The land-use and development context of potential locations;
- The substations will be located adjacent to the railway line in the form of a fenced compound surrounding a single storey building which will house all the necessary electrical switching and feeding equipment;
- The substations will be connected to the local power distribution network and the OHLE system using insulated cables. These cables will be installed in buried routes for additional protection;
- The substations will need to be accessible from the local road network for construction and maintenance purposes; and
- The footprint of each substation compound and requirement for the building to house the electrical equipment for both IÉ and ESB.

While every effort has been made to contain the necessary works, including the provision of eight additional substations, within existing IÉ owned lands, this has not always been possible. Where works are required outside of IÉ lands, lands required for Construction Compounds will typically be on a temporary basis while the lands required for the substations will be on a permanent acquisition basis.

The alternatives considered for each of the substation locations are detailed in the sections below.

3.5.2.1 Donabate substation

From the outputs of the power study, the study area under consideration for a substation at Donabate extends from directly south of the overbridge for the R126 to the northern boundary of Donabate Station car park (see Image 3-15).

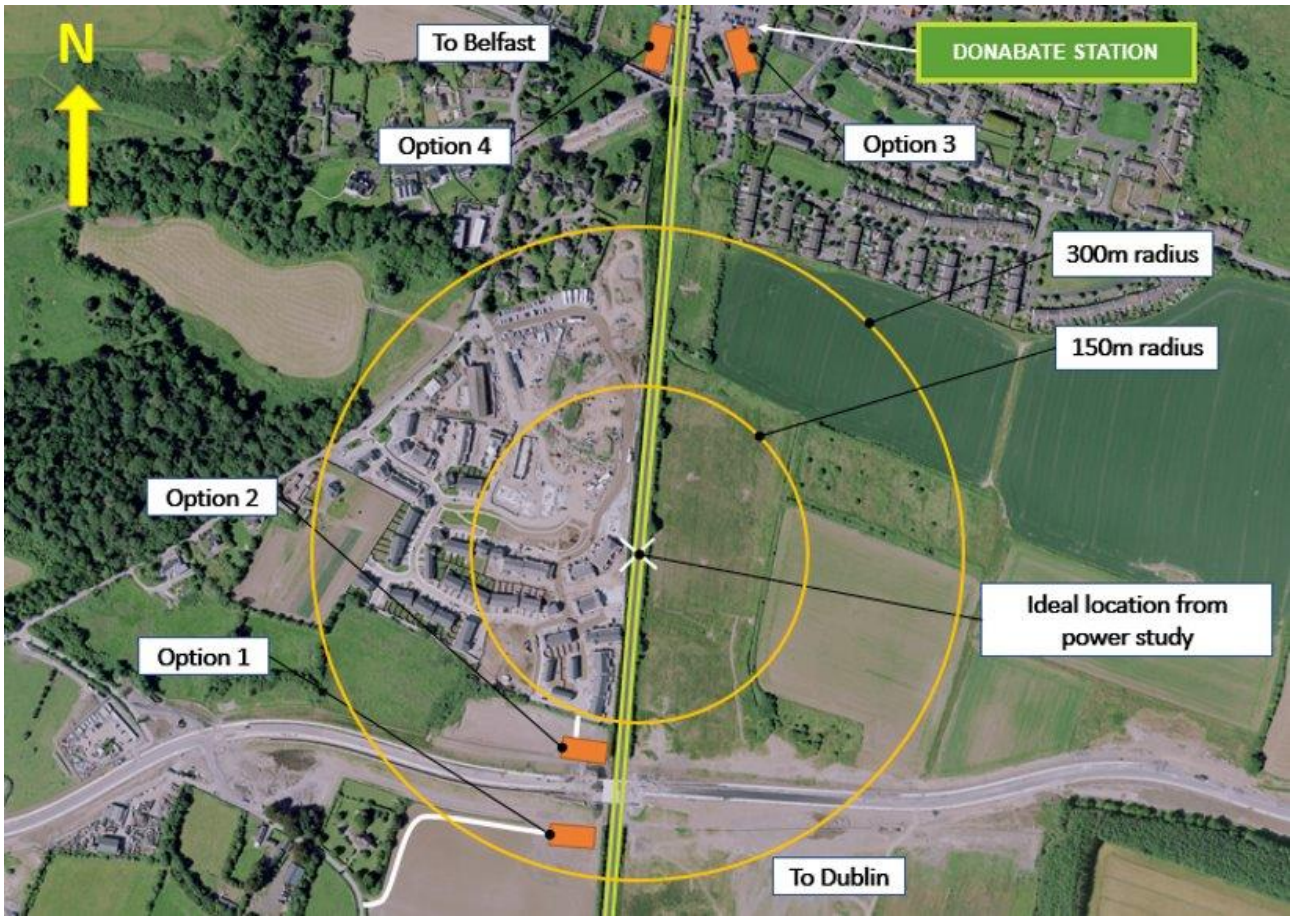

Image 3-15 Options considered for Donabate substation (Source: OSI aerial mapping)

3.5.2.1.1 Stage 1: Preliminary Assessment

Four feasible options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-16.

Table 3-16 Summary of long list sifting for Donabate substation

Option	Screening Result	Summary
"Do-nothing"	FAIL	Fails to provide electrical railway between Malahide and Drogheda. Fails to provide adequate number and location of substations.
Option 1	PASS	Meets project objectives and requirements.
Option 2	PASS	Meets project objectives and requirements.
Option 3	PASS	Meets project objectives and requirements.
Option 4	PASS	Meets project objectives and requirements.

3.5.2.1.2 Stage 2: MCA

All four options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option 1 – located on agricultural land south of the R126, west of the railway line. An access road would be required from the lane south-west of the proposed location;
- Option 2 – located on agricultural land north of the R126, west of the railway line. An access road would be required from the housing development direction north of the site;
- Option 3 – located on a grassed area at the entrance to the station car park, east of the railway line, located on IÉ owned land; and
- Option 4 – located on undeveloped land west of the station. It is envisaged access would be provided through the station west car park.

The summary findings of the MCA are contained in Table 3-17.

Table 3-17 Summary of MCA

Criteria Summary	Option 1	Option 2	Option 3	Option 4
Economy				
Safety				
Environment				
Accessibility & Social Inclusion				
Integration				
Physical Activity				
Preferred Option	Yes	No	No	No

Option 1 was identified as the Preferred Option. The basis for the selection is as follows:

- **Economy, Safety, Accessibility & Social Inclusion, and Physical Activity**: All options are comparable.
- **Environment**: Options were comparable with regards to Water Resources and Air Quality & Climate Change. Option 1 had significant advantages in Landscape and Visual Quality, Noise and Vibration and Archaeology, Architectural and Cultural Heritage. Option 4 had significant advantage in Agricultural and Biodiversity.
- **Integration**: Option 2 had significant comparative advantage as it is zoned for Residential as opposed to High Amenity (option 1) and Town Centre (options 3 and 4). Options 1 and 2 had advantage over options 3 and 4 for transport integration since options 3 and 4 impacted existing parking and pedestrians and cyclists at the station.

The Preferred Option for Donabate Substation is to locate it within agricultural land south of the R126, west of the railway line. An access road will be required from the lane south-west of the proposed location. The area is currently outside of the IÉ land ownership boundary and hence property rights will be affected by the permanent works.

3.5.2.2 Rush and Lusk substation

From the outputs of the power study, the study area considered for a substation at Rush and Lusk extends from the southern boundary of Rush and Lusk station car park to agricultural land directly adjacent to R128 Station Rd (see Image 3-16).

Image 3-16 Options considered for Rush and Lusk substation (Source: OSI Aerial Mapping)

3.5.2.2.1 Stage 1: Preliminary Assessment

Three options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-18.

Table 3-18 Summary of MCA

Option	Screening Result	Summary
"Do-Nothing"	FAIL	Fails to provide electrified railway between Malahide and Drogheda. Fails to provide adequate number and location of substations.
Option 1	PASS	Meets project objectives and requirements.
Option 2	PASS	Meets project objectives and requirements.
Option 3	PASS	Meets project objectives and requirements.

3.5.2.2.2 Stage 2: MCA

The three options that passed preliminary sifting were taken forward to MCA. They are described briefly below:

- Option 1 – located within the southern boundary of the station car park, west of the railway line, on IÉ owned land;
- Option 2 – located adjacent to the station car park, east of the railway line, on IÉ owned land; and
- Option 3 – located within the station car park, which is closest to Station Road, west of the railway line. It is envisaged that access would be provided through the station car park.

The summary findings of the MCA are contained in Table 3-19.

Table 3-19 Summary of MCA

Criteria Summary	Option 1	Option 2	Option 3
Economy			
Safety			
Environment			
Accessibility & Social Inclusion			
Integration			
Physical Activity			
Preferred Option	No	Yes	No

Option 2 was identified as the preferred option. The basis for the selection is as follows:

- **Safety, Accessibility & Social Inclusion and Physical Activity**: All options are comparable.
- **Economy**: Option 2 has advantage over the other options as it does not impact on the car park in the same way as other options, which impacts traffic functionality and associated economic activities and opportunities.
- **Environment**: Option 2 has some disadvantage as it has greater biodiversity impact due to vegetation removal.
- **Integration**: Option 2 has advantage over the other options as it does not impact the long-term parking provision at the station in a similar manner to the other options.

The Preferred Option for Rush and Lusk Substation is to locate it adjacent to the station car park, east of the railway line, on IÉ owned land.

3.5.2.3 Skerries south substation

From the outputs of the power study, the study area under consideration for a substation at Skerries South extends from agricultural land east of the southern boundary of Skerries Golf Club to agricultural land directly north of the overbridge for Golf Links Rd (see Image 3-17).

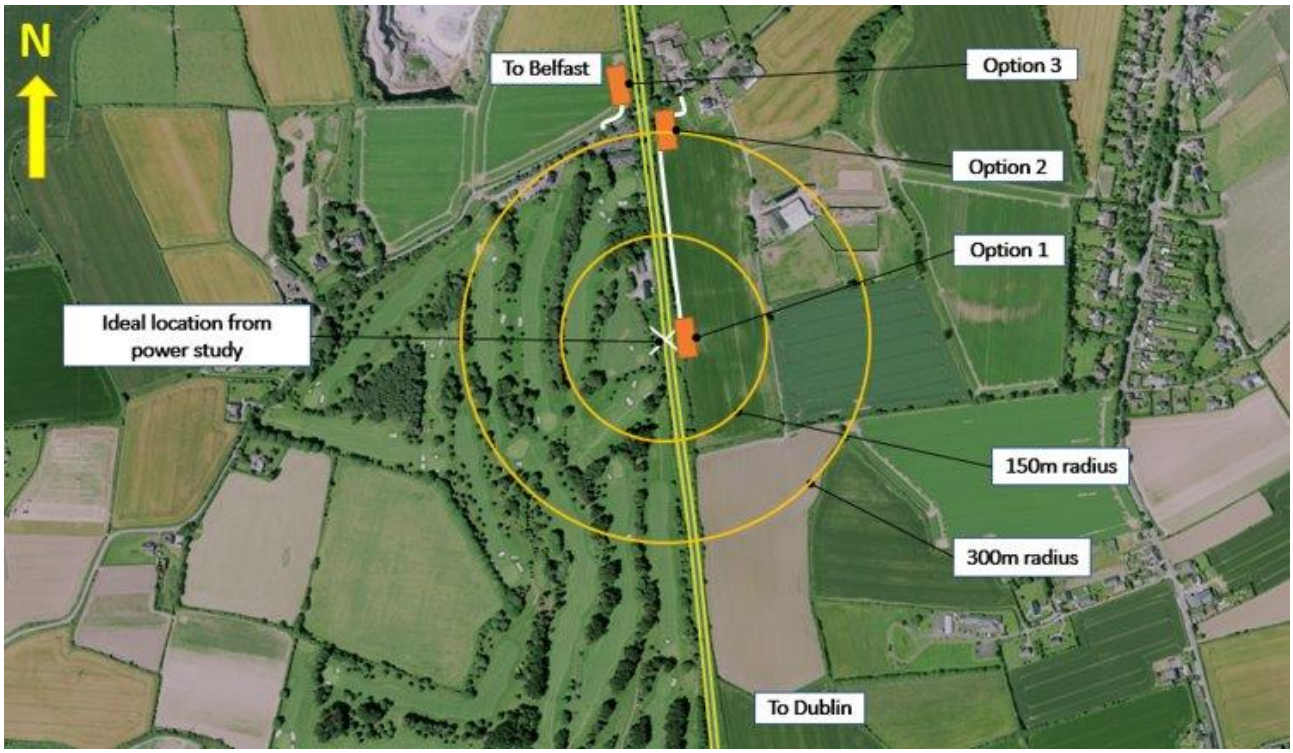

Image 3-17 Options considered for Skerries South substation (Source: OSI Aerial Mapping)

3.5.2.3.1 Stage 1: Preliminary Assessment

Three options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-20.

Table 3-20 Summary of Longlist Sifting for Skerries south substation

Option	Screening Result	Summary
"Do-Nothing"	**FAIL**	Fails to provide electrified railway between Malahide and Drogheda. Fails to provide adequate number and location of substations.
Option 1	**PASS**	Meets project objectives and requirements.
Option 2	**PASS**	Meets project objectives and requirements.
Option 3	**PASS**	Meets project objectives and requirements.

3.5.2.3.2 Stage 2: MCA

All three feasible options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option 1 – located on agricultural land, east of the railway and approx. 325m south of Golf Links Rd. An access road would be required from Golf Links Rd, parallel to the railway corridor along the boundary of the field;
- Option 2 – located on agricultural land, east of the railway and directly south of Golf Links Rd. It is envisaged that access would be provided directly from Golf Links Rd; and
- Option 3 – located on agricultural land, west of the railway and directly north of Golf Links Rd. It is envisaged that access would be provided directly from Golf Links Rd.

The summary findings of the MCA are contained in Table 3-21.

Table 3-21 Summary of MCA

Criteria Summary	Option 1	Option 2	Option 3
Economy			
Safety			
Environment			
Accessibility & Social Inclusion			
Integration			
Physical Activity			
Preferred Option	No	Yes	No

Option 2 has been identified as the Preferred Option. The basis for the selection of option 2 is as follows:

- **Safety, Accessibility & Social Inclusion, Integration, and Physical Activity**: All options are comparable.
- **Economy**: Options 1 and 2 have comparative advantage as Option 3 would require large excavations along with the construction of retaining walls.
- **Environment**: Options 2 and 3 have comparative advantage primarily as option 1 requires a longer access road which has an associated increased environmental impact.

The Preferred Option for Skerries South Substation is to locate it on agricultural land, east of the railway and directly south of Golf Links Rd. It is envisaged that access would be provided directly from Golf Links Rd. The area is currently outside of the IÉ land ownership boundary and hence property rights will be affected by the permanent works.

3.5.2.4 Skerries north substation

From the outputs of the power study, the study area under consideration for a substation at Skerries North extends from agricultural land 250m southeast of Barnageeragh Bay Steps to woodland on the south-eastern tip of Ardgillan castle land (see Image 3-18).

Image 3-18 Options considered for Skerries north substation (Source: OSI Aerial Mapping)

3.5.2.4.1 Stage 1: Preliminary Assessment

Four options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-22.

Table 3-22 Summary of longlist sifting for Skerries North substation

Option	Screening Result	Summary
"Do-Nothing"	FAIL	Fails to provide electrified railway between Malahide and Drogheda. Fails to provide adequate number and location of substations.
Option 1	PASS	Meets project objectives and requirements.
Option 2	FAIL	Fails to consider built environment and landowners by requiring routing of substation power cables under road and private garden.
Option 3	FAIL	Fails to consider adverse impact on built environment and landowners by building within historic castle grounds.
Option 4	PASS	Meets project objectives and requirements.

3.5.2.4.2 Stage 2: MCA

Two options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option 1 – located on grassed scrubland opposite the top of Barnageeragh Bay Steps, east of the railway. An access road would be required from the Hamilton Hill residential development as direct access to the R127 is precluded by the surrounding topography; and
- Option 4 – located on agricultural land 250m southeast of Barnageeragh Bay Steps, west of the railway. The substation is positioned close to the railway corridor, blocking the current access road to the farmland directly south of the proposed substation. An access road would be required from Barnageeragh Rd to allow access to the farmland south to be maintained.

The summary findings of the MCA are contained in Table 3-23.

Table 3-23 Summary of MCA

Criteria Summary	Option 1	Option 4
Economy		
Safety		
Environment		
Accessibility & Social Inclusion		
Integration		
Physical Activity		
Preferred Option	No	Yes

Option 4 has been identified as the Preferred Option. The basis for the selection of Option 4 is as follows:

- **Safety, Environment, Accessibility & Social Inclusion, Integration, and Physical Activity**: All options are comparable.
- **Economy**: Option 4 has comparative advantage as it would be cheaper to construct and maintain due to the level land on which it is proposed to be constructed, compared to the changing levels at the site of Option 1 which would require earth retaining structures.

The Preferred Option for Skerries North Substation is to locate it on agricultural land 250m southeast of Barnageeragh Bay Steps, west of the railway. The substation is positioned close to the railway corridor, blocking the current access road to the farmland directly south of the proposed substation. An access road will be required from Barnageeragh Rd to allow access to the farmland south to be maintained. The area is currently outside of the IÉ land ownership boundary and hence property rights will be affected by the permanent works.

3.5.2.5 Balbriggan substation

From the outputs of the power study, the study area under consideration for a substation at Balbriggan extends from grassland directly north of O'Dwyers GAA pitches to directly south of the overbridge (OBB62) serving agricultural land (see Image 3-19).

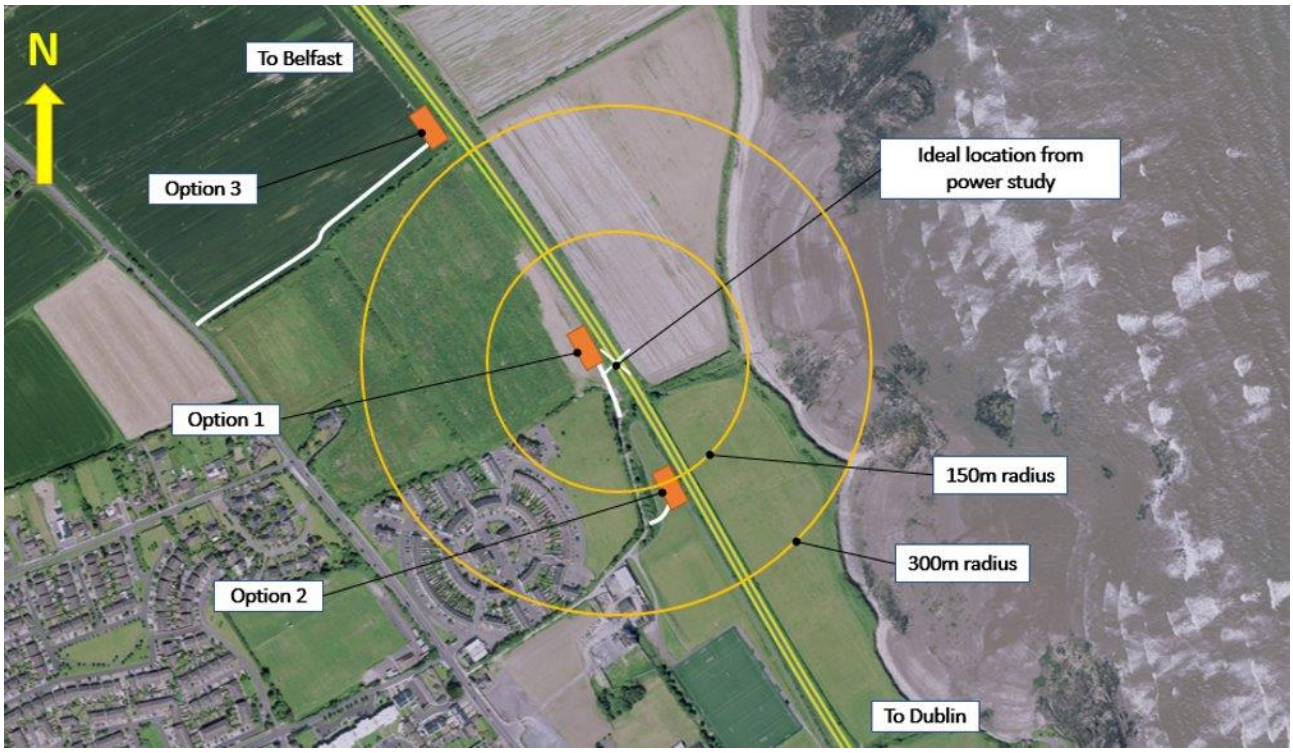

Image 3-19 Options considered for Balbriggan substation (Source: OSI Aerial Mapping)

3.5.2.5.1 Stage 1: Preliminary Assessment

Three options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-24.

Table 3-24 Summary of longlist sifting for Balbriggan substation

Option	Screening Result	Summary
"Do-Nothing"	FAIL	Fails to provide electrified railway between Malahide and Drogheda. Fails to provide adequate number and location of substations.
Option 1	PASS	Meets project objectives and requirements.
Option 2	PASS	Meets project objectives and requirements.
Option 3	PASS	Meets project objectives and requirements.

3.5.2.5.2 Stage 2: MCA

All three options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option 1 – located on scrubland directly north of the underbridge serving Bremore Bay Beach, west of the railway;
- Option 2 – located on grassed parkland directly south of the underbridge serving Bremore Bay Beach, west of the railway; and
- Option 3 – located on agricultural land 350m north of the aforementioned underbridge, west of the railway. An access road would be required from the R132, running along the boundary of the existing fields.

The summary findings of the MCA are contained in Table 3-25.

Table 3-25 Summary of MCA

Criteria Summary	Option 1	Option 2	Option 3
Economy			
Safety			
Environment			
Accessibility & Social Inclusion			
Integration			
Physical Activity			
Preferred Option	No	No	Yes

Option 3 has been identified as the Preferred Option. The basis for the selection of Option 3 is as follows:

- **Economy**: Options 1 and 2 have some comparative advantage as the length of access road and new highway connection in Option 3 has greater associated capital cost.
- **Environment:** Options 2 and 3 have comparative advantage since option 2 has significant comparative advantages from Geology and Soils, and Agricultural perspectives and Option 3 has significant comparative advantages from Landscape and Visual Quality, Noise and Vibration and Archaeology, Architectural and Cultural Heritage perspectives.
- **Accessibility & Social Inclusion and Physical Activity**: all options are comparable.
- **Integration**: Option 3 has comparative advantage from a land use perspective as Options 1 and 2 are encompassed by the Part XI approval for a recreational park.

The Preferred Option for Balbriggan Substation is to locate it on agricultural land 350m north of the underbridge serving Bremore Bay Beach, west of the railway. An access road will be required from the R132, running along the boundary of the existing fields. The area is currently outside of the IÉ land ownership boundary and hence property rights will be affected by the permanent works.

3.5.2.6 Gormanston substation

From the outputs of the power study, the study area under consideration for a substation at Gormanston extends from 150m north of the disused runway to the overbridge to the north (see Image 3-20).

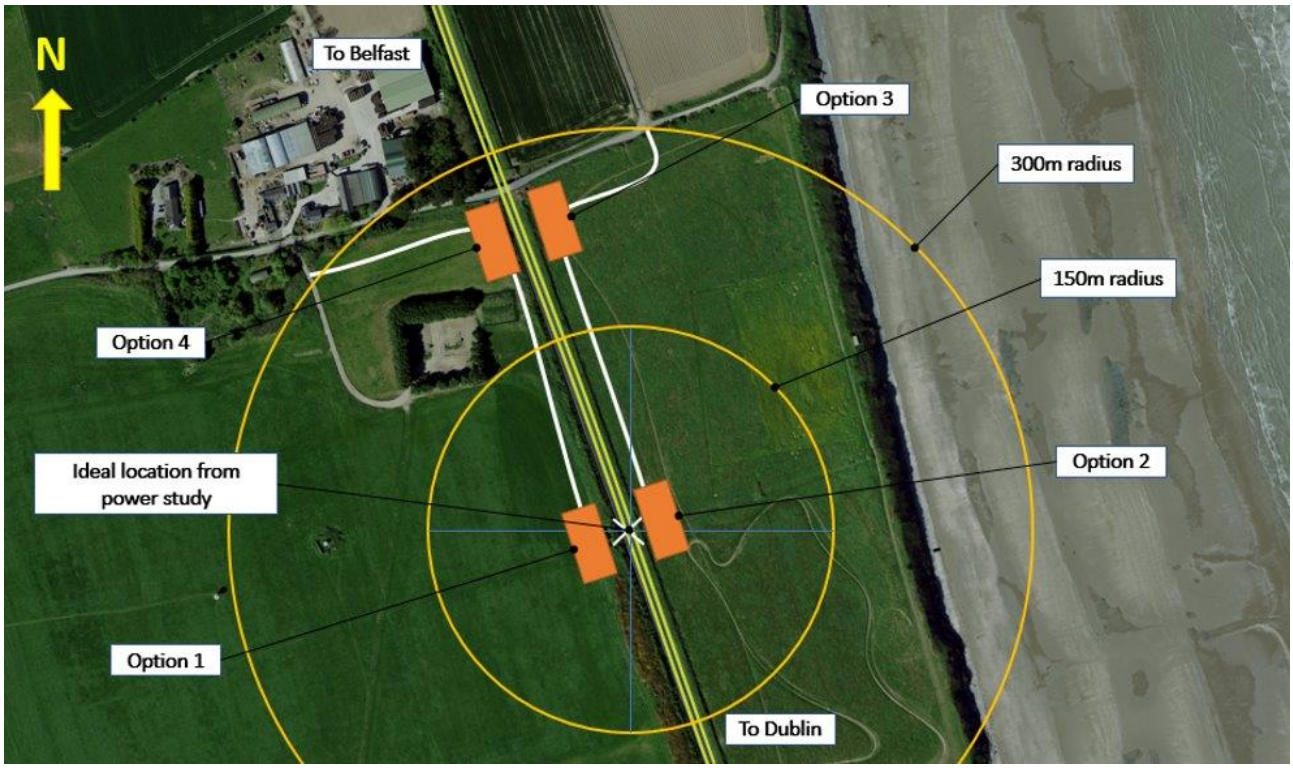

Image 3-20 Options considered for Gormanston substation (Source: OSI Aerial Mapping)

3.5.2.6.1 Stage 1: Preliminary Assessment

Four options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-26.

Table 3-26 Summary of longlist sifting for Gormanston substation

Option	Screening Result	Summary
"Do-Nothing"	FAIL	Fails to provide electrified railway between Malahide and Drogheda. Fails to provide adequate number and location of substations.
Option 1	PASS	Meets project objectives and requirements.
Option 2	PASS	Meets project objectives and requirements.
Option 3	PASS	Meets project objectives and requirements.
Option 4	PASS	Meets project objectives and requirements.

3.5.2.6.2 Stage 2: MCA

All four options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option 1 – located on grassland within Gormanston Camp, 150m north of the disused runway, west of the railway. An access road would be required around the perimeter of the camp to the adjacent lane;
- Option 2 – located on grassland, 150m north of the disused runway, east of the railway. An access road would be required parallel to the railway boundary and up to the adjacent lane;
- Option 3 – located on grassland directly south of the overbridge, east of the railway;
- Option 4 – located on grassland directly south of the overbridge, west of the railway. A short access road would be required perpendicular to the tracks due to topological constraints for the overbridge access ramps.

The summary findings of the MCA are contained in Table 3-27.

Table 3-27 Summary of MCA

Criteria Summary	Option 1	Option 2	Option 3	Option 4
Economy				
Safety				
Environment				
Accessibility & Social Inclusion				
Integration				
Physical Activity				
Preferred Option	No	No	No	Yes

Option 4 has been identified as the Preferred Option. The basis for the selection of Option 4 is as follows:

- **Economy, Environment, Accessibility & Social Inclusion and Physical Activity**: all options are comparable.
- **Safety**: Options 1 and 4 have significant comparative advantage as Options 2 and 3 have associated risk due to nearby firing ranges.
- **Integration**: Option 4 has significant comparative advantage regarding land use integration as following discussions with the Defence Forces it is understood to have the least impact on military operations and assets.

The Preferred Option for Gormanston Substation is to locate it on grassland directly south of the overbridge, west of the railway. A short access road would be required perpendicular to the tracks due to topological constraints for the overbridge access ramps. The area is currently outside of the IÉ land ownership boundary and hence property rights will be affected by the permanent works.

3.5.2.7 Bettystown substation

From the outputs of the power study, the study area under consideration for a substation at Bettystown extends from agricultural land south of Ardmore Avenue to woodland west of Ardmore Lane (see Image 3-21).

Image 3-21 Options considered for Bettystown substation (Source: OSI Aerial Mapping)

3.5.2.7.1 Stage1: Preliminary Assessment

Five options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-28.

Table 3-28 Summary of longlist sifting for Bettystown substation

Option	Screening Result	Summary
"Do-Nothing"	FAIL	Fails to provide electrified railway between Malahide and Drogheda. Fails to provide adequate number and location of substations.
Option 1	PASS	Meets project objectives and requirements.
Option 2	PASS	Meets project objectives and requirements.
Option 3	PASS	Meets project objectives and requirements.
Option 4	PASS	Meets project objectives and requirements.
Option 5	PASS	Meets project objectives and requirements.

3.5.2.7.2 Stage 2: MCA

All five options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option 1 – located on agricultural land south of Ardmore Avenue, east of the railway. An access road would be required from the corner of Ardmore Avenue and around the perimeter of the field. The access road crosses a drainage ditch/stream;
- Option 2 – located on agricultural land southwest of Ardmore Avenue, west of the railway. An access road would be required from Minnistown Road, running along the perimeter of two fields, over approximately 600m;
- Option 3 – located on scrubland adjacent to Ardmore Avenue. It is envisaged that it could be directly accessed from the existing road with a small section of new access road;
- Option 4 – located on agricultural land south of Ardmore Avenue, west of the railway. An access road would be required from Minnistown Road, running along the perimeter of two fields, over approximately 600m. The access road crosses a drainage ditch/stream; and
- Option 5 – located on Irish Rail owned land adjacent to the junction between Ardmore Lane and Narroways Road, east of the railway. An access road would be required from the substation to the junction.

The summary findings of the MCA are contained in Table 3-29.

Table 3-29 Summary of MCA

Criteria Summary	Option 1	Option 2	Option 3	Option 4	Option 5
Economy					
Safety					
Environment					
Accessibility & Social Inclusion					
Integration					
Physical Activity					
Preferred Option	No	No	Yes	No	No

Option 3 has been identified as the Preferred Option. The basis for the selection of Option 3 is as follows.

- **Safety, Accessibility & Social Inclusion, Integration and Physical Activity**: All options are comparable.
- **Economy**: Options 1, 3 and 5 have some comparative advantage due to the significantly shorter access roads required.
- **Environment**: Option 3 has some comparative advantage as it can be screened from residential properties, having less impact on water resources, having no impact to agricultural land, and having a geology and soils advantage due to the shorter access road.

The Preferred Option for Bettystown Substation is to locate it on scrubland adjacent to Ardmore Avenue. It is envisaged that it could be directly accessed from the existing road with a small section of new access road. The area is currently outside of the IÉ land ownership boundary and hence property rights will be affected by the permanent works. The interface with long-term station proposals in this area has been considered (not part of DART+ Coastal North), along with interfacing with proposed adjacent development.

3.5.2.8 Drogheda substation

From the outputs of the power study, the study area under consideration for a substation at Drogheda extends from the end of McGrath's Lane to the Marsh Road Pay & Display car park (see Image 3-22).

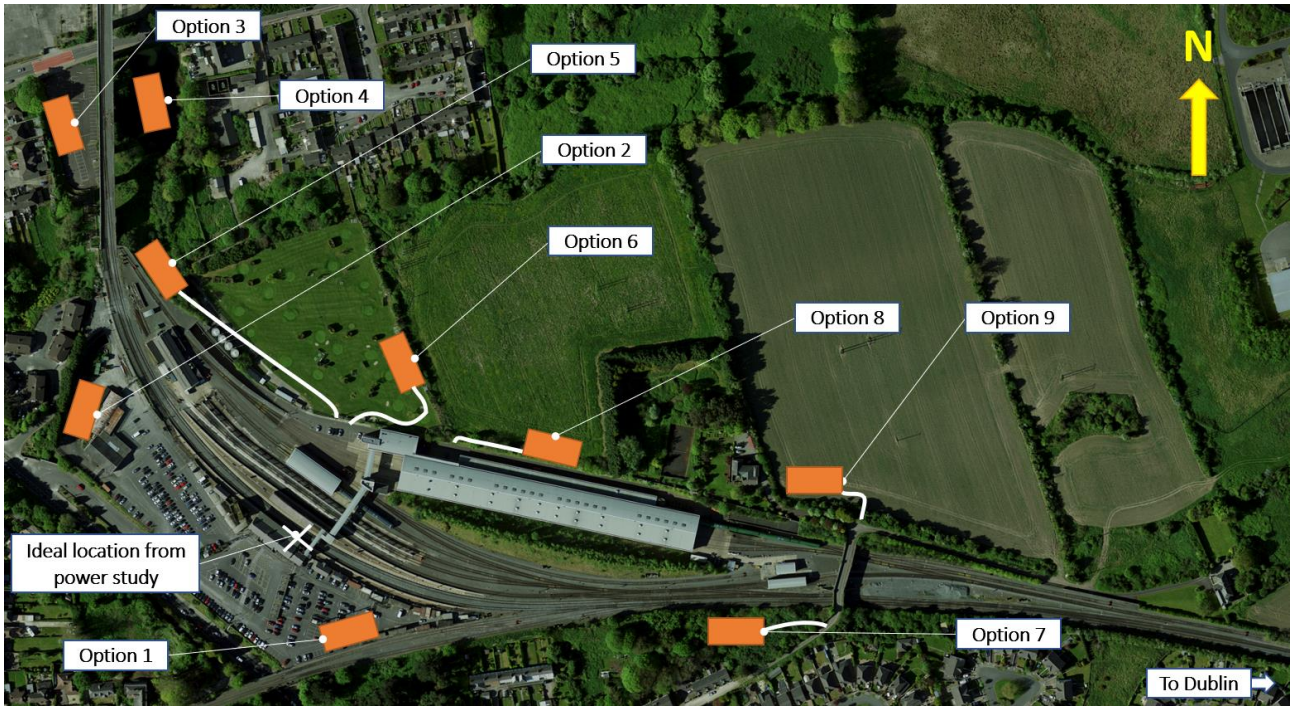

Image 3-22 Options considered for Drogheda substation (Source: OSI Aerial Mapping)

3.5.2.8.1 Stage 1: Preliminary Assessment

Nine options, excluding the 'Do-Nothing' option, were identified for the area. A summary of the findings of the sifting assessment is provided in Table 3-30.

Table 3-30 Summary of longlist sifting for Drogheda substation

Option	Screening Result	Summary
"Do-Nothing"	FAIL	Fails to provide adequate number and location of substations. Fails to provide electrified railway between Malahide and Drogheda.
Option 1	PASS	Meets project objectives and requirements.
Option 2	FAIL	Unsuitable impacts on maintenance operations.
Option 3	PASS	Meets project objectives and requirements.
Option 4	FAIL	Unsuitable topography does not consider adverse impact on natural and built environment and disruption due to significant works required.
Option 5	FAIL	Unsuitable topography does not consider adverse impact on natural and built environment and disruption due to significant works required.
Option 6	PASS	Meets project objectives and requirements.
Option 7	PASS	Meets project objectives and requirements.
Option 8	PASS	Meets project objectives and requirements.
Option 9	PASS	Meets project objectives and requirements.

3.5.2.8.2 Stage 2: MCA

Six options passed preliminary sifting and were taken forward to MCA. They are described briefly below:

- Option 1 – located on the southern boundary of the station car park;
- Option 3 – located on hardstanding for a current construction storage area and ancillary buildings within the station car park. This would require demolition of the existing corrugated steel building;
- Option 6 – located on grassland currently used by the McBride Pitch and Putt Club, north of the depot confines. A short access road would be required from the current depot boundary;
- Option 7 – located on vegetated land located between the railway corridor and McGrath's Lane, just south of the railway bridge. This area is heavily vegetated and likely on a sloping gradient;
- Option 8 – located on agricultural land, north of the depot train shed. A short access road would be required from the current depot boundary. Access would be created through the existing reinforced concrete wall, rather than through the gabion wall, with additional sections of reinforced concrete wall constructed to the rear when in cutting; and
- Option 9 – located on agricultural land north of the end of McGrath's Lane, north of the railway. It is envisaged access would be provided from McGrath's Lane, directly opposite the railway bridge.

The summary findings of the MCA are contained in Table 3-31.

Table 3-31 Summary of MCA

Criteria Summary	Option 1	Option 3	Option 6	Option 7	Option 8	Option 9
Economy						
Safety						
Environment						
Accessibility & Social Inclusion						
Integration						
Physical Activity						
Preferred Option	No	No	No	No	Yes	No

Option 8 has been identified as the Preferred Option. The basis for the selection of option 8 is as follows:

- **Safety, Accessibility & Social Inclusion and Physical Activity**: all options are comparable.
- **Economy**: Options 6, 8 and 9 have some comparative advantage since Option 7 would have cost associated with new ESB supplies needing to cross the line, and Options 1 and 3 impacting the existing parking provision, pedestrians and cyclists (thus affecting traffic functionality and associated economic activities and opportunities).
- **Environment**: Options 1 and 8 have significant comparative advantage. Option 1 has significant advantages from a biodiversity and water resources point of view and Option 8 has similar from a landscape and visual quality, noise and vibration and water resources perspective.
- **Integration**: Options 6, 8 and 9 have some comparative advantage since Option 7 has the land use disadvantage as being the only option not zoned as Transportation Development Hub, and Options 1 and 3 result in the loss of station parking, having a transport integration disbenefit.

3.5.3 Works Around Drogheda MacBride Station

3.5.3.1 Background

Drogheda MacBride Station is located on the Northern Line, south-east of Drogheda town centre. The station is located to the east of Dublin Road (R132) and south of the River Boyne. The station consists of three platforms: Platform 1 on the Down Main line, Platform 2 on the Up Main line and Platform 3 on a spur. An earth bund is present next to the depot maintenance building.

See Image 3-23 for aerial mapping of the existing station layout.

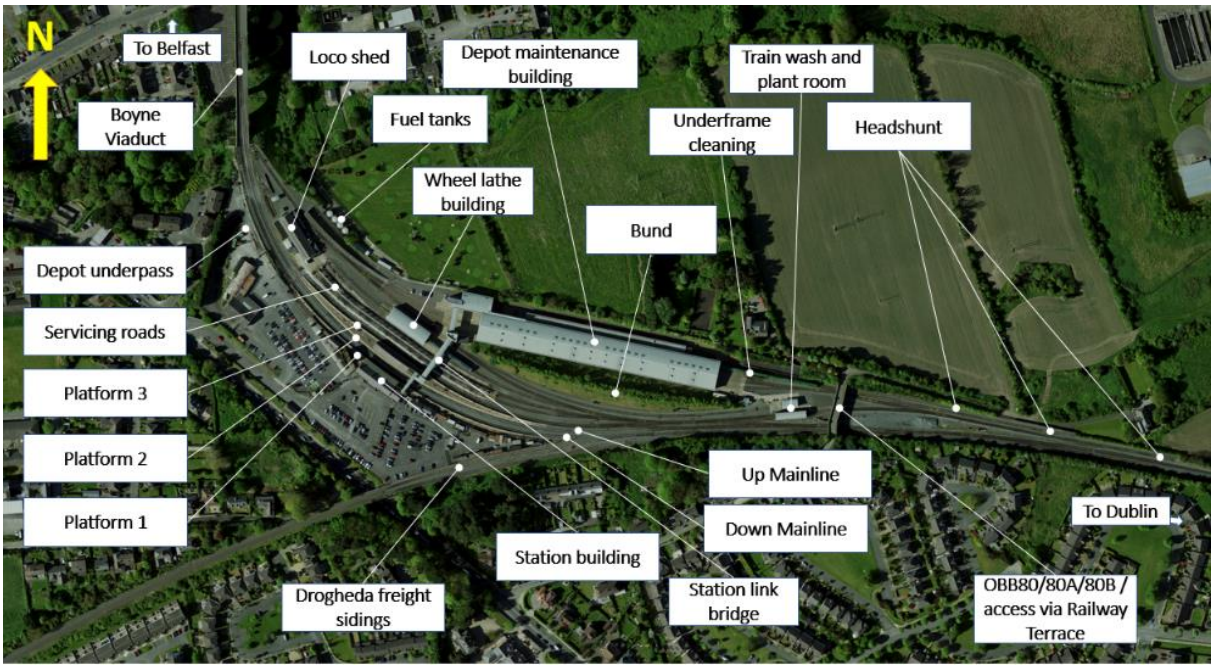

Image 3-23 Drogheda MacBride existing arrangement (Source: OSI aerial mapping)

The existing track and depot layout would not provide sufficient operational capacity to meet the project requirements. Consequently, track and depot alterations are required (including a new Platform 4), along with associated alterations to signalling, electrification, telecoms and structures.

Modifications are required to the depot to provide infrastructure, maintenance and servicing facilities necessary for the new DART+ Fleet. New turnback infrastructure is also required at Drogheda MacBride Station.

3.5.3.2 Stage 1: Preliminary Assessment

To achieve the operational capacity needed at Drogheda MacBride Station, a total of 18 options were developed for this area (excluding the 'Do-Nothing' option), as summarised in Table 3-32.

Table 3-32 Summary of long list of sifting for works around Drogheda MacBride Station

Option	Description	Screening Result	Summary
Option 0 - "Do-Nothing"	Do-Nothing	FAIL	This option fails to meet the TSS, depot access or stabling requirements set.
Option 1A	New platform at location of existing service road 4.	FAIL	This option fails to meet the TSS and depot access requirements set. In addition, there is non-compliant track geometry on approach to new platform.
Option 1B	New platform at location of existing service road 4 with new crossover from Down main at the station approach.	FAIL	This option fails to meet the TSS and depot access requirements set.
Option 1C	New platform at location of existing service road 4 with new crossover allowing parallel moves from Down and Up main at the station approach.	FAIL	This option fails to meet the TSS and depot access requirements set.
Option 1D	New platform at location of existing service road 4 with new crossover allowing parallel moves from Down and Up main at the station approach with no ECS moves to depot in peak.	PASS	Met project objectives and requirements.
Option 1E	New platform at location of existing service road 4 with new depot headshunt to south and with new crossover from Down main at the station approach.	PASS	Met project objectives and requirements.
Option 1F	New platform at location of existing service road 4 with new depot headshunt to south and with new crossover from Down main at the station approach. Southern headshunt depot arrivals only.	PASS	Met project objectives and requirements.
Option 2A	Single Drogheda freight sidings platform.	FAIL	This option fails to meet the TSS and depot access requirements set.
Option 2B	Single Drogheda freight sidings platform but with no ECS moves to Drogheda freight sidings platforms.	PASS	Met project objectives and requirements.
Option 2C	Single Drogheda freight sidings platform with southern headshunt to depot.	PASS	Met project objectives and requirements.
Option 2D	Island Drogheda freight sidings platform.	FAIL	This option fails to meet the TSS and depot access requirements set.
Option 2E	Island Drogheda freight sidings platform with no ECS moves to new western platforms.	PASS	Met project objectives and requirements.
Option 2F	Island Drogheda freight sidings platform with southern headshunt to depot.	PASS	Met project objectives and requirements.
Option 2G	Drogheda freight sidings platform provided by removing dual track with no ECS moves to new western platforms.	FAIL	This option presents a severe risk to DART performance with the interaction with freight services.

Option	Description	Screening Result	Summary
Option 2H	Drogheda freight sidings platform provided by removing dual track with southern headshunt to depot.	FAIL	This option presents a severe risk to DART performance with the interaction with freight services.
Option 2I	New platforms in station car park with no ECS moves to new western platforms.	FAIL	This option has significant impacts on heritage assets, compromises the current station functionality and car parking provision.
Option 2J	New platforms in station car park with southern headshunt to depot.	FAIL	This option has significant impacts on heritage assets, compromises the current station functionality and car parking provision.
Option 3A	New headshunt to north.	FAIL	This option fails to meet the TSS and depot access requirements set. It also has significant impacts on heritage assets.
Option 3B	New headshunt to north with connection from Platform 2.	FAIL	No compliant or suitable track geometry solution can be found. It also has significant impacts on heritage assets.

3.5.3.3 Stage 2: MCA

Options 1D, 1E, 1F, 2B, 2C, 2E and 2F passed preliminary sifting and were taken forward to MCA. They are described briefly below:

3.5.3.3.1 Option 1D

For Option 1D, a new Platform 4 is provided at the location of the existing service roads between Platform 3 and the wheel lathe building. A new footbridge with lift access would be provided to Platform 4. The service roads would be relocated within the depot to the bund area where vegetation would be removed and earthworks required to level and regrade the ground. Significant alteration of the depot and platform approach track configurations would be made, including two new crossovers for platform access and improved operational performance. New stabling would be provided on the new platform and on depot servicing roads.

Track alterations would require significant modifications or, most likely, replacement of OBB80 and OBB80A. The adjacent OBB80B may also need replacing or modification depending on whether there are any interdependencies between the structures. See Image 3-24 for general overview of Option 1 solutions.

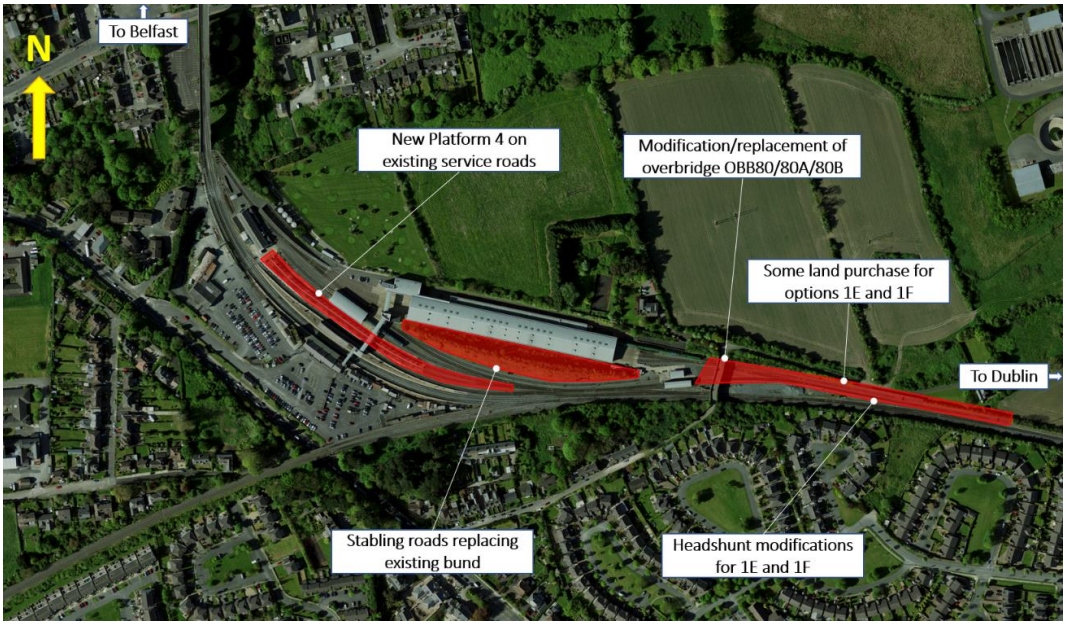

Image 3-24 Option 1 general overview (Source: OSI aerial imagery)

3.5.3.3.2 Option 1E

Option 1E is similar to Option 1D with differences east of the train wash. An extra headshunt of length > 200m is added between the existing eastern headshunt and the Up main. This would require some purchase of additional land to move the existing headshunts north. See Image 3-24 for general overview of Option 1 solutions.

3.5.3.3.3 Option 1F

Similar to Option 1D, Option 1F proposes a new Platform 4 between Platform 3 and the wheel lathe building with the servicing roads relocated to the bund area. The track changes differ from Option 1D on the platforms although this results in some operational impact when trains from Platforms 3 and 4 enter the depot.

Similar to Option 1E, Option 1F includes an extra headshunt with the existing headshunts slewed to the north requiring land purchase. See Image 3-24 for general overview of Option 1 solutions.

3.5.3.3.4 Option 2B

Option 2B provides a new platform on the Drogheda freight sidings. This would require the installation of the platform over the Dublin Road (R132), requiring widening or replacement of Underbridge UBK01, a slew of the Drogheda freight sidings and modification to the mainline points and crossings. Retaining walls and other civil works would also be required to accommodate the new platform, along with other track modifications to cater for the increase in stabling requirements.

The new platform would be interconnected with the existing Platform 1 which would require modification to allow for pedestrian movements to the new platform. A new direct entrance to the new platform from the car park will also be provided. This option would require moving the existing SET buildings, SET equipment rooms and SET/CCE staff accommodation cabins to a new location and would also result in the loss of some station car parking.

New stabling would be provided via a combination of the following:

1. Stabling on the southern Drogheda freight sidings;
2. Stabling on the northern Drogheda freight sidings; and
3. Stabling within the bund area of the depot.

The provision of the new platform will allow current freight levels to continue but this will require the timing of freight trains, the use of the platform and any stabling to be considered and aligned with each other.

See Image 3-25 for general overview of Option 2 solutions.

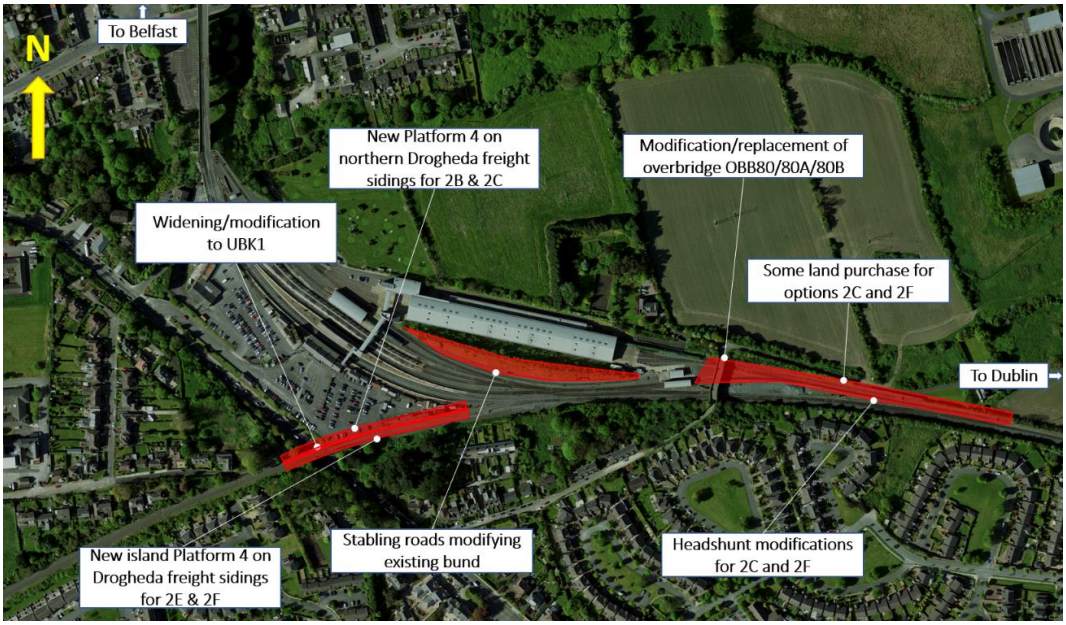

Image 3-25 Option 2 general overview (Source: OSI aerial imagery)

3.5.3.3.5 Option 2C

Option 2C is a development of Option 2B, whereby the side platform on the Drogheda freight sidings and the proposed additional stabling road in the depot remain the same. An extra headshunt of length > 200m is added between the existing eastern headshunt and the Northern Line. In order to retain the two existing headshunts they have been slewed north which pushes them outside IÉ land and would require purchasing additional land, similar to Option 1E.

Tack modifications would likely require structural modification or replacement of OBB80/80A/80B (Railway Terrace). See Image 3-25 for general overview of Option 2 solutions.

3.5.3.3.6 Option 2E

Option 2E is similar to 2B but instead proposes an island platform on the Drogheda freight sidings. Similar widening or replacement of Underbridge UBK01, retaining structures and track alterations would be required.

A new footbridge with lifts would be provided which will be interconnected with the existing Platform 1. This option would require moving the existing SET buildings, SET equipment rooms and SET/CCE staff accommodation cabins to a new location. Alternatively, a new station entrance could be built which serves as the focal point for DART services.

The stabling and freight implications are the same as for Option 2B. See Image 3-25 for general overview of Option 2 solutions.

3.5.3.3.7 Option 2F

Option 2F is a development of Option 2E with an extra headshunt added similar to Option 2C. See Image 3-25 for general overview of Option 2 solutions.

The summary findings from the MCA are contained in Table 3-33.

Table 3-33 Summary of MCA

Criteria Summary	Opt. 1D	Opt. 1E	Opt. 1F	Opt. 2B	Opt. 2C	Opt. 2E	Opt. 2F
Economy							
Safety							
Environment							
Accessibility & Social Inclusion							
Integration							
Physical Activity							
Preferred Option	No	No	No	Yes	No	No	No

Option 2B has been identified as the Preferred Option. The basis for the selection of Option 2B as the preferred option is as follows:

- **Economy**: Option 2B is preferred as it can be constructed for a comparatively small capital cost and with relatively minimal disruption to existing passenger services. It can be shown that by splitting DART services between the new platform and the existing Platform 3, a robust operational solution for services exists. By “alternating” services between the platforms, the track infrastructure on the approach is most efficiently used. Options 2C and 2F perform better than Option 2B in terms of train and depot operations, as Option 2B lacks the extra headshunt necessitating turning back on the mainline. However, this higher operational performance is not required for the project and the significantly lower cost of Option 2B compared to Options 2C and 2F is considered to outweigh this benefit.

- **Safety**: Options 2B and 2C are the preferred options for safety as the new platforms have clear escape routes to the rear of the car park. Options 1D, 1E and 1F are seen to have some disadvantages compared to these options as the new platform is constrained to one side by the depot and does not offer easy escape routes. Options 2E and 2F also have some disadvantages over Options 2B and 2C as the new island platform increases the number of platform interfaces. Also, with these options, the platform escape is more constrained.
- **Environment**: All options were found to be comparable in terms of impact on water resources, geology and soils, agricultural and non-agricultural land use and air quality and climate change. There are some differences between the options on these topics, such as the options trade-off between heritage impact and proximity to neighbouring residents, but overall the options are considered comparable.
- **Accessibility and Social Inclusion**: Options 2B and 2C have some comparative disadvantages to the other options as construction of a single platform on the Drogheda freight sidings will result in DART serving Platform 3 and the new platform, resulting in uncertainty in platform destinations for passengers. Furthermore, this option introduces extended travel distances for passengers transferring services as well as the need to use a bridge to access DART services on Platform 3.
- **Integration and Physical Activity**: There is no comparative advantage or disadvantage between the options.

The Preferred Option for turnback and stabling facilities at Drogheda MacBride Station is Option 2B which provides a new platform on the Drogheda freight sidings.

3.5.4 Works Around Malahide

3.5.4.1 Background

In addition to general feasibility requirements (for example, constructability, safety, technical standard compliance, etc.), the specific requirements for this area are:

- Provide turnback infrastructure at Malahide which will meet the Train Service Specification (TSS) (i.e. allow a greater number of services to turnback at Malahide to return to the centre of Dublin); and
- To take cognisance of the future Broadmeadow Way Greenway and not to do anything which would preclude the construction of the Greenway.

The existing track layout would not provide sufficient operational capacity to enable turnback of services to return to the centre of Dublin. Consequently, track alterations, along with associated signalling, electrification, telecoms and structures, are required to ensure the planned increase in train services can be achieved.

3.5.4.2 Stage 1: Preliminary Assessment

A total of 16 options were developed for this area (excluding the 'Do-Nothing' option), as summarised in Table 3-34.

Table 3-34 Summary of longlist sifting for works around Malahide

Option	Description	Screening Result	Summary
Option 0 "Do-Nothing"	Do Nothing	FAIL	This option fails to deliver the TSS requirements
Option 1A	Down line slewed to provide central turnback north of Malahide (Down line on divergent route)	PASS	Met project objectives and requirements
Option 1B	Down line slewed to provide central turnback north of Malahide (turnback on divergent route)	PASS	Met project objectives and requirements
Option 2A	Up line slewed to provide central turnback north of Malahide (Up line on divergent route)	PASS	Met project objectives and requirements
Option 2B	Up line slewed to provide central turnback north of Malahide (turnback on divergent route)	PASS	Met project objectives and requirements
Option 3A	Turnback on Down side north of Malahide	FAIL	The introduction of train conflicting moves means this option fails to reliably deliver the TSS
Option 3B	Loop on Down side north of Malahide	FAIL	The introduction of train conflicting moves means this option fails to reliably deliver the TSS
Option 4A	Turnback on Up side north of Malahide	FAIL	The introduction of train conflicting moves means this option fails to reliably deliver the TSS
Option 4B	Loop on Up side north of Malahide	FAIL	The introduction of train conflicting moves means this option fails to reliably deliver the TSS
Option 5A	Central turnback south of Donabate	FAIL	The introduction of a service terminating just south of Donabate Station will cause a significant negative experience for passengers at Donabate Station. Furthermore, the turnback is located in an area designated in the local authority plan as for residential development.
Option 5B	Central turnback north of Malahide Estuary	PASS	Met project objectives and requirements
Option 5C	Turnback north of Donabate	FAIL	The option provides service to one station further than what the TSS requires (trains would terminate at Donabate rather than Malahide). While from a passenger experience standpoint this would be beneficial, from a rail operations standpoint the additional train diagram length and reduced turnaround time required to facilitate travelling for one extra station would negatively impact the performance and reliability of the service.

Option	Description	Screening Result	Summary
Option 6A	New platform on Down side south of Malahide	FAIL	The introduction of train conflicting moves means this option fails to reliably deliver the TSS
Option 6B	New platform on Down side south of Malahide with passing loop	FAIL	The introduction of train conflicting moves means this option fails to reliably deliver the TSS
Option 7A	New Down side platform at Malahide	FAIL	This option fails due to the significant negative impacts on the built environment
Option 7B	New Down side platform at Malahide	FAIL	This option fails due to the significant negative impacts on the built environment
Option 8	Relocate station to south with additional platform	FAIL	This option fails due to the significant negative impacts on the built environment

3.5.4.3 Stage 2: MCA

Options 1A, 1B, 2A, 2B and 5B passed preliminary sifting and were taken forward to MCA.

The five shortlisted options only have minor differences from an OHLE perspective. New masts and support structures will be required to facilitate the new track layout. This would likely be via new headspans or portal frames. Cantilevers could be used from the existing masts in locations where this is suitable.

Similarly, from a signalling perspective the five shortlisted options do not vastly differ but reworking to the signalling will be required to accommodate the new tracks and control new points and crossings.

3.5.4.3.1 Option1A

For Option 1A, the Down line will follow a new alignment slewed to the west towards Malahide Estuary. The original track then forms a central turnback with a driver walkway provided. The Up line remains as is, with a new turnout presented to allow egress from the turnback road to the Up line.

This option requires a new retaining structure approximately 325m in length and 3m high running along the west side of the tracks. None of the existing bridge structures will be impacted by this option. There is the potential for direct and indirect impacts to the adjacent designated (SPA and SAC) sites, and there would likely be impact to the proposed Broadmeadow Way Greenway during construction.

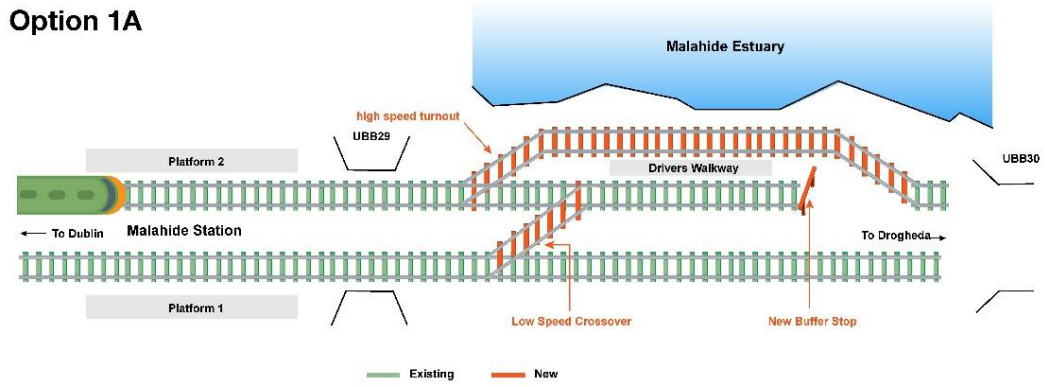

Image 3-26 Schematic of Option 1A

3.5.4.3.2 Option 1B

For Option 1B, the Down line will follow a new alignment slewed to the west towards Malahide Estuary. The original track then forms a central turnback. This would be accessed from both the Up and altered Down lines via new switches.

Similar works to Option 1A would be required for the OHLE, signalling and structural interventions. As the length of affected track is approximately 100m greater than Option 1A, retaining structures would be longer and a greater number of OHLE masts would be required. There is the potential for direct and indirect impacts to the Malahide Estuary SAC and Malahide Estuary SPA, and there would likely be impact to the proposed Broadmeadow Way Greenway during construction.

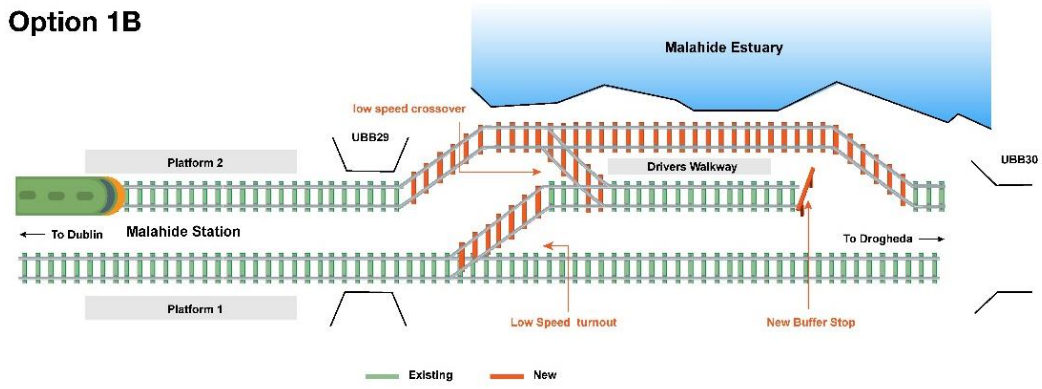

Image 3-27 Schematic of Option 1B

3.5.4.3.3 Option 2A

Option 2A is an inversion of Option 1A, on the east side of the railway. It requires a retaining structure of similar length and comparable signalling/electrification modifications on the east side of the tracks. Works would impact the road into the wastewater treatment plant, requiring temporary traffic management and potentially modified kerb lines in the permanent situation. This option also moves the railway line closer to properties in Malahide Marina Village.

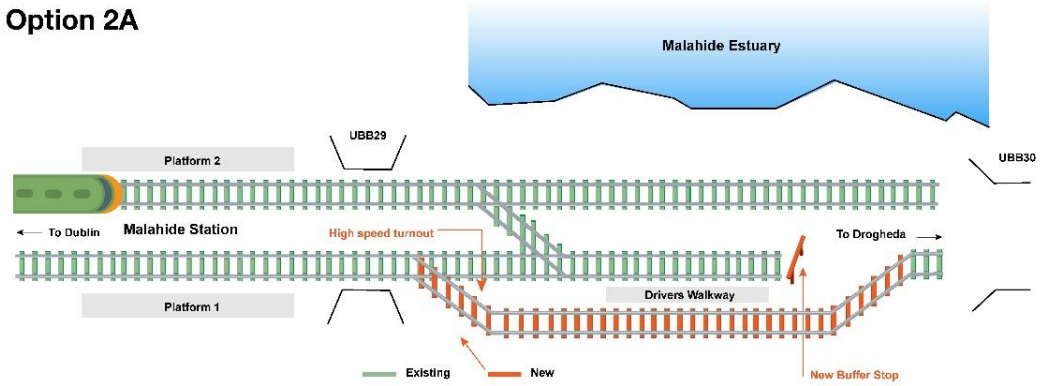

Image 3-28 Schematic of Option 2A

3.5.4.3.4 Option 2B

Option 2B is an inversion of Option 1B, on the east side of the railway. It requires a retaining structure of similar length and comparable signalling/electrification modifications. Works would impact the road into the wastewater treatment plant, requiring temporary traffic management and potentially modified kerb lines in the permanent situation. Similar to Option 2A, this option also moves the railway line closer to properties in Malahide Marina Village.

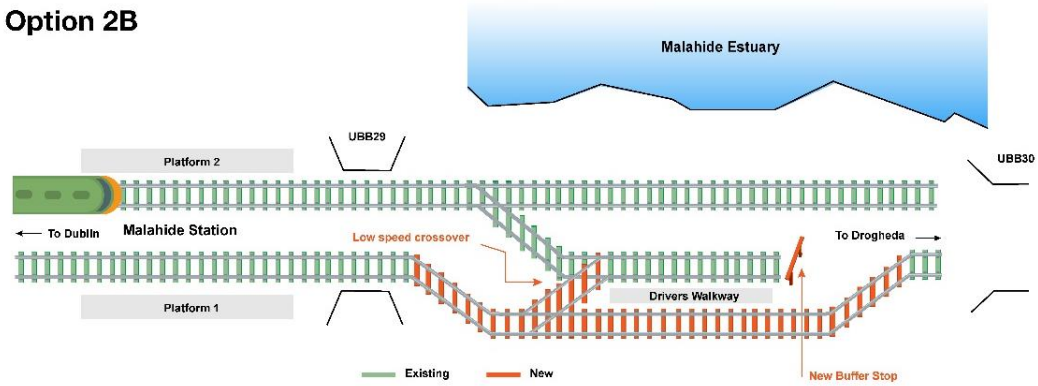

Image 3-29 Schematic of Option 2B

3.5.4.3.5 Option 5B

This option involves provision for a turnback to the north of Malahide Estuary. The track layout and arrangement are the same as in Option 1B but in an alternative geographical location.

The option requires similar OHLE and signalling modifications to previous options. A new retaining structure would be required, approximately 275m long and 3.5m high running along the west side of the tracks.

The existing tidal overflow underbridge UBB31 would also require widening on the west side to accommodate the new horizontal track alignment. There would likely be direct/indirect impacts on the adjacent Malahide Estuary SAC, Malahide Estuary SPA and Malahide Estuary pNHA.

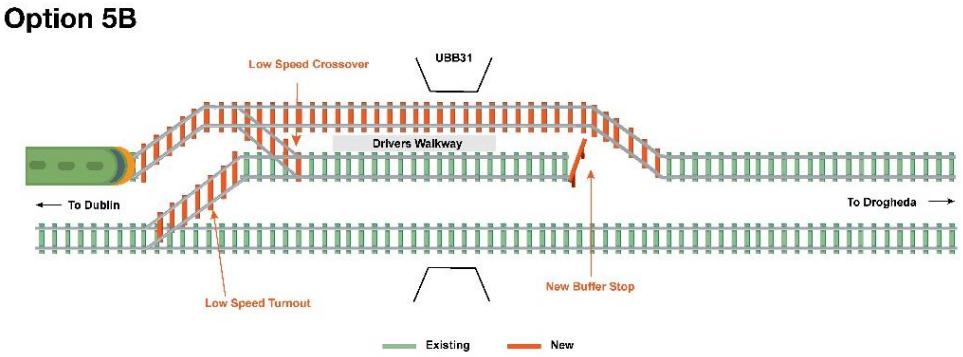

Image 3-30 Schematic of Option 5B

The summary findings of the MCA are contained in Table 3-35.

Table 3-35 Summary of MCA

Criteria Summary	Option 1A	Option 1B	Option 2A	Option 2B	Option 5B
	Down line slewed to provide central turnback north of Malahide (Down line on divergent route)	Down line slewed to provide central turnback north of Malahide (turnback on divergent route)	Up line slewed to provide central turnback north of Malahide (Up line on divergent route)	Up line slewed to provide central turnback north of Malahide (turnback on divergent route)	Turnback facility relocated to the north of the existing estuary crossing
Economy					
Safety					
Environment					
Accessibility & Social Inclusion					
Integration					
Physical Activity					
Preferred Option	No	No	No	Yes	No

Option 2B was identified as the Preferred Option for a turnback at Malahide Station. The basis for the selection of Option 2B as the preferred option was as follows:

- **Economy**: Option 2B was preferred as it presented a comparatively low capital cost by avoiding working over/near water and installation of lower speed switches and crossings with associated capital and maintenance cost savings. The option presented lesser construction impact on the Broadmeadow Way Greenway and thus less cost associated with necessary mitigation. It had benefit over option 5B from a train operations perspective since the turnback facility would be adjacent to the station rather than on the other side of the estuary (i.e. empty trains using the turnback would have to travel less distance). It also had a train operation benefit over option 1A which would introduce a lower speed limit.
- **Safety**: There was no comparative advantage or disadvantage between the options in terms of safety of staff and the public in and around the station and the railway environment.
- **Environment**: Options 2A and 2B were found to have comparative advantage over other options from biodiversity, water resources, archaeology, architectural and cultural heritage, and geology and soils perspectives. This can be attributed mainly to the fact that the other options are near or within designated sites. They were, however, found to have comparative disadvantage as regards landscape and visual quality due to being nearer to properties east of the railway, though it was noted that options to the west would still have some impact.
- **Accessibility and social Inclusion**: There was no comparative advantage or disadvantage between the options. This criterion is not relevant for this zone. There is no access to the public and, whilst there may be some impact to the Broadmeadow Way Greenway during construction, any closure would be short term.
- **Integration**: Options 1A, 1B and 5B would have a greater impact on the Broadmeadow Way Greenway during construction, whereas 2A and 2B would impact the Malahide Marina Village and Uisce Éireann's wastewater treatment works, also during construction. Any impact would be short term and hence there was no comparative advantage or disadvantage between the options.
- **Physical Activity**: All options are comparable. For Options 1A, 1B and 5B it was assumed that the Broadmeadow Way Greenway would be safely accommodated and then there was no temporary or long-term impact foreseen on walking or cycling opportunities. For Options 2A and 2B there would be a temporary impact on the existing local road providing walking and cycling access to the Malahide Marina Village.

A turnback to the east of the existing railway, located between Malahide Station and the Malahide Viaduct was therefore identified as the Preferred Option (Option 2B). However, this was revisited following public consultation as detailed in Section 3.6.1 below.

3.5.5 Works Around Clongriffin

3.5.5.1 Background

In addition to general feasibility requirements (for example constructability, safety, technical standard compliance, etc.), the specific requirement for this area is to provide turnback infrastructure at Clongriffin which will meet the Train Service Specification (TSS).

To match with more constrained pathing requirements around Connolly and the Loop Line between Connolly and Pearse Stations, the 2 trains per hour terminating/departing services must dwell for long periods in platform. This timetable requirement means that it would be difficult to operate TSS 1C at Clongriffin Station with fewer than two dedicated turnaround platforms. In addition, due to the 10 trains per hour through services, it would be impractical to operate Clongriffin Station with fewer than two dedicated through platforms.

Image 3-31 gives an overview of the site. The alternatives considered are presents below.

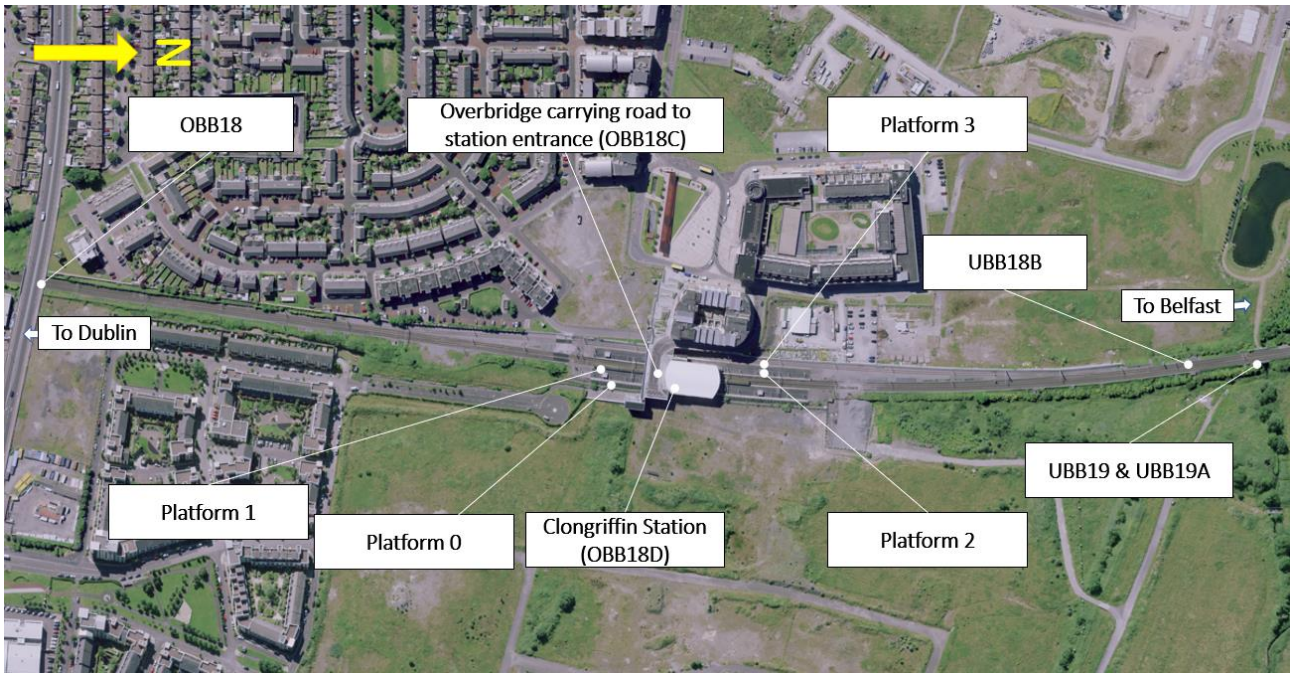

Image 3-31 Aerial view of Clongriffin Station (Source: OSI aerial imagery)

3.5.5.2 Stage 1: Preliminary Assessment

The existing track layout would not provide sufficient operational capacity to enable turnback of services to return to the centre of Dublin and therefore track alterations, along with associated signalling, electrification and telecoms alterations are required.

A total of 7 options were developed for this area (excluding the 'Do-Nothing' Option) as summarised in Table 3-36.

Table 3-36 Summary of longlist sifting works around Clongriffin

Option	Description	Screening Result	Summary
Option 0 "Do-Nothing"	No interventions made to meet the project Objectives and Requirements	FAIL	Does not meet requirements due to the following: TSS requires 2 platforms dedicated to turning back trains due to dwell time, in addition to 2 platforms dedicated to through trains. Single platform would limit ability to regulate services (through constraint at Connolly). Single turnback would limit ability to recover in times of perturbation.
Option 1	Increased speed on Platform 3	FAIL	Does not meet requirements due to the following: TSS requires 2 platforms dedicated to turning back trains due to dwell time, in addition to 2 platforms dedicated to through trains. Single platform would limit ability to regulate services (through constraint at Connolly). Single turnback would limit ability to recover in times of perturbation.
Option 2	Terminating trains on Platform 3	FAIL	Does not meet requirements due to the following: TSS requires 2 platforms dedicated to turning back trains due to dwell time, in addition to 2 platforms dedicated to through trains. Single platform would limit ability to regulate services (through constraint at Connolly). Single turnback would limit ability to recover in times of perturbation.
Option 3	New low speed Platform 0	FAIL	Does not meet requirements due to the following: TSS requires 2 platforms dedicated to turning back trains due to dwell time, in addition to 2 platforms dedicated to through trains. Single platform would limit ability to regulate services (through constraint at Connolly). Single turnback would limit ability to recover in times of perturbation.
Option 3A	New low speed Platform 0 with new crossover	PASS	Meets project objectives and requirements
Option 4	New low speed Platform 0 with new double crossover	PASS	Meets project objectives and requirements
Option 5	New higher speed Platforms 0 and 3	PASS	Meets project objectives and requirements
Option 6	New higher speed Platform 3 and low speed Platform 0	PASS	Meets project objectives and requirements

3.5.5.3 Stage 2: MCA

Options 3A, 4, 5 and 6 passed preliminary sifting and were taken forward to MCA.

3.5.5.3.1 Option 3A

For Option 3A new trackwork to utilise the existing unused platform face to the east of the station along with a crossover on the mainline are introduced. In this option, terminating trains will typically use Platform 2 but the option offers significant flexibility to plan services. The flexibility would include the ability for trains to pass through Platforms 1 and 2 at speed.

New OHLE masts and support structures will be required to facilitate the new track layout. This would likely be via new headspans or portal frames. Cantilevers could be used from the existing masts in locations where this is suitable.

Reconfigurations to the signalling will be required to accommodate the new tracks and control new points and crossings.

This option does not have an impact on any of the existing major civil/bridge structures identified in this area. A new retaining structure (approx. 400m long), parallel to the proposed platform, will be required to retain the earthworks associated with the level difference between proposed track and existing ground levels. Culvert UBB18A is also likely to require widening.

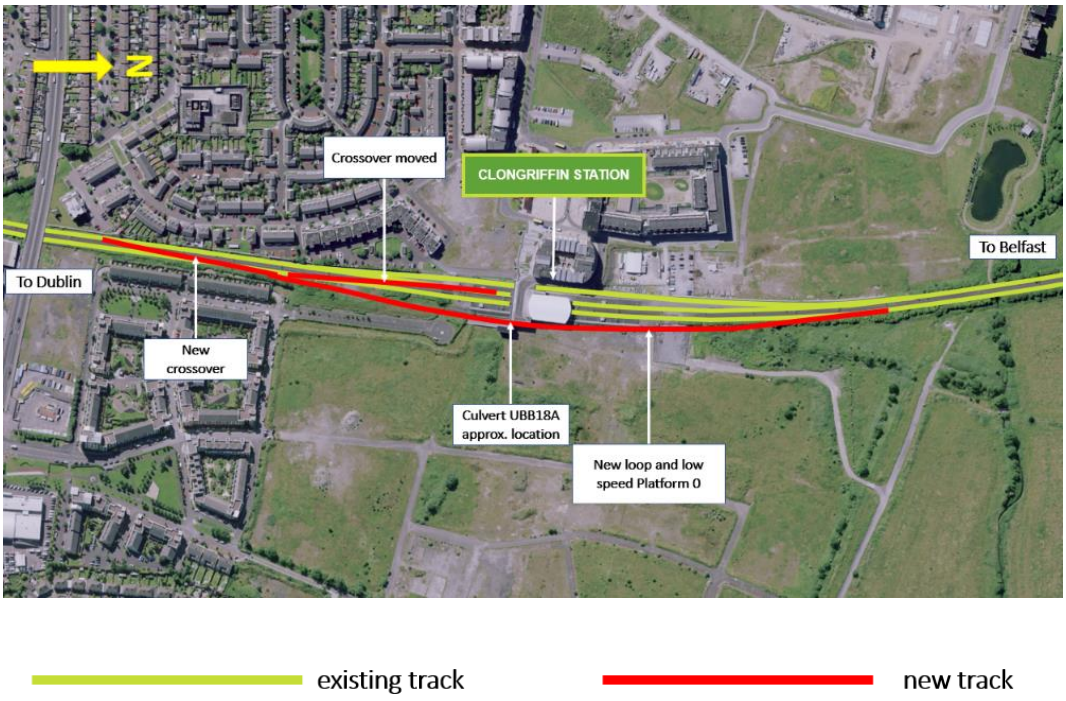

Image 3-32 Aerial view of Option 3A (Source: OSI aerial imagery)

3.5.5.3.2 Option 4

For Option 4, new trackwork to utilise the existing unused platform face to the east of the station and a double crossover are introduced. Terminating trains will use the existing unused platform face and Platform 3, although the use of either platform would result in conflicting moves. In this option, the platforms can also be used to hold a DART service to allow a non-stop service to pass.

This option requires comparable interventions from an OHLE, signalling, civils and structural perspective in relation to the other shortlisted options.

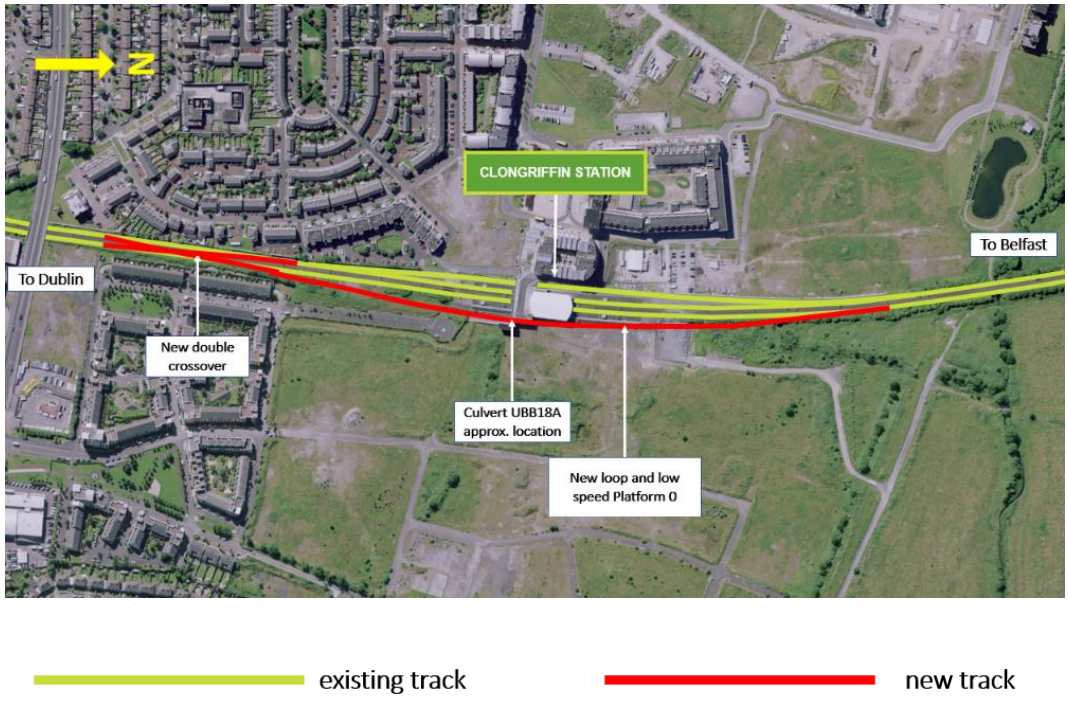

Image 3-33 Aerial view of Option 4 (Source: OSI aerial imagery)

3.5.5.3.3 Option 5

Option 5 involves the introduction of new trackwork to utilise the existing unused platform face to the east of the station and alteration of the existing track to Platform 3. Both are suitable for higher speeds. In this option, the terminating trains would use Platforms 1 and 2, and the platforms can also be used to hold a DART service to allow a non-stop service to pass.

This option requires comparable interventions from an OHLE and signalling perspective, although it should be noted that OHLE alterations will be required over a greater length of track.

From a structural perspective, the option requires a greater length of retaining wall (circa 850m long) to accommodate the new track. Widening/replacement would be required for UBB19, along with culverts UBB18A and UBB19A.

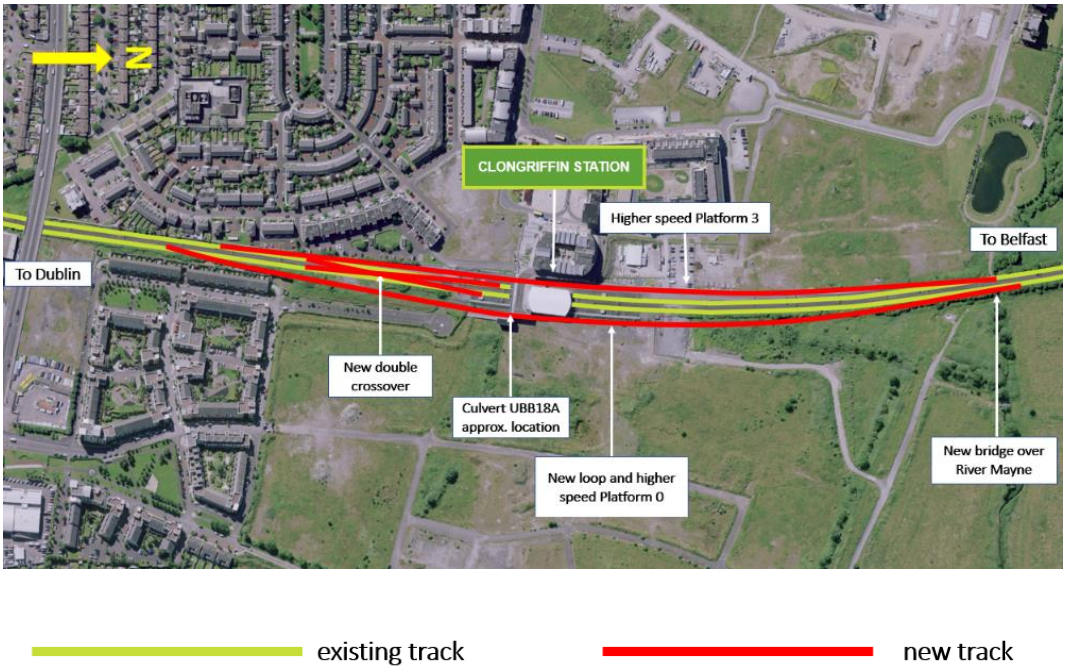

Image 3-34 Aerial View of Option 5 (Source: OSI Aerial Imagery)

3.5.5.3.4 Option 6

Option 6 involves introduction of new trackwork to utilise the existing unused platform face to the east of the station. The track at Platform 3 would be altered to suit higher speeds. Terminating trains would use the new platform and Platform 2. A new crossover would be required.

This option requires comparable interventions to the other shortlisted options from an OHLE and signalling perspective, although it should be noted that OHLE alterations will be required over a greater length of track, albeit less than Option 5 due to the new platform being lower speed and hence requiring a shorter length of track.

From a structural perspective, a new retaining wall (approx. 70 m long) north of Clongriffin Station is required to contain the earthworks to the west of the proposed alignment, along with a 450 m long retaining wall to the east.

Culverts UBB18B and UBB19A are likely to require widening.

Image 3-35 Aerial View of Option (Source: OSI Imagery)

The summary findings of the MCA are contained in below:

Criteria Summary	Option 3A	Option 4	Option 5	Option 6
	New low speed Platform 0 with new crossover	New low speed Platform 0 with new double crossover	New higher speed Platform 0 and Platform 3	New higher speed Platform 3 and low speed Platform 0
Economy				
Safety				
Environment				
Accessibility & Social Inclusion				
Integration				
Physical Activity				
Preferred Option	Yes	No	No	No

Option 3A is identified as the Preferred Option in respect of the Works around Clongriffin Station. The basis for the selection of Option 3A as the preferred option is as follows:

- **Economy**: Options 3A and 4 have significant comparative advantage over other options from a capital expenditure perspective due to less significant structural works and the simpler points and crossings required. They both also have significant advantage from a traffic functionality point of view. Whilst Option 5 is the strongest from a train operations perspective, slightly ahead of Option 3A, this is not enough to change the overall outcome.

Option 3A has advantages from a train operations perspective over Option 4, making it the preferred option overall.

- **Safety**: There is no comparative advantage or disadvantage between the options.
- **Environment**: Options 3A and 4 have significant advantage over both Options 5 and 6 from biodiversity and noise and vibration perspectives. Similarly, Options 3A, 4 and 6 have advantages over Option 5 from landscape and visual, water resources and geology and soils perspectives. The disadvantages of Options 5 and 6 are primarily due to the greater site extents affecting the surrounding environment, and in particular, the Mayne River and associated SAC lands.
- **Accessibility and social Inclusion**: There is no comparative advantage or disadvantage between the options. All options present various opportunities to improve general accessibility at platforms with no notable advantage over the others.
- **Integration and Physical Activity**: There is no comparative advantage or disadvantage between the options.

The Preferred Option for turnback facilities at Clongriffin Station (Option 3A) focuses construction east of the railway. It is proposed to use the platform face that was constructed when the station was originally built but is not currently served by any tracks.

3.5.6 Works around Howth Junction & Donaghmede Station

3.5.6.1 Background

Works around Howth Junction & Donaghmede Station were presented to the general public at Public Consultation number 1 (PC1). The initial emerging preferred option was reported as Option 5 within the Annex 3.6 Technical Optioneering Report[2]. This option was considered against a total of 8 feasible options, from which 4 passed the sifting process and proceeded to a Stage 2 MCA.

Option 5 involved extending the existing platform 2 to allow the platform to be used by services from Howth without impacting on services running along the Northern Line. Modifications to the track included a new crossover east of the platforms. Alterations to existing OHLE, signalling and telecoms are also required. The installation of new signalling would allow circa 90m of overrun protection between itself and the northern line. It required a platform extension to the east to offset the required stopping position in advance of the signal. A new facing crossover was to be provided.

3.5.6.2 Stage 1: Preliminary Assessment

A total of 8 options were developed for this area (excluding the 'Do-Nothing' option), as summarised in Table 3-37.

Table 3-37 Summary of longlist sifting for works around Howth Junction & Donaghmede Station

Option	Description	Screening Result	Summary
"Do-Nothing"	Do-Nothing	FAIL	The constraint on operations will make the TSS unachievable especially in times of perturbation
Option 1	Platform 1 via new crossover on straight	PASS	Met project objectives and requirements
Option 2	Platform 1 via new crossover on curve	PASS	Met project objectives and requirements
Option 3	Platform 2 using crossover and platform 1 trap	FAIL	Failed on the basis this has disadvantages when compared to option 5 and no benefits when compared to option 5
Option 4	Stopping up of Platform 2	FAIL	Fails as the option of through running from the Northern Line to the Howth Branch Lines is NOT maintained on both lines.
Option 5	Signalling overlap on Platform 2	PASS	Met project objectives and requirements
Option 6	New platform behind to Platform 2 on a curve	FAIL	Failed on the basis this has disadvantages compared to option 7a and no benefits
Option 7	New platform behind to Platform 2 on a straight alignment	FAIL	Failed on the basis this has disadvantages compared to option 7a and no benefits
Option 7a	New platform behind to Platform 2 with reduced curve alignment	PASS	Met project objectives and requirements
Option 8	Option 5 but only using half-length units (HLU) in majority of services of services on branch	FAIL	Fails to meet the TSS requirement to use FLU

3.5.6.3 Stage 2: MCA

Options 1, 2, 5 and 7a passed preliminary sifting and were taken forward to MCA.

3.5.6.3.1 Option 1

In Option 1, a new crossover from Up Howth to the Down Line is introduced to allow terminating trains to use Platform 1 on the straight section of track. The terminating trains on Platform 1 are set to the trap points which removes any interface with the mainline signalling. The location of the crossover on the straight allows for standard components to be used but has an impact on operations with its increased distance from the station with the distance of wrong road running required. If operational requirements are more important, then the location of the crossover could be brought closer to the station at the expense of requiring bespoke components and the associated impact to maintenance times. This is presented in Image 3-36.

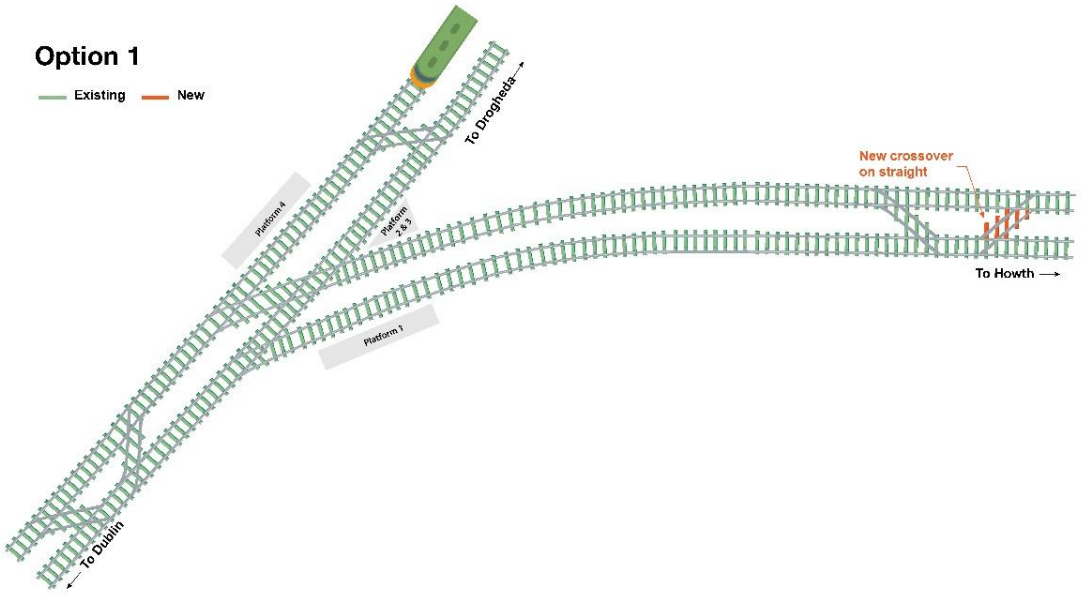

Image 3-36 Schematic view of Option 1

3.5.6.3.2 Option 2

Like Option 1, this option introduces a new crossover from Up Howth to the Down Line to allow terminating trains to use Platform 1. Option 2, however, has the crossover located on the curve. The crossover on the curve would require bespoke components, however, being closer to the station is better for operations The terminating trains on Platform 1 are set to the trap points which removes any interface with the mainline signalling.

Platform 2 remains an option for terminating trains, if required. However, it is worth noting that on approach to the platform, signalling arrangements will result in red aspects being shown on the mainline. This option is presented in Image 3-37.

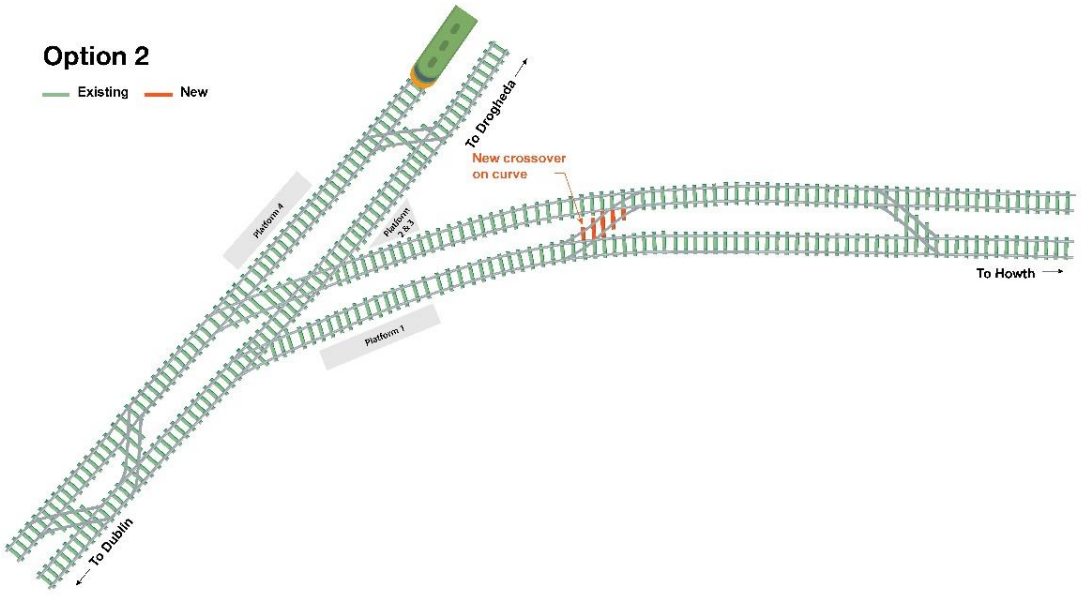

Image 3-37 Schematic view of Option 2

3.5.6.3.3 Option 5

Option 5 involves the installation of new signalling to allow circa 90m of overrun protection between itself and the mainline. It requires a platform extension to the east to offset the required stopping position in advance of the signal. A new facing crossover shall be provided.

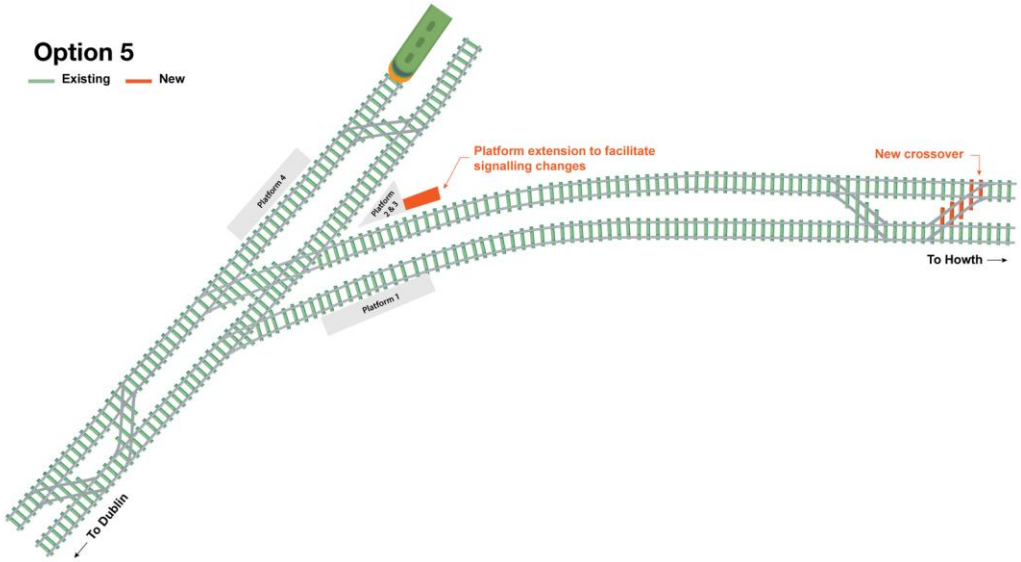

Image 3-38 Schematic view of Option 5

3.5.6.3.4 Option 7a

Option 7a - Due to the location of the existing SEB and adjacent technical rooms, this new platform will have some impact if not of the structures themselves, then on the cable routes associated with the buildings. This option combines Option 6 and 7 to maximise the amount of straight platform but minimise the impact on the surrounding equipment rooms.

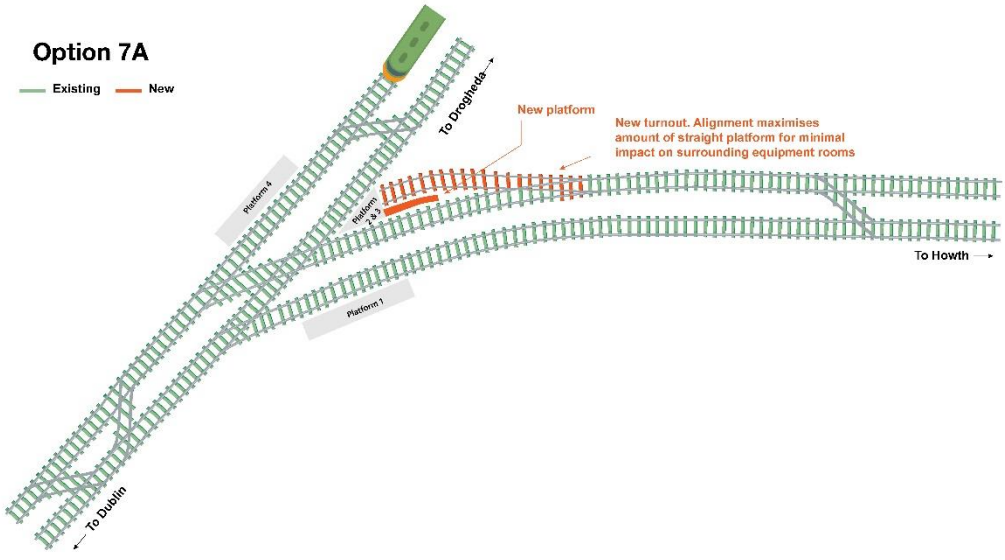

Image 3-39 Schematic view of Option 7a

3.5.6.3.5 Summary

The summary findings of the MCA are contained in Table 3-38.

Table 3-38 MCA Summary Table

Criteria Summary	Option 1	Option 2	Option 5	Option 7a
	Platform 1 via new crossover on straight	Platform 1 via new crossover on curve	Signalling overlap on Platform 2	New platform behind Platform 2
Economy				
Safety				
Environment				
Accessibility & Social Inclusion				
Integration				
Physical Activity				
Preferred Option	No	No	Yes	No

Option 5 was identified as the emerging preferred option as it allowed for Platform 2 to be used to turn back trains without impacting on the mainline signalling and by using Platform 2 for the majority of services, passengers will not have to travel over a footbridge to get a connecting train into Dublin.

3.5.6.4 Further Design Development

Following PC1, submissions from the general public raised a number of issues relating to the emerging preferred option at Howth Junction & Donaghmede Station. These related to a number of issues regarding station safety and facilities as noted in Section 3.4. Following consideration of PC1 feedback the preferred design of the station was changed to respond to the publics concerns. The options considered were presented at Public Consultation number 2 (PC2). The proposed works will involve modifying the entrances to provide a more accessible, user friendly and customer focused station for all rail users, as well as improving the connection to the surrounding areas of Donaghmede and Kilbarrack. Upgrades to the existing footbridge and connections to the centre platforms will also be carried out, as well as upgrades to lighting, signage, and finishes throughout. The options considered for station design improvements were presented at PC2 in Annex 3.6 within the Howth Junction & Donaghmede Station Improvements Phase 2 Concept Design Report4.

The Proposed Development for Howth Junction & Donaghmede Station is described in full in Chapter 4 (Description of the Proposed Development).

[4]https://www.dartplus.ie/getattachment/699e06b0-e774-4178-ae0f-4ecd62d871b7/Annex-3-6-Appendix-B-Howth-Junction-Donaghmede-Station-Improvement.pdf

3.5.7 Depots

There are two depots forming part of the DART+ Coastal North project: Fairview and Drogheda depots. Fairview depot is located directly adjacent to Clontarf Road Station and to the north of Dublin Connolly Station. Directly to the southwest of the depot is the East Wall Road and Tolka River Underbridge (UBB3). Drogheda depot is located within the extents of Drogheda MacBride Station, east of the existing platforms.

Modifications at Fairview and Drogheda depots are required to provide the infrastructure, maintenance and servicing facilities necessary for the new DART+ Fleet.

To facilitate the maintenance of the new trains at Drogheda depot, an additional stabling road is required for the depot along with some track modifications to accommodate the works on the mainline and at Drogheda MacBride Station. The existing bund will be modified to facilitate the new stabling road.

In order to provide a greater output of cleaning at Fairview depot for the new trains, several modifications are required at the depot. These will include the provision of new cleaning platforms on the sidings to the East side of the mainline, along with associated walkways and services. On the West side modifications are proposed largely within the existing maintenance building to provide suitable access and services for cleaning staff.

All the above works will be within the current depot facilities and given the specific requirements at each location, no detailed options assessment was required.

3.6 Design Modifications following PC2

Following PC2, feedback was received from a number of stakeholders and this, together with continued engagement with affected landowners, led to some modifications to the design as presented at the public consultation.

3.6.1 Malahide Turnback

The options assessment undertaken, as described in Section 3.5.4 above, identified the preferred option for the Malahide Turnback, as being Option 2B, with the turnback to the east of the existing railway, located between Malahide Station and the Malahide Viaduct. At the time of the options assessment, which was early in the design development process, the comparative assessment of feasible options, in line with the CAF, identified that Option 2B (turnback to the east) had some marginal benefits over Option 1B (turnback to the west) as well as some marginal disadvantages. On balance, it considered that Option 2B outperformed Option 1B due mainly to the reduced impact on the Broadmeadow Way greenway and the fact that it carried less risk of significant effects on sensitive environmental receptors. For this reason, Option 2B was taken forward as the preferred option and presented at both PC1 and PC2.

Feedback received from various stakeholders following PC2, raised significant concerns in respect of Option 2B, in particular with respect to the closer proximity of the railway line to properties on the eastern side of the railway and perceived increased visual, noise, vibration and residential amenity impacts, both during the Construction and Operational Phases.

As the project had developed in the intervening period, significant additional information was available, including detailed environmental surveys (most particularly comprehensive biodiversity surveys over a number of years) as well as further design development. This allowed the project team to consider afresh whether a design option to the west of the railway line could be progressed. This was directly in response to the feedback received following PC2 and included further consultation with Fingal County Council with respect to any potential conflicts with the Broadmeadow Way, particularly during the Construction Phase.

This further information, design development and the outcomes of the consultation with key parties such as Fingal County Council, provided confidence that an alternate option to the west of the railway line could be progressed, without significant effects on either of the designated sites in the vicinity (Malahide Estuary SAC and Malahide Estuary SPA) or the Broadmeadow Way.

The result is that the preferred option, as part of the final design for the scheme, for the Malahide Turnback is to the west of the railway line. This option is detailed further in Chapter 4 (Description of the Proposed Development) in Volume 2 of this EIAR. It is this option which has been assessed throughout the EIAR.

3.6.2 Other Design Modifications following PC2

Other changes of note are listed below:

- Modifications to Substation sites following engagement with local landowners at:
  - Donabate – Revised layout and access arrangement;
  - Rush and Lusk – Revised access arrangement through junction upgrade;
  - South Skerries – Revised layout and access arrangement;
  - North Skerries – Revised layout and access arrangement; and
  - Drogheda – Minor revision to layout to avoid mature vegetation removal;
  - Bettystown – Revised access layout to avoid permanent access via the residential estate following engagement with the Local Authority.
- Further design development of the proposed Clongriffin turnback, to accommodate particular line speed requirements through this area, which necessitated further development of the track alignment, resulting in:
  - A new underbridge over River Mayne (UBB19A), culvert (UBB18D) extension and embankment north of Clongriffin Station to accommodate extended track corridor widening;
  - Modification and extension of the retaining wall design adjacent to Clongriffin Station following engagement with the Local Authority and Developers.
- Construction Compounds:
  - Extension of Construction Compound size at Clongriffin to account for the design development for Clongriffin Turnback (CC-10600).
  - Additional UTX Construction Compound at Gormanston for utility diversion (chainage 39+720);
  - Additional UTX Construction Compound at Baldongan for utility diversion (chainage 27+460);
- Removal of Construction Compound at Rogerstown due to proximity to Balleally Landfill (CC-21500);

- Minor reduction in size of Construction Compound at Kilbarrack Entrance to HJ&D Station (CC-15250) to avoid encroachment on adjacent property;
- Rationalisation and reduction in the size of Construction Compounds required at Drogheda MacBride Station for works requiring access off Marsh Road following engagement with the Developer;
- Updates to proposed construction traffic routes at Malahide, proposing only the use of Old Street and James Terrace;
- Alterations to the proposed parapet modifications on OBB38 (Rogerstown Lane) and OBB47 (Skerries Golf Course) following engagement with the Local Authority to ensure a conservation led approach;
- Modification of the OHLE arrangement on protected structure UBB36 (Rogerstown Viaduct) following engagement with the Local Authority to ensure a conservation led approach; and
- Provision of a 600mm diameter otter crossing near UBB31 following engagement with NPWS.

These changes, as part of the final design for the scheme, are described in more detail in Chapter 4 (Description of the Proposed Development) in Volume 2 of this EIAR.

3.7 References

Dublin Transportation Office (DTO) (2001). A Platform for Change – Outline of an integrated transportation strategy for the Greater Dublin Area – 2000 to 2016.

National Transport Authority (NTA) (2018). DART Expansion Programme Options Assessment Report.

NTA (2020). DART Expansion Programme Future Patronage Modelling Report.

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NTA / Irish Rail (2018b). DART Expansion Programme Options Assessment Addendum.

NTA / Irish Rail (2019). DART Expansion – Rail Electrification Assessment Report.