DART+ Coastal North

Public Consultation No.2

Annex 3.2 E5: Option Selection OBB80/80A/80B Report

NTA Údarás Náisiúnta Iompair National Transport Authority

Rialtas na hÉireann Government of Ireland | Tionscadal Éireann Project Ireland 2040

Iarnród Éireann Irish Rail

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ABBREVIATIONS

Abbreviation	Definition
ACA	Architectural Conservation Area
AEP	Annual Exceedance Probability
BGL	Below Ground Level
CAF	Common Assessment Framework
CWH	Contact Wire Height
DART	Dublin Area Rapid Transit
DTDA	Drogheda Transport Development Area
DUIL	Dinantian Upper Impure Limestones
EPA	Environmental Protection Agency
FI	Further Information
GSI	Geological Survey Ireland
IÉ	Iarnród Éireann
IEL	Industrial Emissions Licensing
IGSL	Ground Investigations & Geotechnical Specialists
IPC	Integrated Pollution Control
LCC	Louth County Council
MCA	Multi-Criteria Analysis
NIAH	National inventory of Architectural Heritage
OHLE	Overhead Line Electrification
OPW	Office of Public Works
pNHA	Proposed Natural Heritage Area
SAC	Special Area of Conservation
SDH	Synchronous Digital Hierarchy
SPA	Special Protected Area
SSI	Solid State Interlocking
TER	Telecoms Equipment Rooms
TSS	Train Service Specification
WFD	Water Framework Directive

1. INTRODUCTION

This report documents the optioneering assessment for the vehicular bridges to the East of Drogheda Station to enable the electrification of the railway line beneath these bridges. The existing vertical clearance beneath these structures is insufficient to accommodate electrical wiring without some form of physical intervention (to either the track below or the bridge itself). This report is a following on from the previous work carried out to look at bridge clearances along the Northern Line for the proposed electrification between Malahide and Drogheda. For further information on this, please refer to report *Annex 3.2 Section E OHLE Bridge Clearances Works* (issued as part of Public Consultation 2 documentation).

The purpose of the report is to provide the technical input to the Option Selection Report. This report provides the technical assessment of overbridges OBB80, OBB80A and OBB80B; from option selection through to the Preferred Option, including the options considered and how a Preferred Option was chosen.

The report includes:

- An introduction and description of the study;
- A summary of the option assessment approach undertaken;
- A description of the existing situation;
- The requirements required;
- The relevant constraints;
- The option assessment containing:
- Longlist of options;
- Sifting of longlist of options;
- Summary and details of the shortlisted options;
- Multi-criteria analysis (MCA);
- The Preferred Option.

1.1 Packages of Work

The scope of work for DART+ Coastal North covers a wide range of interventions on the Northern Line needed in order to meet the Train Service Specification (TSS) requirements. To appropriately assess options against each other, the works have been split into separate work packages, as detailed in the relevant Annexes. Where appropriate, the works have then been further split down into ‘Sections’ which define the system which has been subject to the optioneering and design process.

This document is a Section of Annex 3.2 - the overarching optioneering report for the electrification of the Northern Line between Malahide and Drogheda. Please refer to Table 1-1 for a list of the different sections which make up the electrification package of work.

Table 1-1: List of key documents associated with Electrification of the Northern Line from Malahide to Drogheda

Annex	Section	Title
3.2	A	OHLE System
	B	OHLE foundation solutions
	C	OHLE foundation solutions at underbridges
	D	Bridge parapet modifications for OHLE
	E	OHLE Bridge Clearance works
	E1	OBB39 Option Selection Report
	E2	OBB44 Option Selection Report
	E3	OBB55 Option Selection Report
	E4	OBB78 Option Selection Report
	E5	OBB80/80A/80B Option Selection Report
	E6	OBB81 Option Selection Report
	F	Traction Power Supply
	G	User worked level crossing south of Donabate
	H	Fencing and lineside safety
	I	Drogheda Station Canopies

1.2 Option Assessment Approach

In line with the Option Selection Process section of the Option Selection Report, elements can be scoped out of the Multi-criteria Analysis (MCA) process based on a number of criteria, one of which is as follows:

'*If the type of system to be used is solely governed by IÉ standards and specified by technical requirements, then the CAF/MCA process will not be utilised.*'

This was true for a number of the overbridges along the Northern Line, documented in the Technical Optioneering Report Section E OHLE Bridge Clearance Works therefore no MCA was undertaken.

For OBB80, OBB80A and OBB80B electrical solutions are not possible without infrastructure interventions, and this is the subject of this report.

2. EXISTING SITUATION

2.1 Overview

The vehicular bridges East of Drogheda Station (IÉ reference OBB 80/80A/80B) are located on the edge of the station at approximate chainage 31 mi 869 yds. The bridges provide vehicular access to McGrath's Lane which includes 2no. residential properties, a train depot, a farmer's field and maintenance access to tracks. Adjacent to these properties; planning permission has been granted for a proposed development (Louth County Council Planning Ref. No. 17387) consisting of 133 no. two storey residential dwellings and a vehicular access road connecting to Marsh Road (R150). This proposed development is independent of the existing bridges and McGrath's Lane.

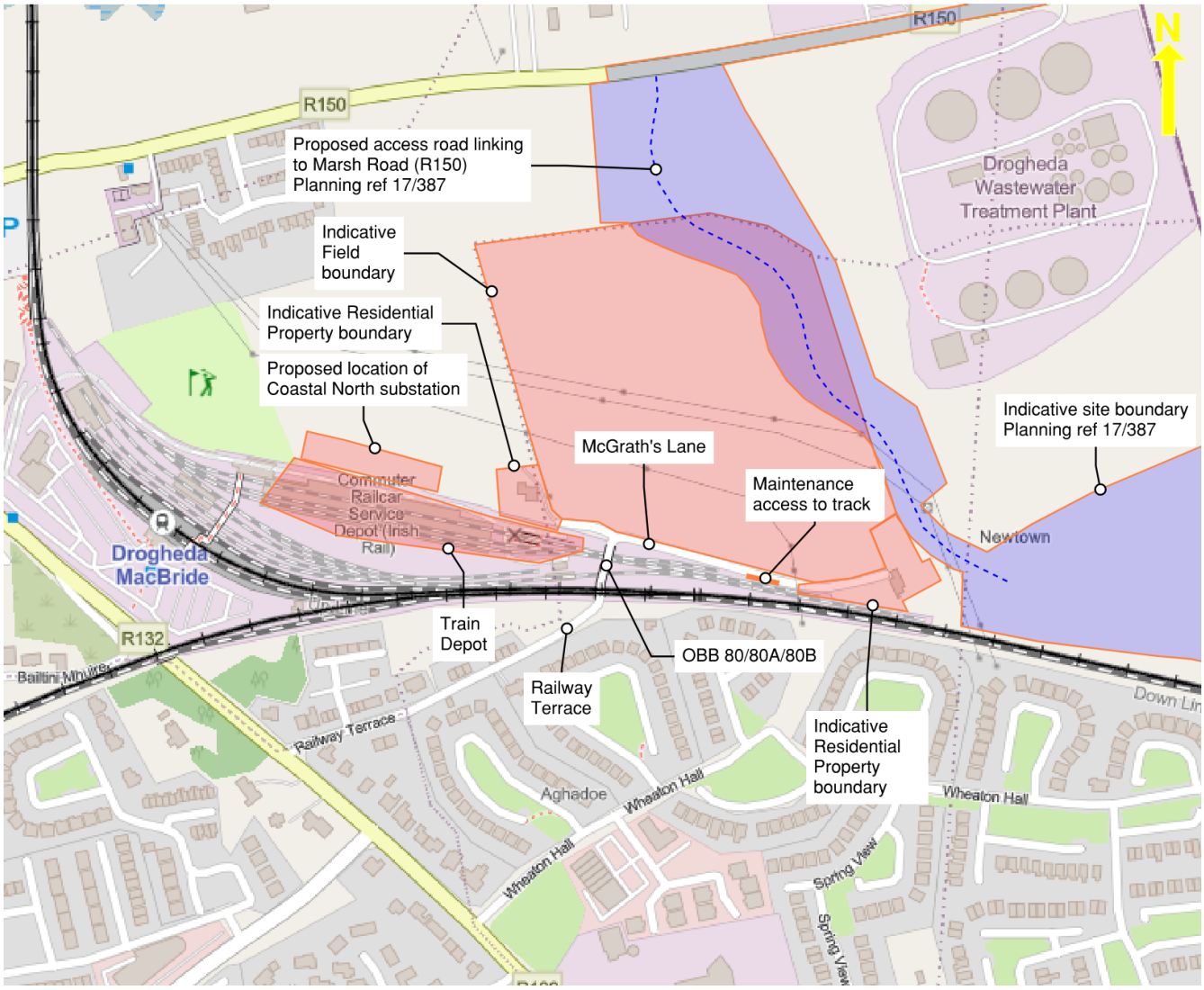

Figure 2-1: Location of bridges

2.2 Structures

OBB80 and OBB80A are stone masonry arch structures with single 9.1 m spans, built in the 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 embankment removed. The bridge is a reinforced concrete bridge of 8.2 m span on piled abutment walls built between OBB80 and OBB80A.

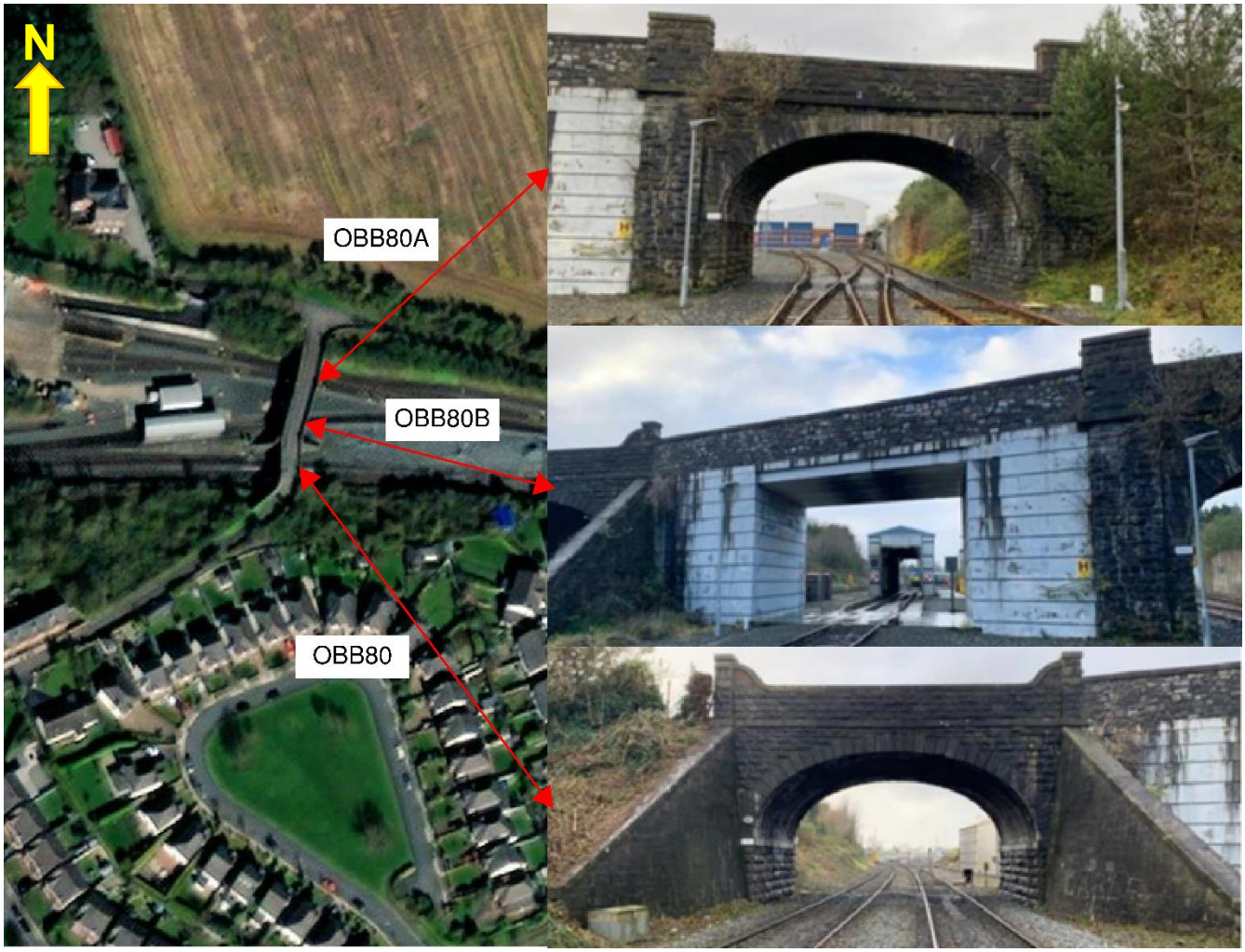

Figure 2-2: Bridge elevations and locations

2.3 Permanent ways and track

The track arrangement under OBB80 consists of a standard Up and Down Main line on the Dublin to Belfast line; the natural continuation of the Main lines then run through to Platforms 1 & 2. Limited clearance to each side of the running track is provided. The current trackform in this area is of a ballasted nature, using concrete sleepers.

No points and crossings are provided directly underneath the existing structure however to the immediate east of the structure crossings 217A/B and 218A/B. To the west of OBB80 crossing 219A/B is located on the Up Main line providing access to/from Platform 3 and the depot facilities. Given the interlink nature, and close proximity of the crossings in relation to the structure's location, modification of the mainline will require modifications to all points and crossing to be carried out.

OBB80B provides a single line to service the wash facility under the existing structure. The current track from the south of the structure is of a ballasted nature which then transitions to a concrete slab track arrangement.

Beneath OBB80A Cross over DAHP3A/B is present. To the east of the structure points DAHP4 is present which forms the turnout road to relief sidings 9, whilst to the west points DAHP5 form the start of sidings #8.

OBB80A is a twin track arrangement located on a ballast trackform before transitioning to a slab track/ asphalt combination on the approach to the depot. Immediately underneath OBB80A points and crossing units are present and likewise immediately to the east and west of the structure.

2.4 Other railway facilities

2.4.1 Signaling

Drogheda MacBride Station and its approach are signalled with three aspect signals. Shunt signals with alphanumeric route indicators are also present for the shunting movements and to access the Drogheda Depot and the Navan Branch from the Northern Line. This section is not currently electrified; the track protection system is based on track circuits. There is a shunt route between the mainline and Drogheda depot in the vicinity of OBB80A. This route is not fully interlocked because of the absence of any signalling system within Drogheda depot, which is manually operated. Thus, trains entering or exiting from/to the Depot from/to Drogheda MacBride Station must be supervised by the signalman.

Signalled turnouts are located immediately adjacent to OBB80 including shunt signals. Signals are currently positioned taking into account the constraints on sighting caused by the bridge abutments.

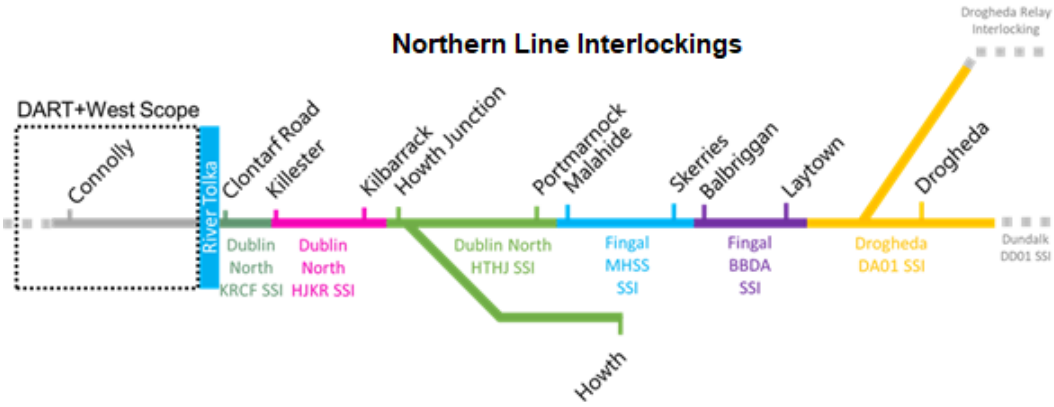

Figure 2-3: Interlocking control areas

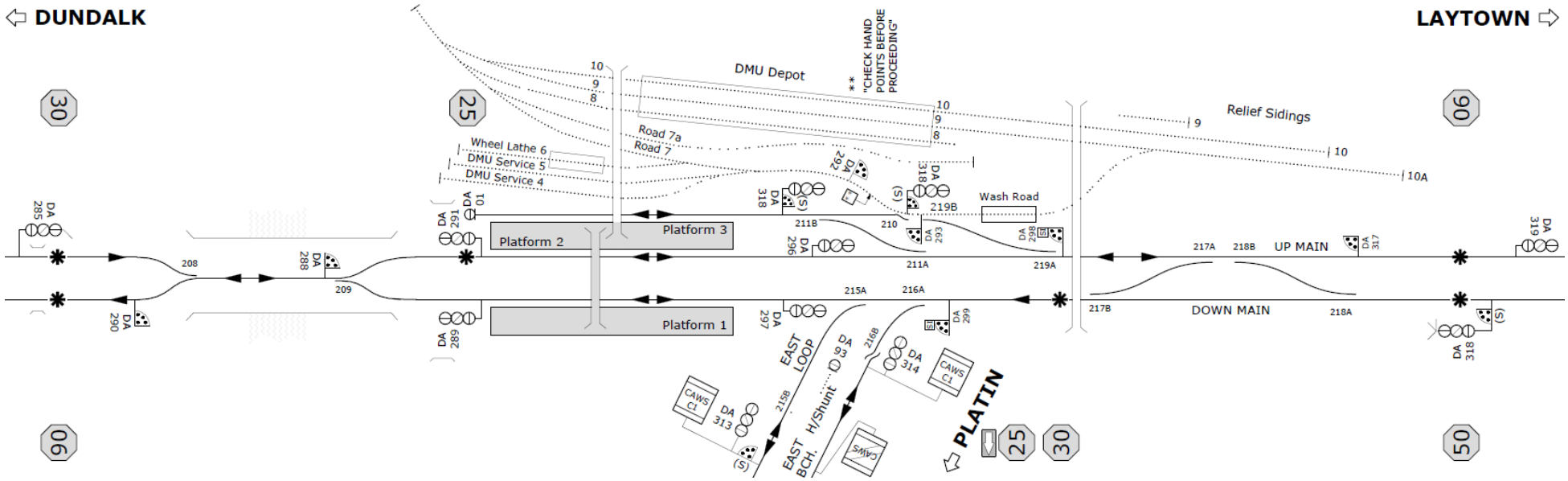

Figure 2-4: Signal plan for Drogheda area

2.4.2 Telecoms

The Telecoms Operational network is a legacy Synchronous Digital Hierarchy (SDH) which is in the process of being updated by Irish Rail (IÉ) with the replacement of nodes with MPLS-TP technology. The existing fibre cables are typically buried in the ballast in the vicinity of the bridges.

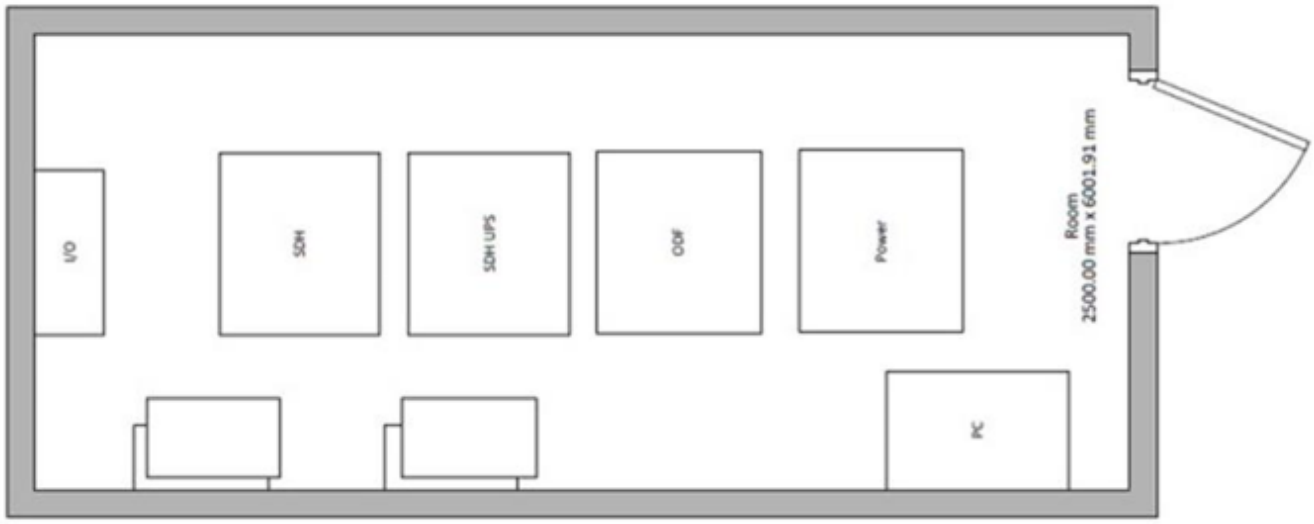

Figure 2-5: Drogheda telecoms equipment room

2.4.3 OHLE

There is no existing OHLE at Drogheda MacBride Station or depot.

2.5 Ground conditions

McGrath's Bridge, which comprises overbridges OBB80, OBB80A and OBB80B respectively, is located to the east of Drogheda MacBride Station on the Dublin side of the railway line and provides vehicular access to McGrath's Lane through Railway Terrace Road. The topography at the site is within the range of 30mOD to 34.5mOD.

A review of historic mapping (OSi Historic 6" and 25" Maps) and aerial photography show that the site was originally agricultural land up to 1842. Two quarries were noted to the south of the site at 270m and 780m on the OSI Historic 6" Colour (1837-1842).

The railway line and associated railway crossing bridge were then constructed in the period 1888-1913. There is the potential for unknown fill to be used in constructing the railway, the bridge foundations, and the ramp to access the bridge.

The following were noted within 250m of the site on the 1888-1913 Historic 25-inch map; a well, an unknown tank and an unknown pump.

Significant developments comprising Drogheda MacBride Station as well as numerous residential, commercial, and industrial buildings occurred to the south and west of the site and a wastewater treatment plant and a liquid petroleum gas terminal were built to the north-east in the twentieth century. The Marsh Road 38kV substation was constructed in the twentieth century to the northwest

of the site with electrical lines supported on poles and pylons crossing the northern portion of the site.

The EPA waterbodies map (EPA, 2021) does not indicate any historic or existing rivers crossing or near the site.

The GSI Quaternary sediment mapping indicates the widespread presence of Made Ground associated with urbanised and developed areas and Irish Sea Till derived from Lower Palaeozoic sandstones and shales (and potentially underlying the Made Ground).

GSI bedrock mapping shows that the site is underlain by dark Limestone & calcareous shale of the Carboniferous Mornington bedrock formation. Less than 100m to the south-east of the bridge, a fault is noted. To the north of the site alongside the River Boyne, a small area of Quartz monzonite of the Drogheda Granite formation is noted.

Limited ground investigation information which is available within the site and its immediate surrounds is summarised below. This includes:

Proposed Maintenance Depot, McBride Railway Station, Drogheda (IGSL, July 2000):

The ground investigation for the current Drogheda depot included boreholes and trial pits of which two cable percussion boreholes and three trial pits are within 100m of the bridge. These were carried out near track level and following assessment of the ground conditions was made:

- The stratigraphy consists of made ground/topsoil which comprises black ash, sandy Clay and brick hardcore to depths of up to 0.85m below ground level (BGL). The latter is underlain by a firm to stiff (becoming very stiff with depth) very sandy, very gravelly Clay with occasional cobbles.
- It must be highlighted that bedrock was not proven with the boreholes refusing at 4.8m BGL.
- No groundwater monitoring is available adjacent to the bridge however within the depot groundwater levels of 2.38 and 2.55 mBGL were noted.
- Trial pits adjacent to the bridge were completed to identify founding levels. Records are limited with one pit detailing the top of the abutment to be 0.85m BGL and have a thickness of 0.15m.
- Two structural core drillholes into the bridge were completed and proved masonry thickness of 0.80 and 1.25m respectively. No further information on these cores is available.

Proposed Railway Crossing at Newtown, Drogheda (IGSL, June 2003):

A ground investigation for a proposed bridge approximately 200m to the east of McGrath's Bridge included three cable percussion boreholes, four rotary core drillholes and ten trial pits.

The following assessment of the ground conditions was made:

- The stratigraphy consists of topsoil of depth up to 0.3m over either rail ballast or made ground comprising fragments of wood, wires, brick and domestic refuge. This is underlain by firm to stiff brown Clay over a dense brown Gravel and a very stiff brown Clay with occasional cobbles and boulders. Topsoil was noted to be underlain by a soft clay at one specific location to the north of the line and plant remains were noted beneath made ground at another to the south.

- Rotary core drillholes identified bedrock at depths in the range 3.0-4.5m BGL and comprising a mid to dark grey, fine-grained, slightly weathered Limestone with subordinate units of brown dolomitised Limestone. One borehole immediately south of the railway line reports gravel and cobble sized returns of Limestone with clay (possibly a highly weathered rock) from 3.0-7.1m BGL.
- Groundwater monitoring data (single record for May 2003) indicate artesian conditions with the groundwater level in the standpipe at ground level at one specific borehole and 0.55m above ground level in another.

Drogheda Train Wash Well W765 (Meehan Drilling Ltd 2014):

A groundwater abstraction well was constructed in November 2014 approximately 30m west of the bridge. It comprises a 60m deep borehole and supplies water to the Drogheda Depot train wash. Limited details are available from the drillers log however rock is noted at a depth of 9.0m BGL. Further details on the well are presented in Section 2.6.9 (Water resources - Groundwater).

Construction photographs provided by IÉ from the bridge's modification works (circa 2000-2003) appear to show excavations of a brown-grey Clay at and from within the current bridge's central span.

While there is no available geo-environmental information covering the study area entirely, there is a potential for contamination based on site history and usage. Ground Investigation is proposed to be carried out in the area of OBB80, 80A and 80B.

2.6 Environmental

A brief overview of the baseline environment, under key environmental criteria, is provided in the following sections.

2.6.1 Traffic and transportation

Drogheda MacBride Station is accessible by a regional road (R132 Dublin Road). The road is approximately 7m wide and footpaths are provided on both sides adding another c. 3m to the total width. The nearest road links of regional importance are the R152 Donore Road through Drogheda town centre and the R132 towards the south. Both link to interchanges with the M1.

Overbridge OBB 80/80A/80B lies at the end of Railway Terrace leading onto McGraths Lane. McGraths Lane provides access for 2no. residential properties, a train depot, agricultural land and maintenance access to tracks.

2.6.2 Landscape and visual impact

The station is located to the southeast of Drogheda town centre, south of the River Boyne. The station area is within the Drogheda Transport Development Area in the Drogheda Borough Council Development Plan, 2011 – 2017. This area is zoned as a Transportation Development Hub in the Draft Louth Development Plan, 2021 – 2027. To the east, west and south of these zoned lands are residential areas, with a commercial/retail area and regeneration area to the north. Further to the north, the River Boyne runs west to east towards the coast.

Newtown Lodge is located at the end of McGrath's Lane on the north side of the railway east of the station. This property is a standalone house located directly adjacent to the railway and in proximity to a number of options. McGrath's Lane crosses the railway corridor via the stone arch overbridge (OBB80/80A/80B) which is being considered as part of this options assessment. Railway Terrace, a terrace of 6 houses off McGrath's Lane, backs on to the south side of the railway station. The west side of the station is defined by the Dublin Road, with its stone retaining wall along the road and stone wall at the top of the embankment. McBride Pitch & Putt Course and agricultural fields lie to the north of the station.

The station area is relatively well screened within its immediate setting, though established residential development lies to the south and west. The station area and railway corridor are openly viewed from the elevated vantage of the over bridges OBB80/80A/80B on McGrath's Lane, immediately east of the station area.

2.6.3 Archaeological and cultural heritage

Over bridges (OBB080/080a/080b) were shown as Newtown Bridge on the revised six-inch Ordnance Survey map, the bridges are located to the east of Drogheda station. Approach ramps are located to the north and south of the multiple cut stone arch structure. The bridge structure is located along the line of the townland boundary between Bryanstown and Newtown townlands. Today, the bridges present as two historic cut stone arch bridges (OBB80 & OBB80A) linked by a concrete bridge (OBB80B) built in 2003. Despite the level of disturbance and alteration and while the structures are not protected, they form part of the approach to the station and are considered to be of historic, architectural and industrial heritage interest. These bridges contribute to the character and special interest of the protected station.

The site of Drogheda Railway Station lies outside (700m) and to the southeast of the twelfth century Anglo Norman town of Drogheda (RMP LH024-041) in Lagavooren townland.

The 1st edition six-inch Ordnance Survey map (1837-1842) shows the area now occupied by Drogheda Railway Station and works as an open field, located to the south of grounds associated with 'St James' Estate. These grounds are planted with trees, possibly forming an orchard. 'Lansdowne' and 'Longwood' two dwellings are annotated to the northwest of the station and this area is now partly occupied by the locomotive shed.

The twenty-five-inch edition Ordnance Survey (1888-1913) shows the 'Station' and the associated railway infrastructure including goods, engine and carriage sheds, platforms and the Drogheda/Boyne Viaduct to the north of the works. A well is shown at the beginning of the approach ramp, north of the bridge, it is located off an access track to Newtown Lodge.

At Drogheda, a number of the railway structures including the engine shed, the station building, water tower as well as an office and a railway station building are protected structures, all are considered to be of regional interest (Draft Louth Development Plan 2021-2027– RPS Structures list) and included in the National inventory of Architectural Heritage (NIAH). These are discussed in the architectural heritage section (2.6.4). As a collection of buildings and structures, the station retains much of its original fabric, preserving the industrial heritage character and setting of the site. The arrival of the railway in the nineteenth century had a significant impact in Louth, due its pivotal location between Dublin and Belfast.

2.6.4 Architectural heritage

The Dublin and Drogheda Railway, which was formed in 1835, and granted parliamentary permission in 1836, reached Drogheda in 1844. The original station was to the south of the existing (at Buckey's Sidings) and was in operation until the completion of the first Boyne Viaduct in 1855. Prior to this, passengers travelling north had to disembark, and cross the Boyne by carriage to Newfoundwell Platform on the north side of the estuary. The existing Boyne Viaduct (UBB82) is included in the Record of Protected Structures (LCC RPS DB-176).

Drogheda MacBride Station is a Protected Structure (LCC RPS DB-055). The listing notes this railway station retains a great deal of its original fabric and is a well composed architectural set piece. OBB80/80A/80B is not a specifically listed protected structure, however it would fall under the protection of the station curtilage.

Five additional structures in the station complex are also included in the Record of Protected Structures. These are:

- Engine Shed LCC RPS DB-395,
- Water Tower LCC RPS DB-397,
- Parcel Office LCC RPS DB-396,
- Boiler House LCC RPS DB-398 and
- toilet block LCC RPS DB-399.

All of these structures are also included in the NIAH where they are rated of Regional Importance for reasons of architectural, technical and social interest. The NIAH notes the high-quality workmanship in stone and brick detailing, developments in railway architecture as evidenced in the buildings and the sensitivity of modern interventions.

2.6.5 Noise and vibration

Drogheda MacBride Station and OBB80/80A/80B is surrounded by residential houses and has a pitch and putt (recreational facility) to the east/north-east for the station. Additional to the existing residential properties, there is a permitted residential development to the north-east of the station. There are commercial properties on the north and south banks of the River Boyne to the north of the station.

The most sensitive receptors in the proximity of OBB80/80A/80B are the residential properties, some of which are directly adjacent to the rail corridor on McGrath's Lane, Harvest Way, Foxhill, and Railway Terrace.

2.6.6 Air quality and climate

The existing environment considers the proximity of sensitive receptors to the construction works. Drogheda MacBride Station is surrounded by residential houses to the north, south, and west, and has a pitch and putt course (recreational facility) to the east/north-east. The River Boyne is also considered a sensitive receptor due to its ecological sensitivity. In addition, permission has been granted for a proposed development consisting of 133 no. two storey residential dwellings and a vehicular access road connecting to Marsh Road (R150).

2.6.7 Agricultural and non-agricultural

Agricultural Land

The lands to the South, East and West of the railway station are urban / built up. To the north of the existing station there is a pitch and putt course (which is non-agricultural) and a grassland field (agricultural). There are three tillage fields adjoining the railway line, just East of the grassland field. The access to these four fields is via McGraths Lane which is on the northern boundary of the station and railway line.

Non-Agricultural land/population assessment

Drogheda MacBride Station is on the edge of the town and is accessible from the R132 Dublin Road. There are small areas of green space and terraced or semi-detached housing nearby on St. Mary's Villas and Railway Terrace. Six properties and their gardens located on a cul-de-sac off Railway Terrace look out onto the Navan Line and to the east of one prospective location for a new platform. A large single property is located on the far side of the railway depot off McGrath's Lane. A pitch and putt club is located immediately to the north of the station.

2.6.8 Geology and soils

The Corine Land Cover 2018 categorises the land use as artificial discontinuous urban fabric areas in the south and north-west, heterogeneous agricultural with complex cultivation patterns in the north and agricultural area with permanent crops as well as non-irrigated arable land in the north-east.

Two historic quarries were identified within 300m of the railway line at Drogheda station. The geological mapping for the area indicates that the soils and geology of the area comprise made ground in urbanised areas overlying glacially deposited sediments including Irish Sea Till and Glaciofluvial terrace sediment.

There are three EPA licensed facilities mapped within 1km of the site. The Superwarm Homes (Limerick) Limited was an IPC licensed site (P0368), 620m to the northwest of the site. The license status is surrendered with the facility closed. The Glanbia Foods Society Limited (Drogheda) is an IEL licensed site (P0799), 250m to the south of the site. Marsh Oil Products, 750m to the northeast of the site has a Section 4 discharges to water license into the River Boyne.

An EPA waste facility with two corresponding waste boundaries was noted approximately 460m to the northwest and 700m to the northeast of the site. The boundaries relate to Stagreenan Polder, a dredging facility (W0052-01 and W0052-02). The license status is surrendered.

The expected ground conditions across the site are summarised in Section 2.5 based on previous site investigations. Ground Investigation is proposed to be carried out in the area of OBB80, 80A and 80B.

2.6.9 Water resources

Surface water bodies

The study area in relation to works at the bridges east to the Drogheda Station is within the Stagrennan_010 river subbasin which is in the Boyne_SC_130 sub-catchment. The main channel of the Stagrennan_010 river waterbody is located 1km east of the study area and flows in a north-easterly direction, discharging into the Boyne Estuary. The Water Framework Directive (WFD, 2000/60/EC) 2013-2018 ecological status of the Stagrennan_010 is Moderate, with the risk currently under review. The 2010-2015 risk was also recorded as under review.

The Boyne Estuary (IE_EA_010_0100) is a transitional waterbody located approximately 800m north of the site. It discharges to the Boyne Estuary Plume Zone coastal waterbody (IE_EA_010_0000) and the Northwestern Irish Sea HA08 coastal waterbody (IE_EA_020_0000). Under the Water Framework Directive (WFD, 2000/60/EC) the ecological status of the Boyne Estuary transitional water body is classified as Moderate for the 2013-2018 monitoring cycle with the risk recorded as At Risk, indicating that the waterbody may not maintain or achieve that status on the next WFD cycle. The minimum objectives for a water body under the WFD are to achieve at least Good status (or Good potential for artificial/ highly modified water bodies), and no deterioration of existing status. The ecological status for the Boyne Estuary Plume Zone coastal waterbody is classified as Moderate for the 2013-2018 monitoring cycle and the WFD risk is recorded as At Risk.

The River Boyne and River Blackwater SAC, Boyne Coast and Estuary SAC and pNHA and Boyne Estuary SPA are located within 2km of the study area.

Marsh Oil Products, 750m to the northeast of the site, has a Section 4 discharges to water license into the River Boyne.

Groundwater

There are no karst features located within the study area. The site is underlain by Dinantian Upper Impure Limestones (DUIL), which is part of the Mornington Formation, which is described as dark limestone and calcareous shale. The aquifer is classified as a Locally Important Aquifer which is Generally Moderately Productive (Lm). The groundwater vulnerability at the site is classified as low.

The study area lies within the Drogheda groundwater body (GWB) (IE_EA_G_025). The Drogheda groundwater body is currently at Good WFD Status for the 2013-2018 monitoring cycle and currently Not at Risk with regard to achieving its WFD objectives.

There are a number of water springs and wells within 250m from the site including one dug well recorded as a public supply (2927SEW013) and an industrial use borehole (2927SEW064). An active Outer Source Protection Zone associated with the Kiltrough Public Water Supply is located approximately 700m south of the study area.

There are no gravel aquifers mapped within the study area. The groundwater in the Drogheda GWB is recorded by the EPA as groundwater in an SPA Habitat and SAC Habitats for the Boyne Estuary SPA and the River Boyne And River Blackwater SAC located 800m and 650m to the north, respectively.

A well was drilled in 2014 for Irish Rail, approximately 30m to the west of the current bridge east of Drogheda railway station. The total depth of the well is 60m. The drillers log recorded the geology as: 'fill, clay, soft rock and hard rock' with the 'hard rock encountered at 9m'. The yield at the time of drilling was estimated to be 108 m^3/day. Water strikes were encountered at 27mBGL, 44mBGL and 51mBGL. The static water level was recorded at 2mBGL. It is understood that the well is used for washing down the trains.

A 2003 Ground Investigation for a Proposed Railway Crossing at Newtown, Drogheda by Irish Geotechnical Services Ltd was conducted approximately 200m to the east of the current Drogheda railway bridge. Groundwater levels fluctuate between 3.15m below ground level to 0.55m above ground level. Two of the five boreholes are recorded as having artesian conditions. The standpipes for the groundwater installations do not monitor any specific strata, with the installs spanning multiple strata.

Flooding

Historical flooding has been assessed by examining reports and maps from the OPW's National Flood Hazard mapping. There are no records of historic flood events within the site area.

Risk of coastal and fluvial flooding at River Boyne estuary has been assessed and mapped by the OPW as part of the Eastern CFRAM study. According to the OPW predictive flood maps (floodinfo.ie), the study area is located near to areas at risk of tidal and fluvial flooding (400m north of the site) from the River Boyne, but the area itself is not at risk of flooding. The predicted flood level during the 0.5% tidal Annual Exceedance Probability (AEP) event near the site is 3.55mOD, with the 1% AEP fluvial event flood level at 3.17mOD. The existing railway line is located at 28mOD and therefore the risk of flooding from river or the sea is unlikely.

2.6.10 Biodiversity

The works location is close to the existing Drogheda train station, which is set in the urban centre of Drogheda, south of the River Boyne, and adjacent to residential holdings and the Dublin Road (R132). The Boyne Viaduct crosses the Boyne River, north of the site, with the Boyne Estuary from c. 800m east of the Viaduct. The area between the works area and the River Boyne is taken up by a pitch and putt club, residential holdings, pockets of woodland, scrub, and bare ground/artificial surfaces.

The River Boyne (and River Blackwater) is designated as a Special Area of Conservation (SAC). It is also designated as a Special Protection Area (SPA) and proposed Natural Heritage area (pNHA) c. 3.7km west of the works area. The Boyne Coast and Estuary is designated as a SAC and pNHA, c. 2km northeast of the works, and also as a SPA c. 1km northeast of the works area.

2.7 Utilities

There are extensive utility networks in the area, typical of an urban environment such as that surrounding Drogheda MacBride Station. Service Providers with network assets in the area, from whom records have been obtained, include:

- Gas Networks Ireland (GNI);
- Irish Water (Water supply);
- Irish Water (Wastewater Sewers)

- Louth County Council (Storm Water Sewers)
- ESB Networks
- Eir;
- BT Ireland; and
- Irish Rail lineside cables running parallel along the railway.

Utility service records have been obtained from all providers in the area. Most services are located within the existing street network surrounding the railway, and there are also some services running under Drogheda MacBride Station and maintenance depot complex. All utility records should be considered indicative only and must be verified prior to any intrusive works occurring.

The records indicate that there are services at track level or within the railway corridor. These include lineside data cable/fibre optic running parallel to the railway as well as signalling cables. The records do not indicate any utilities crossing over at OBB80, OBB80A, or OBB80C.

3. REQUIREMENTS

The main project requirements relevant to this report subsection are as follows:

- Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead;
- Undertake necessary infrastructure change to achieve the clearances required for electrification at bridges and structures;
- Undertake safety improvements resulting from the introduction of 1500V DC overhead.

3.1 Specific requirements

In achieving the clearances required for electrification at bridges and structures, a predefined approach for electrical clearance design is to be adopted as per DART+ Electricity Functional Specifications System-Wide (MAY-MDC-ELE-DART-SP-E-0002) Section 5.6.7. This lists relevant electrical equipment configurations and their hierarchy for adoption.

Ideally, the OHLE will pass under overbridges at a standard contact wire height of 4700 mm, nominal system height of 1300 mm, current carrying dropper of 500 mm combined with enhanced electrical clearances. This is defined as Hierarchy Case 1 in the Functional Specification noted above. Where it is not feasible to provide the clearance to accommodate this preferred electrical solution, then a number of hierarchy cases are presented within the specification which define the preferred order depending on the vertical clearance available. This is summarised in the table below.

A nominal contact wire height of at least 4700 mm is preferred at overbridge locations. Where this cannot be achieved, a minimum contact wire height (CWH) of 4400 mm can be considered provided the associated risks are suitably addressed. Contact wire heights less than 4400 mm will require a derogation. This is summarised as follows:

- **Contact wire height ≥ 4700 mm:** Represents nominal contact wire height. No risk assessment or derogation required. These are coloured green in the table below.
- **Contact wire height < 4700 mm but ≥ 4400 mm:** Electrical solutions with contact wire heights in this range require a risk assessment to be undertaken. These are coloured yellow in the table below.
- **Contact wire height < 4400 mm but >4200 mm:** Electrical solutions with contact wire heights less than 4400 mm require a risk assessment and a derogation. These are coloured orange in the table below.

Table 3-1: Vertical Clearances required for the Electrical Hierarchy Cases

		Nominal CW height	Track Maintenance Tamping	Track Construction	Track Maintenance tolerance	OHLE construction	OHLE maintenance	CW and panto wear	System height	Uplift	Electrical clearance	Survey tolerance	Minimum soffit height (mm)
Case 1 CWH of 4700mm, nominal SH of 1300mm, current carrying dropper of 500mm and enhanced EC.	Static EC	4700	100	5	25	20	30	0	500	0	150	5	5535
	Dynamic EC	4700	100	5	25	20	30	25	500	110	100	5	**5620**
Case 2 CWH of 4700mm, reduced SH with reduced current carrying dropper of 300mm and enhanced EC.	Static EC	4700	100	5	25	20	30	0	300	0	150	5	5335
	Dynamic EC	4700	100	5	25	20	30	25	300	110	100	5	**5420**
Case 3 CWH of 4700mm, reduced SH with reduced current carrying dropper of 100mm and enhanced EC.	Static EC	4700	100	5	25	20	30	0	100	0	150	5	5135
	Dynamic EC	4700	100	5	25	20	30	25	100	110	100	5	**5220**
Case 4 CWH of 4700mm, reduced SH to zero, contenary and enhanced EC. Uplift 70 mm	Static EC	4700	100	5	25	20	30	0	0	0	150	5	5035
	Dynamic EC	4700	100	5	25	20	30	25	0	70	100	5	**5080**
Case 5 CWH of 4600mm, reduced SH with reduced current carrying dropper of 300mm, reduced tamping allowance to 75 mm and enhanced EC.	Static EC	4600	75	5	25	20	30	0	300	0	150	5	5210
	Dynamic EC	4600	75	5	25	20	30	25	300	110	100	5	**5295**
Case 6 CWH of 4600mm, reduced SH with reduced current	Static EC	4600	75	5	25	20	30	0	100	0	150	5	5010

		Nominal CW height	Track Maintenance Tamping	Track Construction	Track Maintenance tolerance	OHLE construction	OHLE maintenance	CW and panto wear	System height	Uplift	Electrical clearance	Survey tolerance	Minimum soffit height (mm)
carrying dropper of 100mm, reduced tamping allowance to 75 mm and enhanced EC.	Dynamic EC	4600	75	5	25	20	30	25	100	110	100	5	**5095**
Case 7 CWH of 4600mm, reduced SH to zero, contenary, reduced tamping allowance to 75 mm and enhanced EC. Uplift 70 mm	Static EC	4600	75	5	25	20	30	0	0	0	150	5	4910
	Dynamic EC	4600	75	5	25	20	30	25	0	70	100	5	**4955**
Case 8 CWH of 4500mm, reduced SH with reduced current carrying dropper of 300mm, reduced tamping allowance to 50 mm and enhanced EC.	Static EC	4500	50	5	25	20	30	0	300	0	150	5	5085
	Dynamic EC	4500	50	5	25	20	30	25	300	110	100	5	**5170**
Case 9 CWH of 4500mm, reduced SH with reduced current carrying dropper of 100mm, reduced tamping allowance to 50 mm and enhanced EC.	Static EC	4500	50	5	25	20	30	0	100	0	150	5	4885
	Dynamic EC	4500	50	5	25	20	30	25	100	110	100	5	**4970**
Case 10 CWH of 4500mm, reduced SH to zero, contenary, reduced tamping allowance to 50 mm and enhanced EC. Uplift 70 mm	Static EC	4500	50	5	25	20	30	0	0	0	150	5	4785
	Dynamic EC	4500	50	5	25	20	30	25	0	70	100	5	**4830**
Case 11 CWH of 4400mm, reduced SH with reduced current carrying dropper of 300mm, reduced tamping allowance to 50 mm and enhanced EC.	Static EC	4400	50	5	25	20	30	0	300	0	150	5	4985
	Dynamic EC	4400	50	5	25	20	30	25	300	110	100	5	**5070**
Case 12 CWH of 4400mm, reduced SH with reduced current	Static EC	4400	50	5	25	20	30	0	100	0	150	5	4785

		Nominal CW height	Track Maintenance Tamping	Track Construction	Track Maintenance tolerance	OHLE construction	OHLE maintenance	CW and panto wear	System height	Uplift	Electrical clearance	Survey tolerance	Minimum soffit height (mm)
carrying dropper of 100mm, reduced tamping allowance to 50 mm and enhanced EC.	Dynamic EC	4400	50	5	25	20	30	25	100	110	100	5	**4870**
Case 13 CWH of 4400mm, reduced SH to zero, contenary, reduced tamping allowance to 50 mm and reduced EC. Uplift 70 mm	Static EC	4400	50	5	25	20	30	0	0	0	100	5	4635
	Dynamic EC	4400	50	5	25	20	30	25	0	70	80	5	**4710**
Case 14 CWH of 4350mm, reduced SH to zero, contenary, reduced tamping allowance to 50 mm and reduced EC. Uplift 50 mm	Static EC	4350	50	5	25	20	30	0	0	0	100	5	4585
	Dynamic EC	4350	50	5	25	20	30	25	0	50	80	5	**4640**
Case 15 CWH of 4270mm, reduced SH to zero, contenary, slab track: tamping allowance 0 mm and maintenance tolerance 5 mm. Reduced EC. Uplift 50 mm	Static EC	4270	0	5	5	20	30	0	0	0	100	5	4435
	Dynamic EC	4270	0	5	5	20	30	25	0	50	80	5	**4490**

3.2 Systems Infrastructure and Integration

Integration with the signalling system will be considered at the next stage of the design and will not have a determining influence on the options considered.

Integration with other electrical cables including OHLE feeder cables though the bridge structure will be considered at the next stage of the design and will not have a determining influence on the options considered.

3.3 Design Standards

Table 3-2 contains the key applicable standards that will be used to develop the design. Please note that this is not intended as an exhaustive list.

Table 3-2: Relevant design standards for OHLE bridge clearance works

Source	Description	Comments
European Norm	EN50122-1	Protective provisions against electric shock
European Norm	EN50119	Electric traction overhead contact lines
Irish Rail	I-ETR-4004	Electrification Clearances
Irish Rail	I-ETR-4101	Maintenance Parameters for 1500Vdc OHLE
Irish Rail	CCE-TMS-300	Track Construction Requirements and Tolerances
Irish Rail	CME-TMS-306	OHLE Interface for IÉ Rolling Stock
Irish Rail	CCE-TMS-321	Track Maintenance Requirements and Tolerances
Irish Rail	CME-TMS-327	Vehicle gauging
Irish Rail	CCE-TMS-410	Civil Engineering Structures Design Standard
Irish Rail	I-PWY-1101	Requirements for Track and Structures Clearances
Irish Rail	SET-AMS-002-012 Iss1.0	Derogation from SET Technical Standards

4. CONSTRAINTS

This section describes the constraints that are relevant to this package of works.

4.1 Technical

The technical constraints are described in the following sub-sections.

4.1.1 Permanent way and track

The existing layout of Drogheda station, the depot facility including the train wash and the bifurcation to the Navan Branch lines all form hard physical constrains for the proposed layout.

The current track arrangement is interlinked by points and crossing units both the north and the south of the existing structures; any amendments to the Main Up & Down lines must therefore be chased through all other interlinked lines. To ensure a compliant design this will require removal and reinstatement of crossing units, 217A/B, 218 A/B, 219A/B and lowering of the wash facility.

Any lowering of PTS 215A and 216A with associated alignment modifications, will result in lowering of the existing UTX in the vicinity to provide sufficient ballast depths as the track traverses it.

PTS 211A/B from the Up Main line to the Wash Road/Platform 3 are also a constraint in the area and would be impacted by any lowering works.

Platforms 1 through to 3 present a physical constraint, the existing track through platforms 1 and 2 is currently canted to allow for through line traffic. Lowering of aforementioned PTS are likely to require modifications throughout the platforms including works with respect to the setting of the platform coping level to ensure stepping distances are achieve and ensure safe passing running clearance is present.

With the exception of the Wash Road, all other lines currently utilise ballast and modifications may impact on supporting/adjacent structures and require slab track solutions. Existing track drainage in this area will also be similarly impacted.

The proposed introduction of a platform along the Navan Branch line and the location of the existing Dublin Road Underbridge (UBK1), which has restricted vertical clearance to the roadway below, also presents a constraint to any track lowering at the location of the OBB80 bridges.

4.1.2 Geotechnical

Based on the nature of the site usage as a railway station (which includes train refuelling areas), there is the risk of the presence of contaminated land. As such, materials excavated during the works may not be suitable for direct reuse on site and, subject to testing may require, disposal or recovery to a suitably licenced facility.

Due to limited information on the stratigraphy, depth to bedrock, groundwater regime and geo-environmental considerations from existing ground investigations, a site-specific ground investigation is a prerequisite at the location of the proposed works to investigate the current ground and groundwater conditions.

4.1.3 Structures

The three bridges at this location create the physical dimensional constraints for the passage of a compliant electrical solution beneath these structures.

An assessment of bridge clearances required for electrification of the Northern line has been carried out at this location based on the topographical survey of the existing rail and bridge arrangement. This assessment found that the existing clearance from the rails to the underside of the bridge is insufficient to cater for a compliant electrical solution at OBB80 and OBB80A. A compliant electrical solution is possible at OBB80B, however modifications required to OBB80 and OBB80A may also necessitate modifications to OBB80B. The images below show OBB80 & 80A overlayed with the panto envelope required to give a contact wire height (CWH) of 4.270 m as per the allowances of hierarchy case 15 (derogation required). This arrangement clashes with the existing stone arch and is hence unacceptable. To achieve a Case 13 electrical solution (CWH of 4.400 m and no derogation required) a 4.71 m soffit height is required at each structure. The clearance envelope for OBB80A shows the min soffit height at the rails is ~ 4.21 m requiring an additional ~ 0.50 m of clearance to the rails.

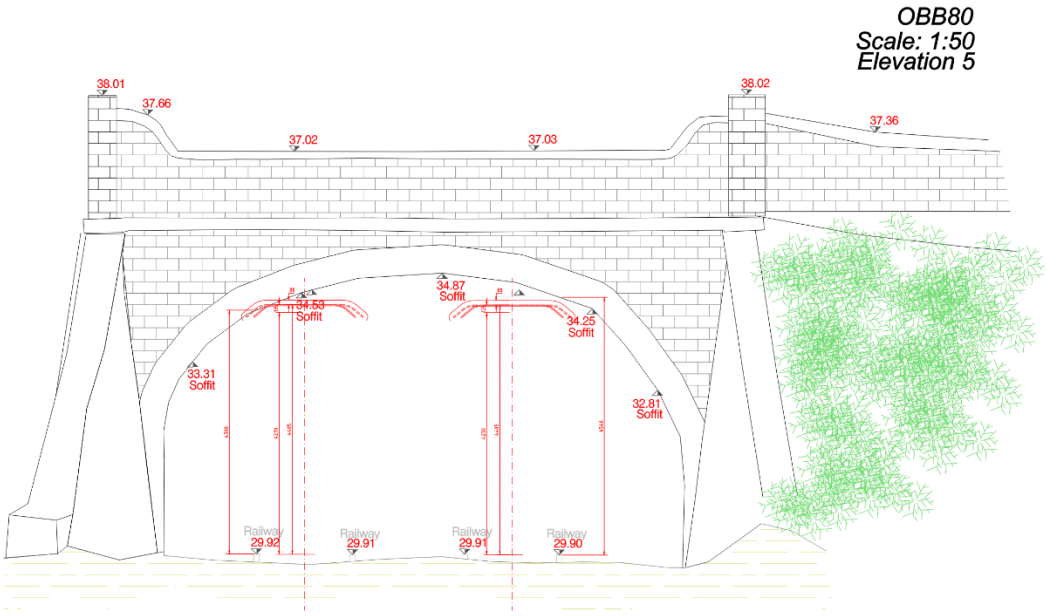

Figure 4-1: Clearance at OBB80

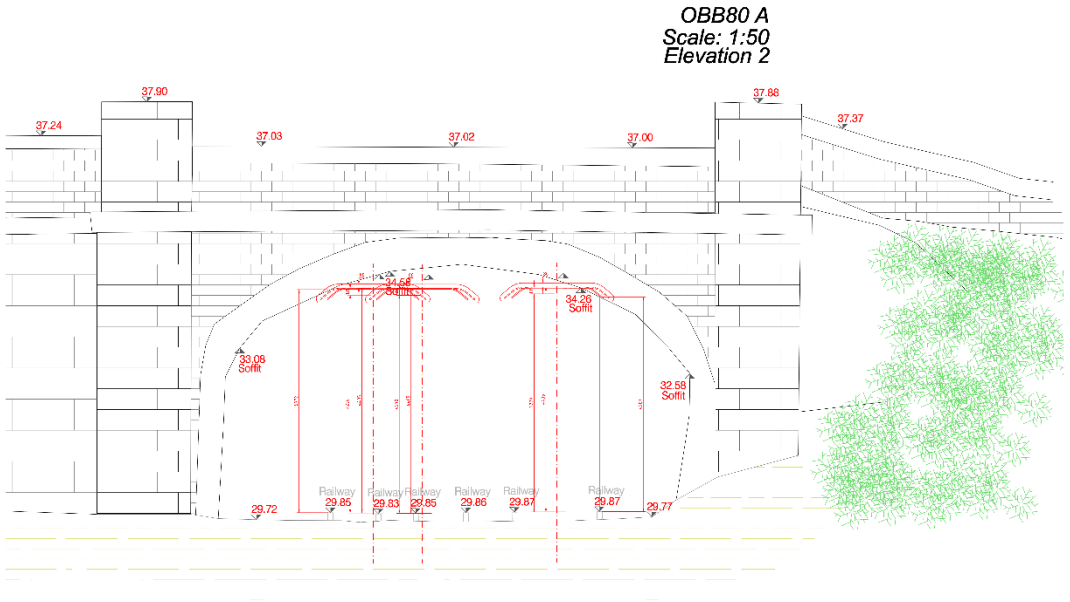

Figure 4-2: Clearance at OBB80A

These bridges were built in the 1800's and hence there is limited records of their design and construction. In particular, the foundation details are unknown and investigation pits would be required to determine the extent of structure below ground level to ensure any proposed works do not undermine the existing foundations.

4.1.4 Utilities

Utility locations are a consideration when designing and implementing new railway infrastructure (whether at a station or elsewhere along the railway line), as this usually requires all the existing utilities in that location to be diverted – either temporarily or permanently. Underground services can be impacted when any digging occurs.

As outlined in section 2.7, there are several utilities traversing and alongside the existing rail corridor, within the study area for the works around Drogheda MacBride Station. Utilities are crossing the tracks at the northern end of the station and within the station, including an above ground medium voltage cable, an underground low-pressure gas main, and underground watermain. There are also medium and high voltage cables crossing the tracks on the southern side of the station. Most of the utility crossings on the Navan branch line are located at the Dublin Road (R132) railway bridge (Irish Water and telecommunications).

Underground utilities present are low, medium, and high voltage underground electrical cables, medium and low-pressure gas mains, telecommunications, watermains, wastewater sewers and surface water drainage networks. There are also lineside telecommunications and signalling cables running parallel to the railway in this area.

Any work conducted at or around OBB80, OBB80A, OBB80B would need to take the relevant utilities into account. Surveys is proposed to be carried out in the area of OBB80, 80A and 80B to determine underground services locations.

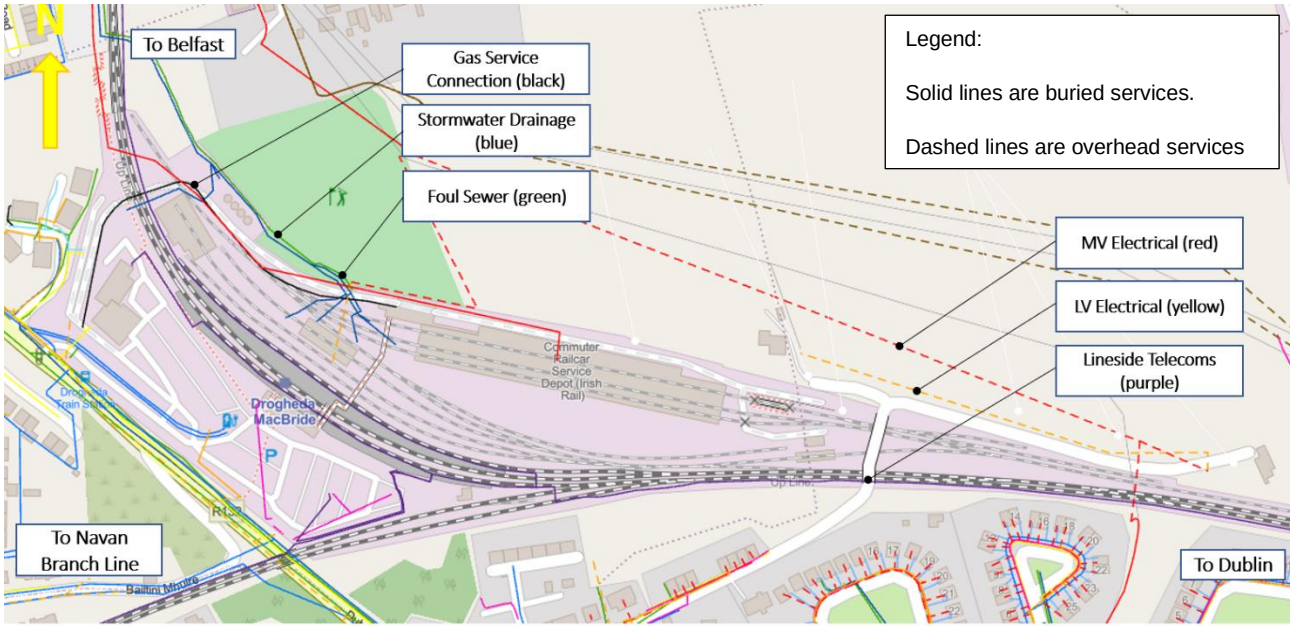

Figure 4-3: Existing Utilities at and around Drogheda MacBride Station

4.1.5 Other railway facilities

Signalling

OBB80, OBB80A and OBB80B are unlikely to pose significant constraints on the signalling; however, there are cable routes alongside the track in particular OBB80 carrying cables to the TER and SSI buildings located at Drogheda station. Currently signals have been located to ensure that signal sighting requirements can be achieved. Any changes to accommodate the necessary clearance at the bridges will require an evaluation of the signals visibility to ensure that the sighting requirement are still complied with.

Telecoms

The main Telecoms constraint is the presence of existing fibre optic cables running alongside the tracks beneath the bridge or bridges. The precise location of the cables is not confirmed. Future requirements anticipate the provision of a formal cable route using troughing buried in the ballast. This needs to be considered in terms of the existing cables and any work carried out on the bridge abutments or surrounding areas.

OHLE

The OHLE is constrained by the vertical clearances provided by any alteration to the bridge that will allow a compliant OHLE design. The existing OBB80 and OBB80A do not have sufficient clearance. Depending on the solution adopted, the provision and location of OHLE masts will be determined and whether the location is available for foundations will be determined. Mast pole placements need to take utilities into account and be placed in such a way to allow access to the utility infrastructure in the future.

4.1.6 Roads

The immediate vicinity of the residential buildings south of the exiting railway lane limits the longitudinal gradient of Railway Terrace. Therefore, any increase in the clearance above the existing railway without changing the horizontal alignment may result in a longitudinal gradient that exceeds acceptable values. Additionally, the proximity of residential buildings limits the space available for earthworks required to increase the vertical alignment to provide the required clearance above the exiting railway.

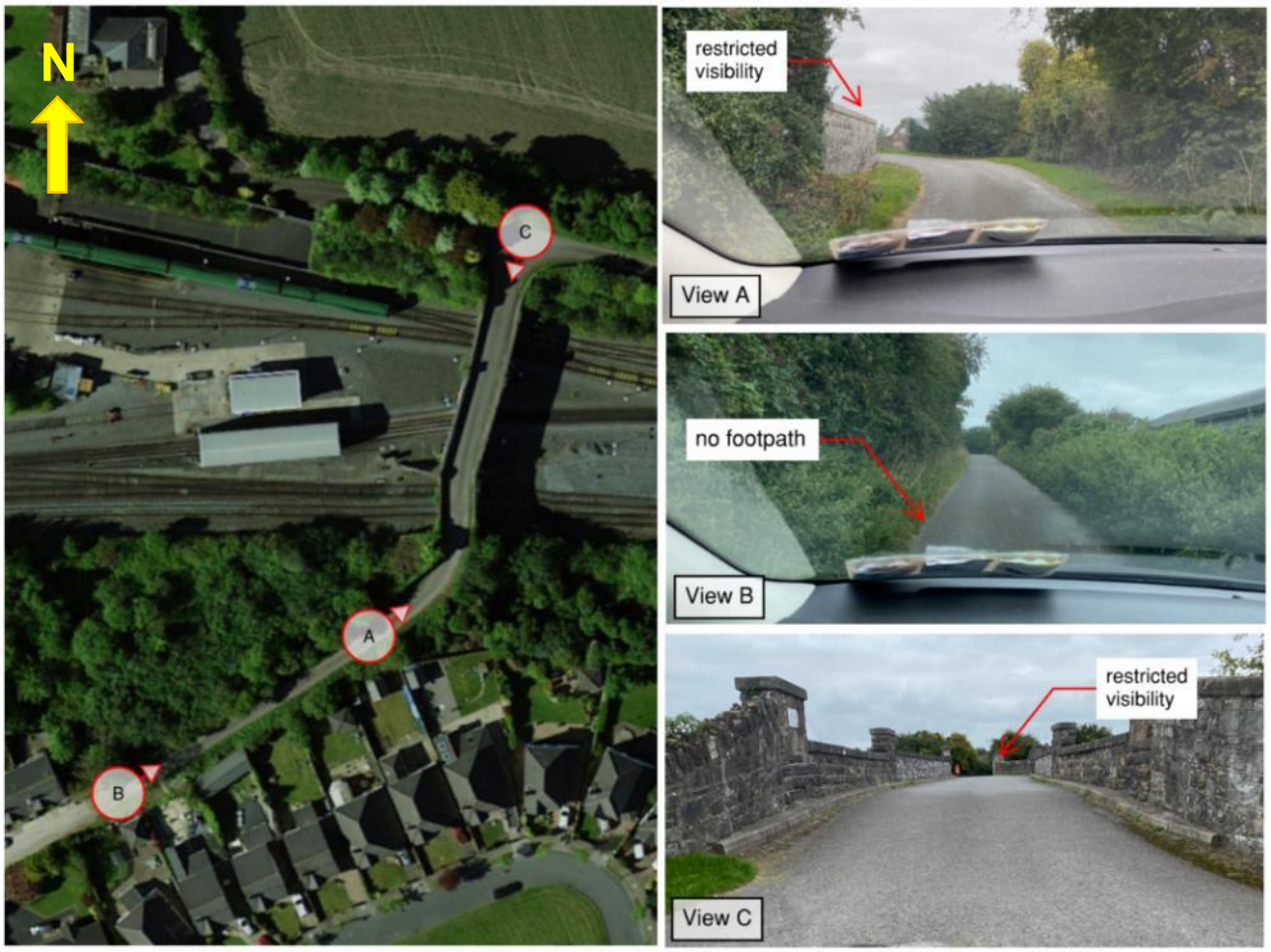

Figure 4-4: Railway Terrace northbound direction (Source: Google)

The current horizontal alignment of Railway Terrace limits the visibility on the approach to the existing structure when driving northbound (Figure 4-4). The visibility is also restricted when driving southbound, by both the alignment and bridge parapets.

Despite a relatively low speed environment, the current alignment presents safety risks, especially for non-motorised road users. Consequently, any change to the horizontal alignment resulting in increased visibility will have a positive impact.

Road restraint barriers on the approach to the bridge at either end are restricted to short masonry wall extensions of the abutment. The bridge parapets measure between 1.05 – 1.20 m and do not comply with the 1.8 m high barrier requirement over the railway.

The existing cross section is limited and does not allow for the footpath to be continued along the existing bridge and across the railway line. Subsequently, non-motorised users are forced onto the road carriageway.

4.2 Environmental

For an overview of the existing environmental constraints for DART+ Coastal North refer to Annex 3.1 Constraints Report.

Section 2.6 describes the baseline environment for the various options being considered under this package of work. Building on this information, the key constraints associated with the options being considered, under the various environmental criteria, are summarised below.

4.2.1 Traffic and transportation

The low speed and low traffic character of the surrounding streets will need to be considered in the context of construction traffic.

A constraint is ensuring that the permeability of the area for pedestrians and cyclists is maintained and the integration of the planned residential development adjacent to the construction area.

4.2.2 Landscape and visual impact

As outlined in Section 2.6, the lands of the existing station are zoned DTDA: Drogheda Transport Development Area: “To protect and expand the existing Transport Hub around the train station and facilitate the development of Public Transport facilities including Residential, Retail and Office Development.”

There are protected views east and west along the River Boyne towards the Boyne Rail Viaduct. There are no protected landscape or visual aspects to the rail station area.

Newtown Lodge is located at the end of McGrath’s Lane on the north side of the railway east of the station. McGrath’s Lane crosses the railway corridor via a stone arch overbridge OBB80/80A/80B . Railway Terrace, a terrace of 6 houses off McGrath’s Lane, backs on to the south side of the railway station.

The west side of the station is defined by Dublin Road, with its stone retaining wall along the road and stone wall at the top of the embankment. McBride Pitch & Putt Course and agricultural fields lie to the north of the station.

4.2.3 Archaeology and cultural heritage

The railway and its associated infrastructure at Drogheda are of industrial heritage interest as well as being of architectural heritage significance. There is also the potential to reveal below ground archaeological features, finds and material within the environs of the existing station and works as a result of the proposal. As such work in this area will be archaeologically monitored to ensure that all features and finds are appropriately identified and recorded.

The removal of the two historic stone arch bridges (OBB80 & OBB80A) linked by a concrete bridge (OBB80B) built in 2003 is considered as a significant constraint on the associated historic railway station at Drogheda.

4.2.4 Architectural heritage

There are six Protected Structures in Drogheda MacBride Station. They are: Drogheda MacBride Station (LCC RPS DB-055); Engine Shed LCC RPS DB-395,; Water Tower LCC RPS DB-397; Parcel Office LCC RPS DB-396; Boiler House LCC RPS DB-398; and a toilet block LCC RPS DB-399. All of these structures are also included in the NIAH. Their settings or curtilages include the whole station complex. OBB80/80A/80B is not a specifically listed protected structure, however it would fall under the protection of the station curtilage.

There is a protected structure of note to the north of the station, St. James's House (LCC RPS DB-148), within who's setting the station is situated, and one protected structure to the southwest, Bayview House (LCC RPS DB-301). Similarly, UBB82 (Boyne Viaduct) is a protected structure (LCC RPS DB-176).

The station does not fall within an Architectural Conservation Area (ACA) and there are no historic gardens included in the NIAH Garden Survey, in the vicinity of it.

Historic Map analysis identifies a number of additional features which require further investigation to determine their architectural interest. These include a double arched cut stone bridge across Newtown Lane, and the Dublin Road Bridge. A terrace of six houses marked Railway Terrace is noted on the 1870 town map, with later workers houses added to the south of these by 1907. The former Union Workhouse and Fever Hospital to the west of the station is a significant complex of buildings likely to be of architectural, technical, social and historical interest. There were substantial gardens to the north of the station as Wierhope and St. James which may retain landscape features of interest.

4.2.5 Noise and vibration

The residential properties directly adjacent to the station and rail corridor (including the permitted development to the north-east of the station) are the most sensitive receptors in terms of noise and vibration from rail operations and construction activities.

Nearby residents, recreational facilities, and commercial properties must be considered in the construction phase to ensure that their acoustic amenity is preserved, as this is the phase that has the potential for the largest impact on the surrounding community.

4.2.6 Air quality and climate

Existing and proposed residential properties to the south, west, and north of Drogheda MacBride Station are the most sensitive receptors in terms of potential air quality impacts during the construction phase.

The development of a new station will increase the attractiveness of rail as a more sustainable mode of transport, having the effect of reducing carbon and harmful emissions associated with road traffic.

4.2.7 Agricultural and non-agricultural

Agricultural Land

The agricultural constraints consist of four agricultural fields (1 grassland and 3 tillage) on the northern boundary of the station and railway line. The sensitivity of the agricultural environment in this area is medium.

Non-Agricultural land

As regards Accessibility and Social Inclusion, the principal constraints relating to the former would be the ease and speed of access to trains, and transfer between trains or platforms, i.e. that the distance to walk should not be too far and that it is easy for passengers to know where to go, by virtue of the station layout combined with good signage. Avoidance of these constraints makes it easier for people to choose the DART service as means of accessing employment of social facilities.

For social inclusion, it is important to consider the needs of those with limited mobility, including older people, people with disabilities, people with intellectual difficulties and, potentially, also parents (and single parents) with children. Again, it is important for there to be ease and speed of access to trains, and transfer between trains or platforms. Distance is a constraint, but so is the need to avoid stairs to changes in grade access between platforms. Although lifts have been proposed in the station design, these must be easy to locate, but can nevertheless present users with delays or be subject to breakdowns.

4.2.8 Geology and soils

Based on the historic and industrial use of the site as a railway station and depot (including refuelling areas), there are likely to be sources of contamination within the made ground throughout the study area.

There are no geological heritage areas within the vicinity of McGrath's Bridge.

Ground Investigation is proposed to be carried out in the area of OBB80, 80A and 80B.

4.2.9 Water resources

The constraints to the development in terms of water resources include the Stagrennan_010 river sub basin, the Boyne Estuary transitional waterbody and Boyne Estuary Plume Zone coastal waterbody, the underlying locally important aquifer, the public supply well and industrial borehole and the protected water dependant ecological sites where changes to the water flow and quality could have a negative impact.

4.2.10 Biodiversity

The key ecological constraints in this area are the River Boyne and Blackwater SAC, the Boyne Coast and Estuary SAC, the Boyne Estuary SPA, which are designated for riparian and marine habitats and protected species, and overwintering birds, and the overlapping pNHA designation. These designated areas are of international and national biodiversity importance.

The River Boyne and Blackwater SPA is not likely to be impacted by the proposed works as it is located c 4.1km upstream of the development, is designated for kingfisher *Alcedo atthis,* and as works will not be within the River Boyne or altering kingfisher habitat within (banks), this SPA is not considered further.

The qualifying interests (reasons for designation) of the River Boyne and Blackwater SAC, the Boyne Coast and Estuary SAC, and the Boyne Estuary SPA, are listed in Table 4-1. Other potential ecological constraints include:

- Potential for roosting bats in OBB80, OBB80A & OBB80B bridges, the Boyne Viaduct (UBB82) and the bridge structure on the Dublin Road (depending on the nature and structure of this bridge);
- Vegetation (scrub, hedgerows or treelines) which may provide foraging, nesting, and commuting corridors for fauna species (e.g. birds, bats, small mammals);
- Potential for the railway to support interesting flora species and habitats due to the calcareous nature of the ballast and their often relatively undisturbed nature; and
- Potential for invasive species to occur along the railway line.

Table 4-1: Reasons for designation of the River Boyne and Blackwater SAC, Boyne Coast and Estuary SAC and Boyne Estuary SPA

River Boyne and Blackwater SAC	Boyne Coast and Estuary SAC	Boyne Estuary SPA
7230 Alkaline fens 91E0 Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) 1099 River lamprey Lampetra fluviatilis 1106 Atlantic salmon *Salmo salar* 1355 Otter *Lutra lutra*	1130 Estuaries 1140 Mudflats and sandflats not covered by seawater at low tide 1210 Annual vegetation of drift lines 1310 Salicornia and other annuals colonising mud and sand 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) 2110 Embryonic shifting dunes 2120 Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)	A048 Shelduck (*Tadorna tadorna*) A130 Oystercatcher (*Haematopus ostralegus*) A140 Golden Plover (*Pluvialis apricaria*) A141 Grey Plover (*Pluvialis squatarola*) A142 Lapwing (*Vanellus vanellus*) A143 Knot (*Calidris canutus*) A144 Sanderling (*Calidris alba*) A156 Black-tailed Godwit (*Limosa limosa*) A162 Redshank (*Tringa totanus*) A169 Turnstone (*Arenaria interpres*) A195 Little Tern (*Sterna albifrons*) A999 Wetland and Waterbirds

4.3 Planning

OBB80/80A/80B are all located in an area zoned J in the Louth County Development plan 2021-2027. The objective of this zoning is "*To support the provision of mixed-use development commensurate with a transportation hub*."

The Guidance in the Development Plan states:

"This zoning will facilitate the development of a public transport hub and is suitable for other land uses including high-density residential development and retail and office uses."

Generally Permitted Uses are: B&B/ Guest House, Coffee Shop/Tea Room, Car Park, Childcare Facility, Cinema, Community Facility, Conference/Event Centre, Funeral Home/Mortuary, Healthcare Practitioner, Home Based Economic Activities, Industry Light, Multi Storey Car Park, Nightclub, Nursing Home, Offices, Park/Playgrounds, Park and Ride Facilities, Plant and Tool Hire, Public Transport Infrastructure (Rail/Bus), Recreational/Sports Facility, Retail Warehouse, Research and Development, Retirement Village, Shop (Convenience), Taxi Office, Telecommunications Structures, Training Centre, Veterinary Surgery.

Open for Consideration are: Advertisements and Advertising Structures, Amusement Arcade, Bring Banks, Business Enterprise Centre, Drive thru Restaurant, Garden Centre, Industry General, Recycling Facility (Waste), Residential, Restaurant, Shop ≤20m² Takeaway/Fast Food Outlet, Traveller Accommodation, Utilities, Vehicle Sales Outlet.

It is therefore a relatively open zoning, with a variety of uses possible.

There are 3 planning applications of relevance to consider in the vicinity of these options:

- 12510037: Extension of duration for 260 residential units. An extension was granted until July 2019. It has since lapsed.
- 17/387: Permission granted for development to consist of the construction of a total of 133 no. two storey residential dwellings. Access was from marsh Road. Lands adjoining McGrath's Lane were designated as "lands for future development".
- 21/1333: permission for 68 no. dwellings consisting of 28 no. 2 storey 3 bed house type A, 21 no. 2 storey 3 bed house type B, 11 no. 2 storey 2 bed house type C, 2 no. 2 storey 3 bed house type D and 6 no. 2 storey 3 bed house type E in a layout of a variety of detached, semi-detached and terraces of 3, 4 or 6 dwellings with ancillary site development works, including roads, footpaths, public open space, landscaping and boundary treatments with access from the Marsh Road (R150) via a new access road previously permitted Reg. Ref. 17/387. Further Information (FI) was requested by the local authority. The response to the FI was extended until September 9th by Louth County Council.

5. OPTIONS

The following section runs through the optioneering process from the longlist of options to the selection of the Preferred Option.

The option selection process is described in the Option Selection Report.

5.1 Longlist of options

A number of options have been considered to enable the electrification of the track beneath these bridges. These options generally consider electrical solutions which would require the replacement of the bridge structure or the lowering of the track. If one bridge is to be modified, then all bridges will need to be modified. This is to ensure continuity of tie in levels between bridges. Increasing height of approach bridges will likely require raised road levels increasing loading on the existing bridge and requiring a structural assessment of the existing bridge. Replacing outside bridges while middle bridge is in place creates constraints making option more expensive. Additionally, the bridge parapets would need to match new bridges to ensure continuity of bridge parapets containment level (H4a).

Table 5-1: Longlist of options

Option	Description
Option 0 – "do-nothing"	Do Nothing
Option 1	New bridge in existing location
Option 2	New bridge adjacent to existing bridges
Option 3	New bridge in new location
Option 4	Bridge demolition with alternative access road from the north
Option 5	Pedestrian/cycle bridge with alternative access road from the north
Option 6	Track lowering

5.1.1 Option 0 – "Do Nothing"

"Do-Nothing" represents a scenario where infrastructure works and interventions to meet the Project Objectives and Requirements are absent. For this option there will be no change to the current layout.

5.1.2 Option 1 - New bridge in existing location

This option involves the removal of the existing bridge structure and the construction of a new bridge in the same location. A temporary access road would be constructed to the North linking to Marsh Road (R150) to facilitate access to the affected properties for the duration of works. The new bridge would be set at a level to provide a suitable vertical clearance for the OHLE equipment. The roads along McGrath's Lane and Railway Terrace will need to be raised and potentially widened to facilitate tie in with revised bridge levels. Additional temporary access may be required during these works to maintain access to the residential properties during works to road levels.

This option would require the temporary acquisition of land to the North of McGrath's Lane to facilitate construction of an access road. Note the exact location of this temporary access road will be determined at the next stage – dependent on planning application 12/1333.

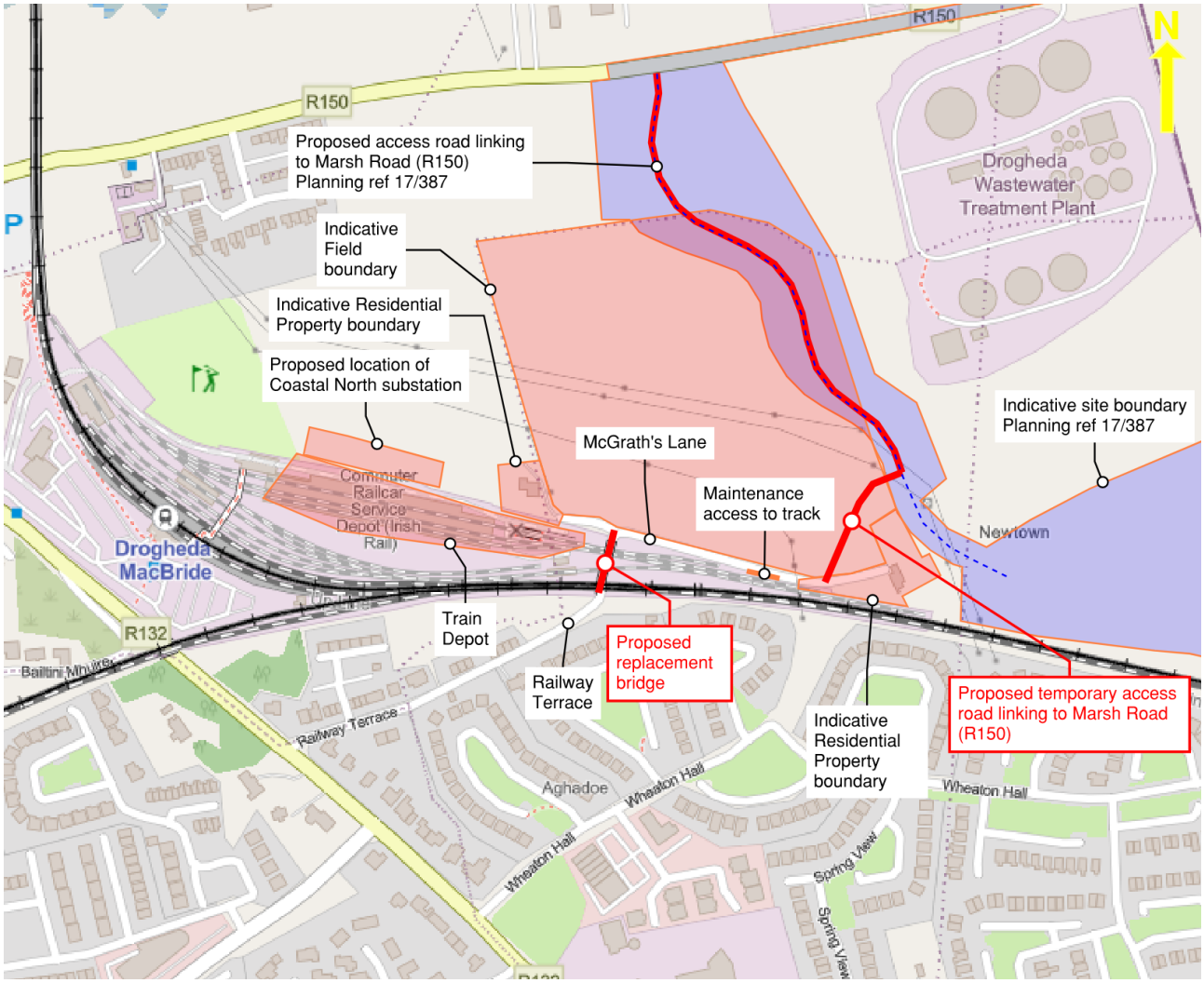

Figure 5-1: Plan view of proposed new bridge in existing location

5.1.3 Option 2 - New bridge adjacent to existing bridges

This option involves the construction of a new bridge adjacent to the existing bridge and the removal of the existing bridge structure. The existing bridges would be used for access to the affected properties for the duration of works and demolished once the new access route is provided. The new bridge would be set at a level to provide a suitable vertical clearance for the OHLE equipment. The roads along McGrath's Lane and Railway Terrace will need to be raised and potentially widened to facilitate tie in with revised bridge levels. Additional temporary access may be required during these works to maintain access to the residential properties during works to road levels. This option would require the acquisition of idle land adjacent to the rail line to construct the abutments and ramped access to the bridge.

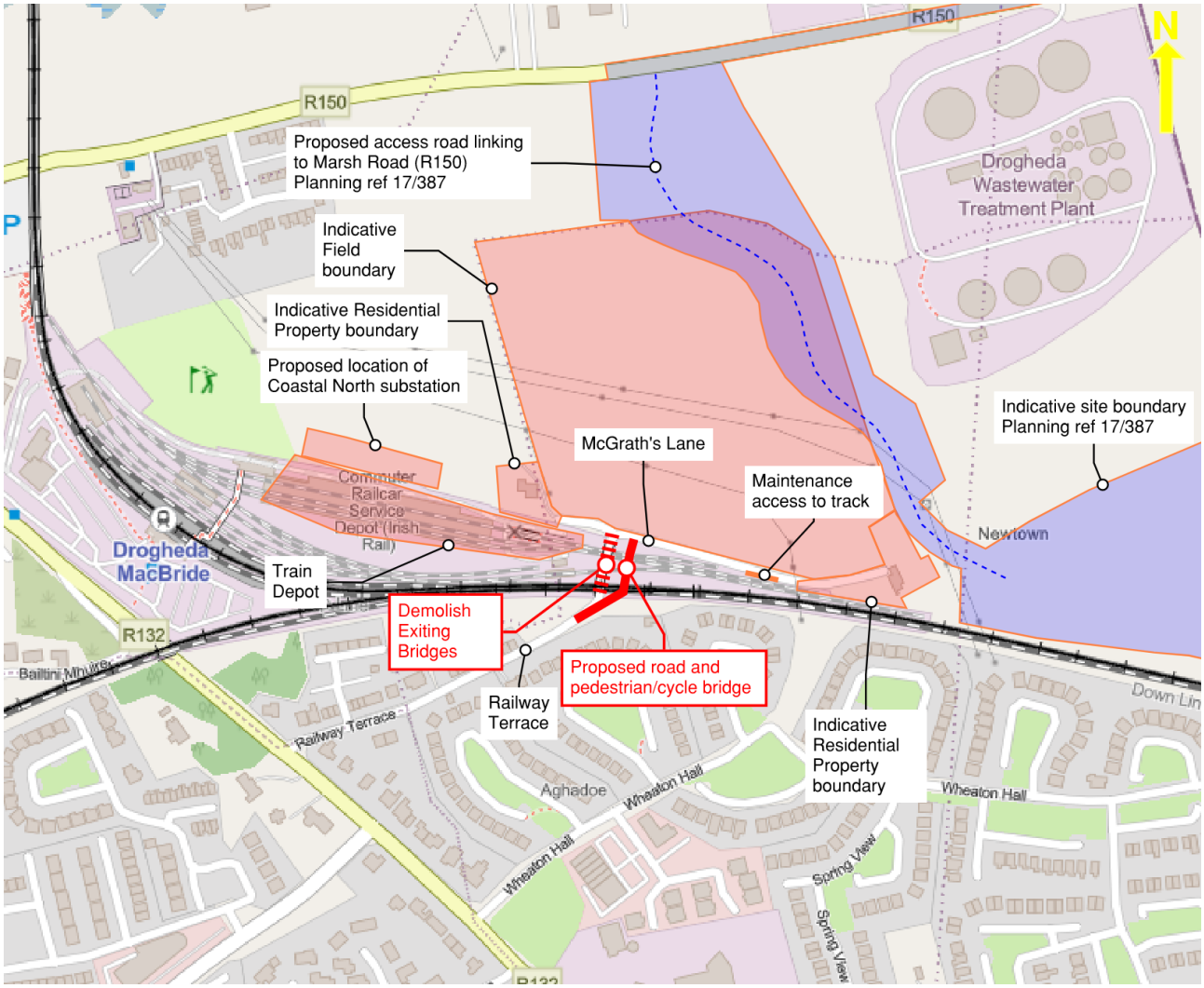

Figure 5-2: Plan view of proposed new bridge adjacent existing bridges

5.1.4 Option 3 - New bridge in new location

This option involves the removal of the existing bridge structure and the construction of a new bridge in a new location. The existing bridge would be used for access to the affected properties for the duration of works and demolished once the new access route is provided. The new bridge would be set at a level to provide a suitable vertical clearance for the OHLE equipment. The location of the proposed bridge is to the East of the existing bridge providing a new access road from Wheaton Hall Road to McGrath's Lane. This option would require the acquisition of idle land to the South of the rail line and from the adjacent field to construct a ramped access road. A curved ramp on the North side of the track will facilitate access to the residential properties and maintenance access to the tracks. Note the exact location of the road will be determined at the next stage – dependent on planning application 12/1333.

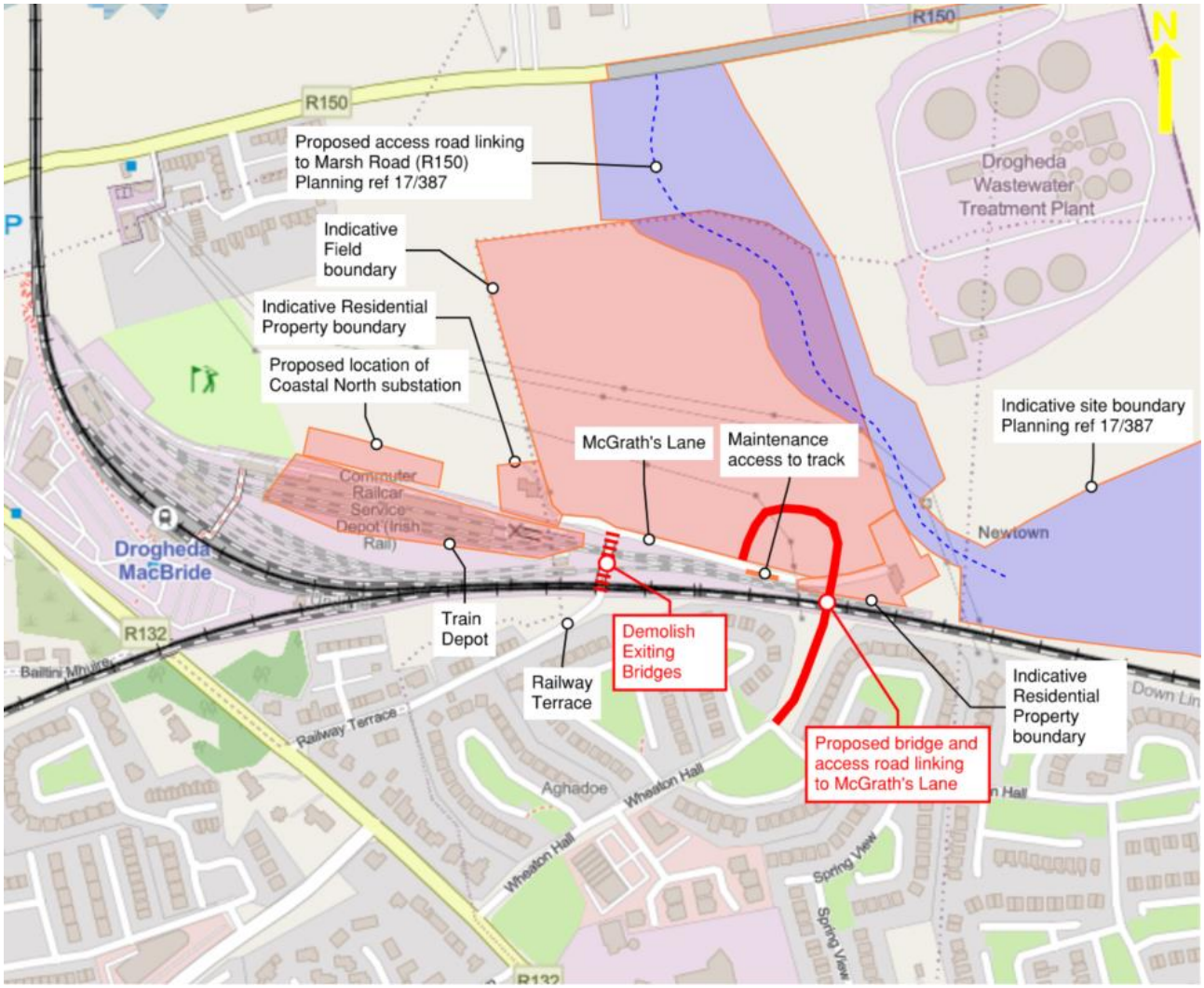

Figure 5-3: Plan view of proposed new bridge in new location

5.1.5 Option 4 - Bridge demolition with alternative access road from the North

This option involves the removal of the existing bridge structure and the construction of a new permanent access road to the North connecting to Marsh Road (R150). The existing bridge would be used for access to the affected properties for the duration of works and demolished once the new permanent access route is provided. This option would require the permanent acquisition of land to the North of McGrath's Lane to facilitate construction of an access road. Note the exact location of the access road will be determined at the next stage – dependent on planning application 12/1333.

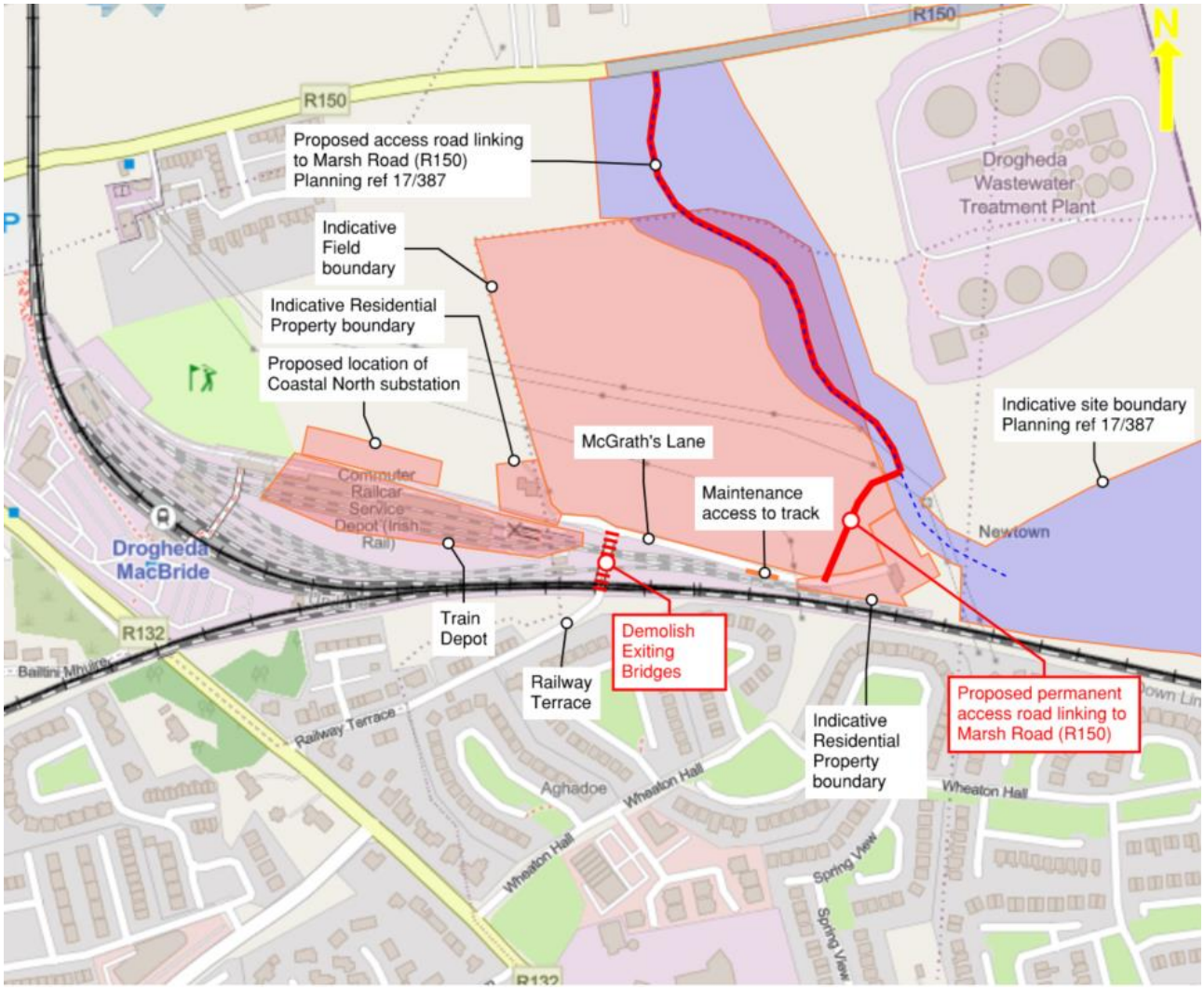

Figure 5-4: Plan view of proposed alternative access road from North

5.1.6 Option 5 - Pedestrian/cycle bridge with alternative access road from the North

This option involves the removal of the existing bridge structure, the construction of a new pedestrian/cycle bridge in the same location and the construction of a new permanent access road to the North connecting to Marsh Road (R150). The existing bridge would be used for access to the affected properties for the duration of works and demolished once the new permanent access route is provided. A new pedestrian cycle bridge would then be constructed in the location of existing bridge. The new bridge would be set at a level to provide a suitable vertical clearance for the OHLE equipment. The roads along McGrath's Lane and Railway Terrace will need to be raised to facilitate tie in with revised bridge levels. This option would require the permanent acquisition of land to the North of McGrath's Lane to facilitate construction of an access road. Note the exact location of this temporary access road will be determined at the next stage – dependent on planning application 12/1333.

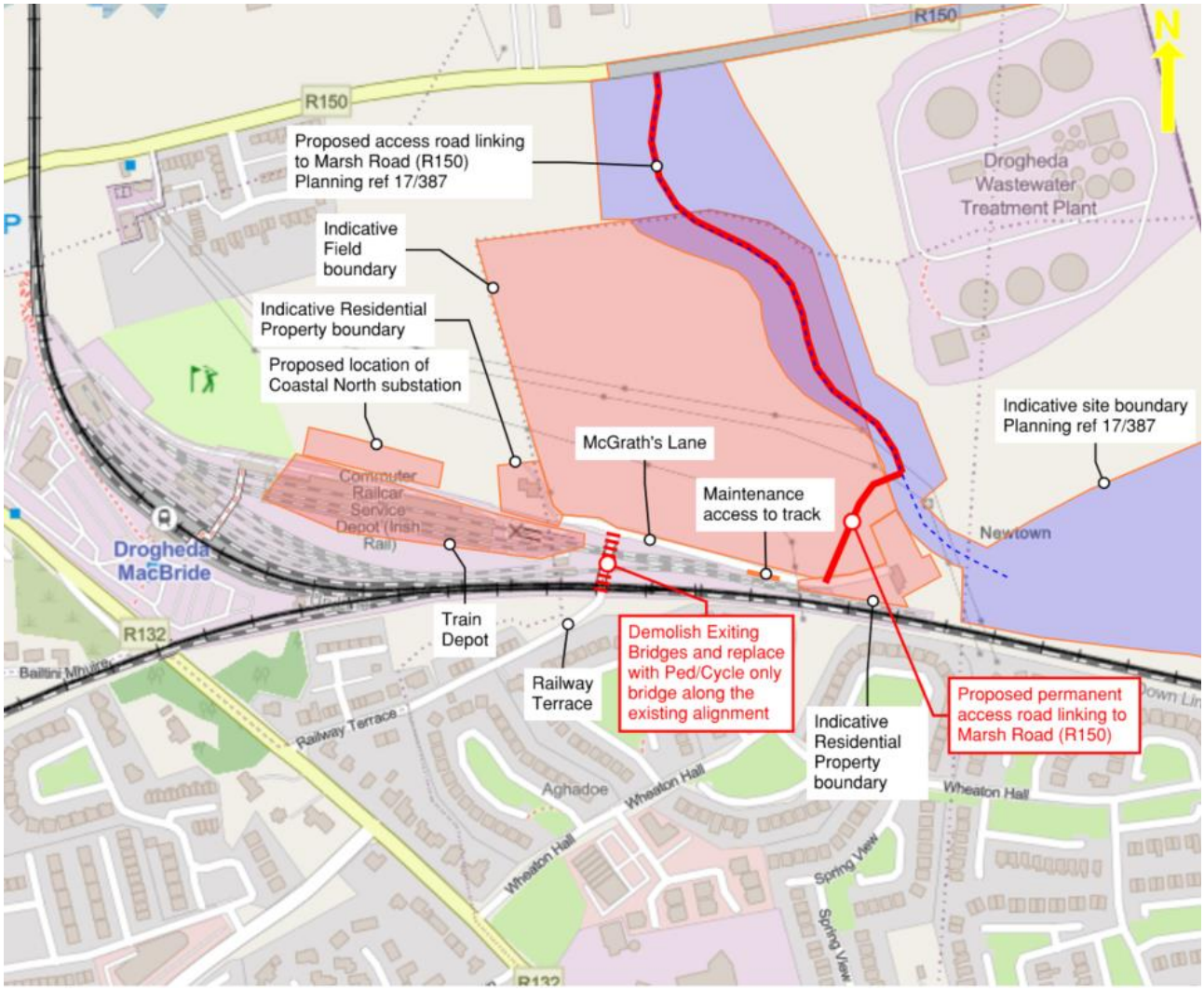

Figure 5-5: Plan view of proposed alternative access road from North

5.1.7 Option 6 – Track lowering

This option involves lowering of the tracks through the station to allow for an electrical solution while retaining the existing bridge levels. This requires the removal of tracks and ballast, lowering of the formation and reinstatement of the tracks at a lower level. A minimum lowering of approximately 500 mm is required to attain a contact wire height of at least 4.400 m beneath the existing bridge. Lowering of the track at this location would have significant impacts on surrounding infrastructure including the Train depot, Wash unit and station track and platforms. Details of the scale of impact of lowering the track by 500mm have been captured on the image below:

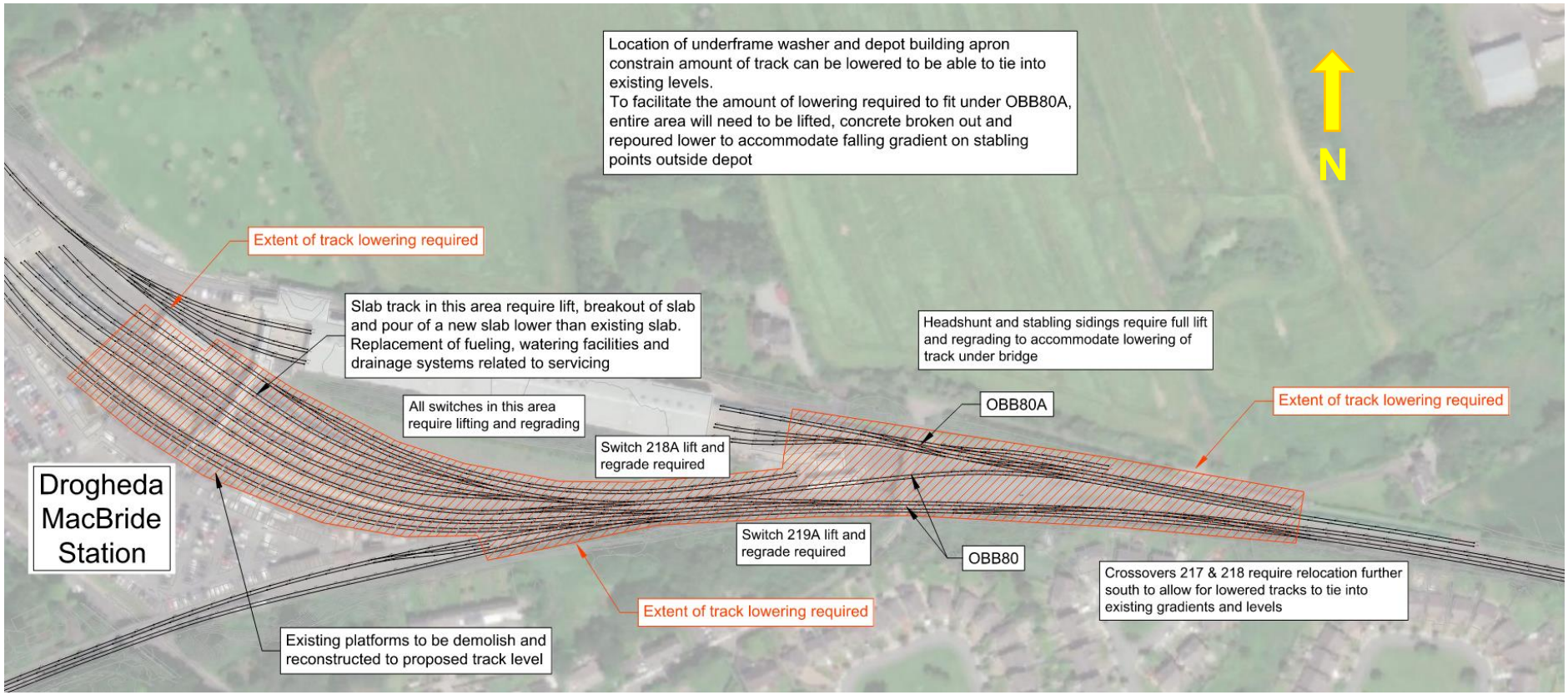

Figure 5-6: Plan view showing impact of track lowering at bridges

5.2 Sifting of longlist of options

This sifting process considers the project objectives and project requirements. Each option presented in section 5.1 will be assessed on its ability to meet the project objectives and requirements.

The results of this screening process are presented in Table 5-2 and Table 5-3.

Table 5-2: Longlist sifting table for Options 0 to 3

Project objectives and requirements	Description	Option 0 – Do nothing		Option 1 – New bridge in existing location		Option 2 – New bridge adjacent to existing location		Option 3 – New bridge in new location	
		Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale
Project objective	To deliver a higher frequency, higher capacity, reliable, electrified route to enable an increased DART service frequency between Drogheda and Dublin City Centre.	**Fail**	Option prevents installation of OHLE and full electrification	**Pass**	Option enables installation of OHLE	**Pass**	Option enables installation of OHLE	**Pass**	Option enables installation of OHLE
Project objective	To deliver solutions which improve the passenger experience where passenger infrastructure interventions are required to meet the Train Service Specification.	**Fail**	No infrastructure intervention considered as part of “do-nothing” approach to allow installation of OHLE	**Pass**	Electrification of Northern Line, new rolling stock and increased service frequency improves passenger experience	**Pass**	Electrification of Northern Line, new rolling stock and increased service frequency improves passenger experience	**Pass**	Electrification of Northern Line, new rolling stock and increased service frequency improves passenger experience
Project objective	To deliver a sustainable, low carbon and climate resilient design solution including making use of existing infrastructure where possible with targeted improvement works.	**Pass**	No changes	**Pass**	Use of existing rail land.	**Pass**	Use of existing rail corridor Use of existing bridge in temporary case therefore removing requirement for alternative temporary access	**Pass**	Use of existing rail land

Project objectives and requirements	Description	Option 0 – Do nothing		Option 1 – New bridge in existing location		Option 2 – New bridge adjacent to existing location		Option 3 – New bridge in new location	
		Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale
Project objective	To identify cost-effective solutions from a capital, operations, and maintenance perspective.	**Pass**	No costs	**Pass**	Cost of demolition and construction of new bridge with required clearance	**Pass**	Cost of demolition and construction of new bridge with required clearance	**Pass**	Cost of demolition and construction of new bridge with required clearance
Project objective	To minimise adverse impacts on the natural and built environment associated with the construction, operation and maintenance of the project.	**Pass**	No changes	**Pass**	Minimal impacts	**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.	**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.

Project objectives and requirements	Description	Option 0 – Do nothing		Option 1 – New bridge in existing location		Option 2 – New bridge adjacent to existing location		Option 3 – New bridge in new location	
		Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale
Project objective	To minimise adverse impacts on existing rail services, road users and landowners associated with the construction, operation and maintenance of the project.	**Pass**	No changes	**Pass**	No negative operational impacts Potential disruption to train services during construction	**Pass**	No negative operational impacts Potential disruption to train services during construction	**Pass**	No negative operational impacts Potential disruption to train services during construction
Project objective	To provide efficient and cost-effective integration of systems with the other DART+ projects	**Pass**	Failure to provide fully electrified route between Malahide and Drogheda precludes effective integration with DART route.	**Pass**	No impact on integration with systems of other DART routes.	**Pass**	No impact on integration with systems of other DART routes.	**Pass**	No impact on integration with systems of other DART routes.
Project requirement	To design in accordance with IÉ Standards and relevant national and EU standards and guidelines.	**Pass**	No interventions	**Pass**	Compliant clearance achieved	**Pass**	Compliant clearance achieved	**Pass**	Compliant clearance achieved
Project requirement	Designs shall comply with the Minimum Employer's Functional Requirements and meet the Train Service Specification	**Fail**	Does not meet the requirement for electrification of the line	**Pass**	Compliant	**Pass**	Compliant	**Pass**	Compliant
Project requirement	Electrification of the line from the end of the current electrified section at	**Fail**	No electrification possible with current bridge clearance	**Pass**	Enables installation of OHLE	**Pass**	Enables installation of OHLE	**Pass**	Enables installation of OHLE

Project objectives and requirements	Description	Option 0 – Do nothing		Option 1 – New bridge in existing location		Option 2 – New bridge adjacent to existing location		Option 3 – New bridge in new location	
		Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale
	Malahide to Drogheda with 1500V DC overhead.								
Project requirement	Provision of an appropriate number of substations to support electrification.	**Pass**	'Do-nothing' approach does not preclude installation of substations elsewhere to support electrification	**Pass**	No impact on substations	**Pass**	No impact on substations	**Pass**	No impact on substations
Project requirement	Undertake necessary infrastructure change to achieve the clearances required for electrification at bridges and structures.	**Fail**	No electrification possible with current bridge clearance	**Pass**	Necessary clearances can be achieved	**Pass**	Necessary clearances can be achieved	**Pass**	Necessary clearances can be achieved
Project requirement	Undertake safety improvements resulting from the introduction of 1500V DC Overhead.	**Pass**	No safety impact from 'do-nothing' approach.	**Pass**	Earthing and bonding considerations	**Pass**	Earthing and bonding considerations	**Pass**	Earthing and bonding considerations

Table 5-3: Longlist sifting table for Options 4 to 6

Project objectives and requirements	Description	Option 4 – Bridge demolition with alternative access road from the north		Option 5 – Pedestrian/cycle bridge with alternative access road from the north		Option 6 – track lowering	
		Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale
Project objective	To deliver a higher frequency, higher capacity, reliable, electrified route to enable an increased DART service frequency between Drogheda and Dublin City Centre.	**Pass**	Option enables installation of OHLE	**Pass**	Option enables installation of OHLE	**Pass**	Option enables installation of OHLE
Project objective	To deliver solutions which improve the passenger experience where passenger infrastructure interventions are required to meet the Train Service Specification.	**Pass**	Electrification of Northern Line, new rolling stock and increased service frequency improves passenger experience	**Pass**	Electrification of Northern Line, new rolling stock and increased service frequency improves passenger experience	**Pass**	Electrification of Northern Line, new rolling stock and increased service frequency improves passenger experience
Project objective	To deliver a sustainable, low carbon and climate resilient design solution including making use of existing infrastructure where possible with targeted improvement works.	**Pass**	Use of road for development north of the current bridge location	**Pass**	Use of existing rail land.	**Pass**	Use of existing rail land.
Project objective	To identify cost-effective solutions from a capital, operations, and maintenance perspective.	**Pass**	Cost of demolition of bridge Cost of new access road	**Pass**	Cost of demolition and construction of new bridge suitable for pedestrian and cyclists, with required clearance	**Pass**	Cost of lowering the tracks plus the associated SET costs.
Project objective	To minimise adverse impacts on the natural and built environment associated with the construction, operation and maintenance of the project.	**Pass**	Impacts to the farmland North of the railway to construct the access road – short distance required of the road to the development	**Pass**	Impacts to the farmland North of the railway to construct the access road	**Pass**	Minimal impacts

Project objectives and requirements	Description	Option 4 – Bridge demolition with alternative access road from the north		Option 5 – Pedestrian/cycle bridge with alternative access road from the north		Option 6 – track lowering	
		Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale
Project objective	To minimise adverse impacts on existing rail services, road users and landowners associated with the construction, operation and maintenance of the project.	**Fail**	The removal of the bridge will be unacceptable for pedestrian and cycle users for connectivity	**Pass**	No negative operational impacts Potential disruption to train services during construction	**Pass**	No negative operational impacts Potential disruption to train services during construction
Project objective	To provide efficient and cost-effective integration of systems with the other DART+ projects	**Pass**	No impact on integration with systems of other DART routes.	**Pass**	No impact on integration with systems of other DART routes.	**Pass**	No impact on integration with systems of other DART routes.
Project requirement	To design in accordance with IÉ Standards and relevant national and EU standards and guidelines.	**Pass**	Compliant clearance achieved	**Pass**	Compliant clearance achieved	**Pass**	Compliant clearance achieved
Project requirement	Designs shall comply with the Minimum Employer's Functional Requirements and meet the Train Service Specification	**Pass**	Compliant	**Pass**	Compliant	**Pass**	Compliant
Project requirement	Electrification of the line from the end of the current electrified section at Malahide to Drogheda with 1500V DC overhead.	**Pass**	Enables installation of OHLE	**Pass**	Enables installation of OHLE	**Pass**	Enables installation of OHLE
Project requirement	Provision of an appropriate number of substations to support electrification.	**Pass**	No impact on substations	**Pass**	No impact on substations	**Pass**	No impact on substations
Project requirement	Undertake necessary infrastructure change to achieve the clearances required for electrification at bridges and structures.	**Pass**	Necessary clearances can be achieved	**Pass**	Necessary clearances can be achieved	**Pass**	Necessary clearances can be achieved

Project objectives and requirements	Description	Option 4 – Bridge demolition with alternative access road from the north		Option 5 – Pedestrian/cycle bridge with alternative access road from the north		Option 6 – track lowering	
		Pass/ fail	Rationale	Pass/ fail	Rationale	Pass/ fail	Rationale
Project requirement	Undertake safety improvements resulting from the introduction of 1500V DC Overhead.	**Pass**	Earthing and bonding considerations	**Pass**	Earthing and bonding considerations	**Pass**	Earthing and bonding considerations

5.3 Summary of Longlist sifting

The outcome of the longlist sifting is summarised in Table 5-4.

Table 5-4: Longlist summary table

Option	Description	Screen Result	Summary
Option 0 – 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

5.4 Shortlisted Options

The following sections describe the shortlisted options in further detail.

5.4.1 Option 1 – New bridge in existing location

This option involves the removal of the existing bridge structure and the construction of a new bridge in the same location. A temporary access road would be constructed to the North linking to Marsh Road (R150) to facilitate access to the affected properties for the duration of works. The new bridge would be set at a level to provide a suitable vertical clearance for the OHLE equipment. The roads along McGrath's Lane and Railway Terrace will need to be raised and potentially widened to facilitate tie in with revised bridge levels. Additional temporary access may be required during these works to maintain access to the residential properties during works to road levels. This option would require the temporary acquisition of land to the North of McGrath's Lane to facilitate construction of an access road.

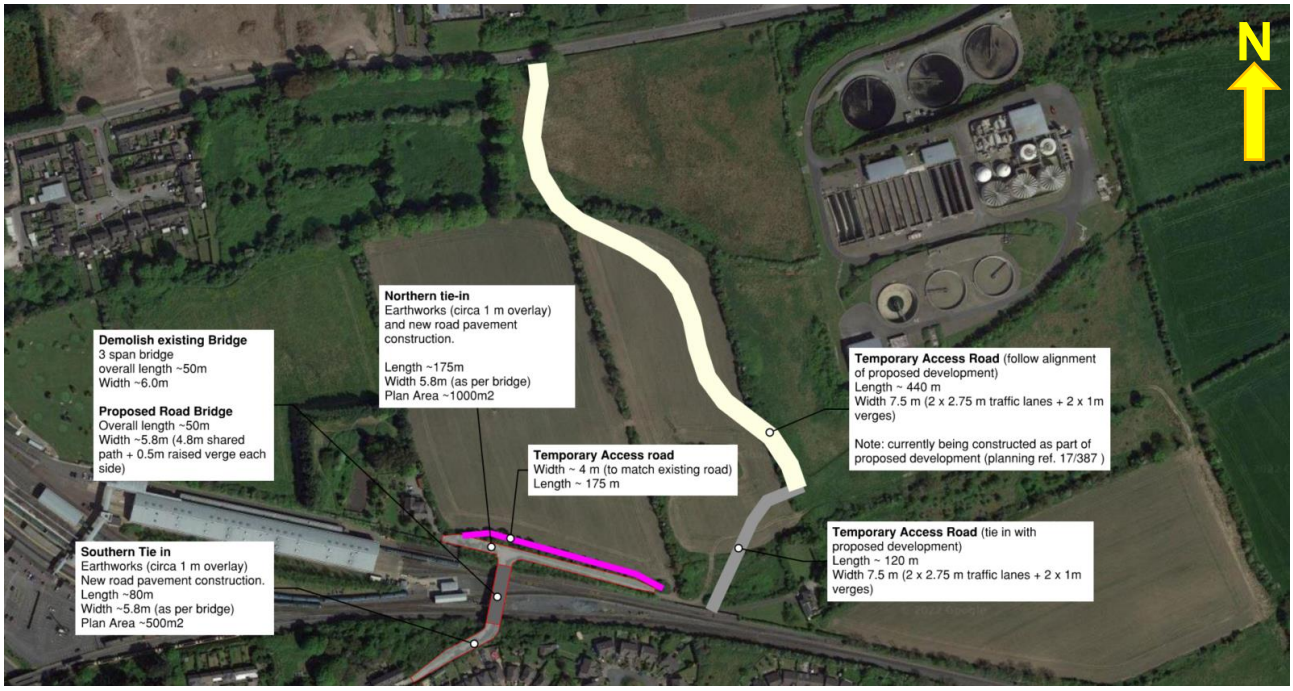

Figure 5-7: Option 1 – New bridge in existing location

5.4.2 Option 5 – Pedestrian bridge with alternative access road from the north

This option involves the removal of the existing bridge structure, the construction of a new pedestrian/cycle bridge in the same location and the construction of a new permanent access road to the North connecting to Marsh Road (R150). The existing bridge would be used for access to the affected properties for the duration of works and demolished once the new access route is provided. A new pedestrian cycle bridge would then be constructed in the location of existing bridge. The new bridge would be set at a level to provide a suitable vertical clearance for the OHLE equipment. The roads along McGrath's Lane and Railway Terrace will need to be raised to facilitate tie in with revised bridge levels. This option would require the permanent acquisition of land to the North of McGrath's Lane to facilitate construction of an access road.

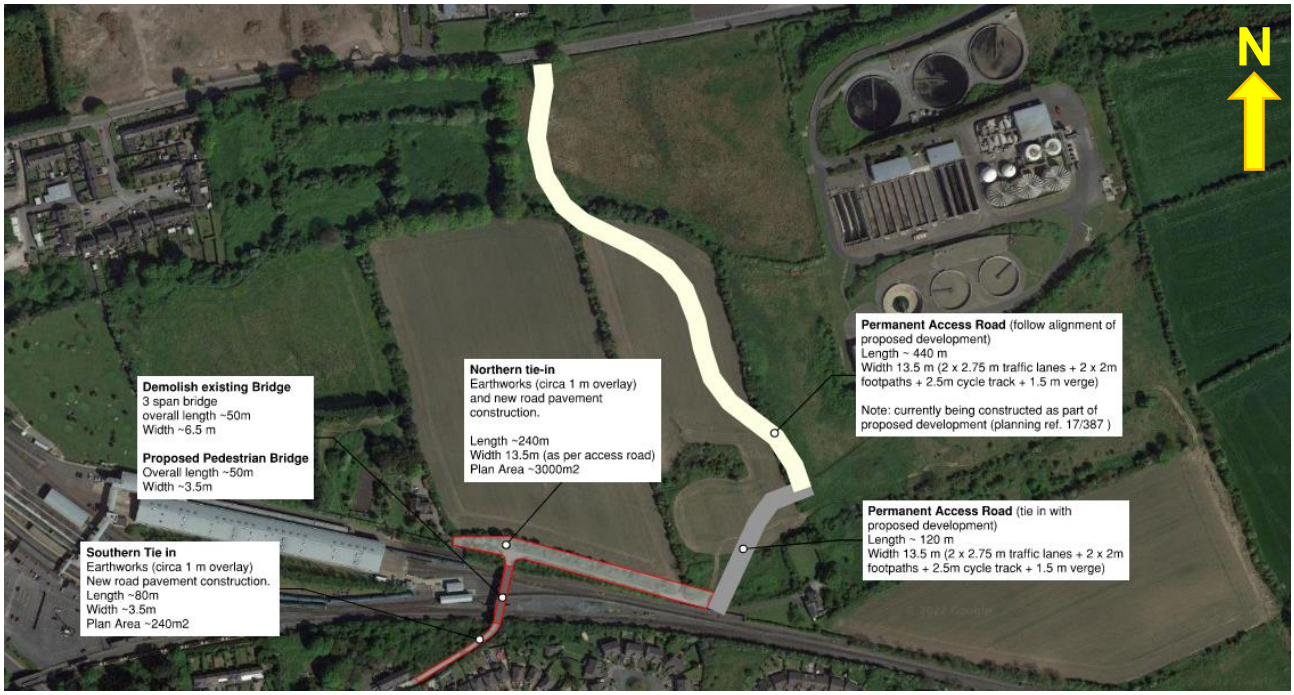

Figure 5-8: Option 5 – Pedestrian bridge with alternative access road from the north

5.4.3 Option 6 – Track lowering

This option involves lowering of the tracks through the station to allow for an electrical solution while retaining the existing bridge levels. This requires the removal of tracks and ballast, lowering of the formation and reinstatement of the tracks at a lower level. A minimum lowering of approximately 500 mm is required to attain a contact wire height of at least 4.400 m beneath the existing bridge. Lowering of the track at this location would have significant impacts on surrounding infrastructure including the Train depot, Wash unit and station platforms and track. Refer to Figure 5-6. Furthermore the existing drainage in the vicinity of these works will need to assessed with respect to acceptable given the extent of the maximum lowering is 500mm.

Modifications to the bridge parapets are still to be required to ensure safety of users from electrification below.

5.5 Multi-criteria analysis

5.5.1 Methodology

For each shortlisted option, an assessment against the MCA criteria has been carried out. Each option has been relatively compared against each other based on the five-point colour coded ranking scale shown in Table 5-7.

5.5.2 MCA summary table

A Multi-Criteria Assessment table is presented in this section. This has been developed to reflect the relative rankings for all sub-criteria assessed for each of the options and is presented as a summary of the key issues considered.

A more detailed table is provided in Appendix A with the full detailed rationale behind the scoring of each criteria and option.

Table 5-5: MCA results

Criteria	Sub-Criteria	Option 1	Option 5	Option 6
		New bridge in existing location	Pedestrian/cycle bridge with alternative access road from the north	Track lowering
Economy	CAPEX			
	OPEX			
	Train operations functionality/economic benefit			
	Traffic functionality and associated economic activities and opportunities			
Safety	Employer's Safety			
	Public safety			
Environment	Landscape and Visual Quality			
	Biodiversity			
	Noise and Vibration			
	Water resources			
	Archaeology, Architectural and Cultural Heritage			
	Geology and Soils			
	Agricultural and non-agricultural			
	Air Quality & Climate Change			
Accessibility & Social Inclusion	Accessibility			
	Social Inclusion			
Integration	Adaptability in the future			
	Transport Integration			
	Land Use Integration			
	Government policy integration			
	Geographical integration			
Physical	Walking/cycling opportunities			

Table 5-6: MCA summary table

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			

Table 5-7: MCA legend

Significant comparative advantage over other options
Some comparative advantage over other options
Comparable to other options / neutral
Some comparative disadvantage over other options
Significant comparative disadvantage over other options

5.5.3 Economy

Economy has been divided into four sub-criteria which are considered below.

CAPEX

Option 6 has significant disadvantages when compared to all other options. This is due to the vast amount of construction required to realise this option. Once you lower the track in the vicinity of the bridge, there are major knock-on effects – demolition and lowering of slab track through the refuelling area, demolition, and reconstruction of platforms to suit the lowered track, lifting and regrading switches and associated track changes with the approach to the depot building.

Options 1 and 5 score similarly. All involve demolition of the existing bridge and replacing with a new crossing. Although there are differences in the end use of the proposed bridges (Option 5 pedestrian and cyclist only), there are differences with regards to the access road from the north with some options required further road construction than others. Considering all factors inputting into the CAPEX parameter, all options have significant advantages over Option 6.

OPEX

The operational costs for all options are assessed to be similar and therefore comparable with each other.

Train operations functionality/economic benefits

Lowering the track (Option 6) around Drogheda Station will have major impacts to train operations during construction. Also, the operations to the depot wash unit and station will be impacted both during construction and operation. It will require prolonged shut down of the stations whilst works are undertaken. On this basis Option 6 as significant disadvantages over Options 1 and 5. The other 3 options will impact train operations during construction during the bridge demolition/construction, however this could be limited to weekends.

Traffic functionality and associated economic activities and opportunities

The proposed upgrades are part of a scheme that will increase the capacity of the rail system and consequently the attractiveness for trips to be undertaken by public transport in the Greater Dublin Area. As such, it brings about positive benefits to sustainable transportation.

When operational, the scheme will have no visible impacts on the prevailing traffic conditions in the surrounding road networks.

Construction activities on Options 1 and 5 are expected to generate a number of additional vehicular journey, and therefore will, at most, have a temporary impact on the traffic conditions of the local road network. There are no changes for Option 6 therefore it has some advantages over the other options.

5.5.4 Safety

Safety has been divided into two sub-criteria which are considered below. It should be noted that all options are safe, but some will have the potential for greater residual risks to remain. This criterion considers relative advantages of each option on the criteria of safety.

Employer's Safety

All options involve working in the railway corridor and imposes a risk during construction and for maintenance.

Public safety

Option 1 and 5 have some comparable advantages when compared to Option 6. These options either remove vehicles and pedestrian/cyclist interaction or improves the safety for pedestrians and cyclists using the bridge (by improving the visibility around bends).

5.5.5 Environment

Section 2.6 sets out a description of the existing environment, under key environmental criteria, while section 4.2 considers the key environmental constraints associated with this study area. Below is a summary of the key findings of the MCA under the various environmental criteria, with an emphasis on differentiating aspects for the options considered.

Landscape and Visual Impact

Options 1 and 5 maintain a bridge connection between Railway Terrace and McGrath's Lane in the historic location of the existing bridge and therefore, maintains the existing landscape structure. Option 1 would however, result in a more elevated bridge structure (for clearance) requiring works to raise the approach on Railway Terrace and McGrath's Lane. The elevated structure would be more visible from the surrounding properties and the works to the road would result in impact on roadside vegetation at either end of the bridge.

Option 5 involves provision of a pedestrian / cycle bridge only and therefore, is likely to be a lighter and smaller, and requiring less works to approach roads and a less visible structure. Proposed vehicular access will be facilitated via a nearby proposed access road serving a residential development which is under construction.

Option 6 involves lowering a section of over 500m of the railway by up to 500mm to achieve required clearance under the existing bridges. This will necessitate removal and replacement of existing platforms in McBride Railway Station, which in turn will impact the physical and visual setting of protected structures within the station, including the main station building.

Options 1 or 5 are preferrable with some comparative advantages over Option 6.

Biodiversity

All of the proposed options have potential to indirectly impact on the River Boyne and River Blackwater SAC, The Boyne Coast and Estuary SAC, the Boyne Estuary SPA and pNHA. There will be no direct impacts to any designated sites as all of the proposed works areas are outside of designated site boundaries. Potential indirect impacts include construction related impacts (e.g. potential for surface and ground water quality impacts or disturbance to birds) and new lighting which could impact on SCI birds. The potential for ground water impacts is greater in Option 6, and the potential for surface water impacts is comparable in all options.

Options 1 and 5 all include the demolition of bridges OBB80, 80A, and 80B, and reconstruction of a new bridge in its place. OBB80/80A/80B all have potential bat roosting features. Any works required on these bridges has the potential to impact roosting bats by disturbance and/or displacement. If bats are found to be roosting, NPWS will need to be consulted, and a bat derogation licence sought. Although Option 6 does not require the demolition of the bridge, the track beneath the bridge will be lowered, which will cause noise and possibly vibration on the bridge, with the potential for disturbance and/or displacement of any bats that may be roosting within the structures. The addition of lighting within this location may also impact commuting and/or foraging bats in the area. The potential impacts on bats are therefore neutral for all options.

Noise and Vibration

In terms of noise and vibration, the construction phase of all options has the greatest potential for adverse impacts on the surrounding sensitive community. This must be carefully managed during the construction process.

Options 1 and 5 are predicted to have a similar impact in terms of construction noise and vibration to the surrounding community. Option 6 is predicted to have a larger impact as the extent of the construction works near residential receptors is much larger than for Options 1 or 5.

From an operational noise and vibration perspective, all options are expected to have a neutral to positive impact, as the overbridge works will allow for electrification and therefore trains with a smaller noise impact.

Water resources

From a water resources perspective including surface waterbodies, groundwater, and flooding, all four alternatives have similar impacts as outlined in Section 4.2. Therefore, while there are some constraints that impact all four options there are no comparative advantages or disadvantages between the alternatives, so the options are considered neutral.

Archaeology, Architectural & cultural heritage

Options 1 and 5 involve the removal of overbridges (OBB 80/ 80A/ 80B) formerly shown as Newtown Bridge on the revised OS edition mapping. These structures are of industrial heritage interest and contribute to the overall historic form of the station. Works as part of these options and Option 6, will require excavation which has the potential to reveal below ground archaeological remains. All options 1, 5 and 6 are considered to be significantly constrained. Options 1 and 5 have potential for a significant impact as they involve the removal of the bridges. Similarly, Option 6 has potential for a significant impact, as in this instance the overbridges will be maintained and preserved in-situ, however considerable excavation will have to take place to lower the track, and this may affect and impact on other aspects of the protected station. Overall, when compared against each other the options are considered as neutral. A conservation led approach will be required for the implementation of successful design proposal in this case.

Geology and Soils

The comparative differences across the four options relate mainly to construction activities and the expected interaction with the underlying geology and soils.

This assessment is based on the assumption that much of the permanent and temporary access road required in Options 1 and 5 will have been constructed as part of the housing development to the south of the Drogheda Wastewater Treatment Plant (refer to Section 5.6, Planning application No. 17/387).

Option 6 has been ranked as the option with some comparative disadvantages over the other options. The proposed works, consist mainly of lowering the actual site level by a minimum of 500mm over a widespread area of approximately 25,000m^2. This will generate significantly larger volume of waste earthworks materials, much of which could include contaminated ballast and soil. This will require off site recovery, treatment and/or appropriate disposal, hence is less sustainable, will incur large disposal costs and the excavation will require increase the site traffic compared to the other options.

Demolition of the existing bridge, which is required for Options 1 and 5, will require the excavation of the soil around the existing bridge foundations and access road to the bridge. This material will likely consist of made ground, and may contain contamination, thereby requiring recovery or disposal.

Options 1 and 5 have been scored as having some comparative advantages over Option 6. In both options, the proposed works include of the demolition of the existing bridge, the construction of either new road with pedestrian/cycle access or pedestrian/cycle bridges at the same location, potential widening of existing roads, construction of the tie-in roads and temporary works for access to residential properties. This will require excavations and will generate earthworks materials for reuse or appropriate disposal.

Furthermore, in Options 1 and 5, the construction of a tie-in road is required. This will require the acquisition of land and will cause potential permanent loss of growing soil /topsoil. As such, Options 1 and 5 are the preferred option from a geology and soils perspective.

Agricultural and Non-Agricultural

In the existing situation Option 1 would involve temporary acquisition of agricultural land along 560m long temporary access road (Approx. 0.4ha). These temporary works on agricultural land would result in medium to long term damage to soil structure. There may also be some permanent land acquisition due to the re-alignment of McGrath's Lane to tie into the new overbridge. There would be temporary disturbance to the farm enterprise for the duration of construction. At this location the impact on agriculture from Option 1 is assessed as not significant.

In the existing situation Option 5 would involve permanent acquisition of agricultural land along 560m long access road (Approx. 0.8ha). There may also be some permanent land acquisition due to the re-alignment of McGrath's Lane to tie into new pedestrian overbridge. There would be temporary disturbance to the farm enterprise for the duration of construction and there would be permanent disturbance to the farm enterprise due to new access arrangements. At this location the impact on agriculture from Option 5 is assessed as slight adverse.

In the existing situation Option 6 would require a re-alignment of part of McGrath's Lane resulting in a small area of permanent agricultural land acquisition. There would be temporary disturbance to the farm enterprise for the duration of construction. At this location the impact on agriculture from Option 6 is assessed as not significant.

Air quality and climate

All options require significant construction and demolition works which have the potential to generate dust emissions at sensitive receptor locations. All options are comparable and likely effects will be similar, therefore are considered neutral.

The provision of electric wiring for all options will have the effect of reducing emissions from diesel engines having a positive impact on air quality and climate.

5.5.6 Accessibility and Social Inclusion

Accessibility and Social Inclusion has been divided into two sub-criteria which are considered below.

Accessibility

Options 1 and 6 provide access to vehicles, pedestrians and cyclists over the railway which have comparative advantages over Option 5, where vehicles are unable to use the new bridge and will need use the new road north of the railway corridor as an alternative. This will increase travel time for the limited number of properties affected.

Social Inclusion

All options provide a bridge with step free access to cross the railway and provide a more direct route to Drogheda Station from the north. All options are comparable, therefore are considered neutral.

5.5.7 Integration

Integration is assessed using the five sub-criteria described below.

Adaptability in the future

All options are comparable as the operation and construction of this station layout in all options has no impact on future internal transport links.

Transport Integration

Removing the vehicle crossing capability of OBB80/80A/80B in Option 5 means this option has significant disadvantages when compared to the other options. There are changes in journey time for the vehicles wanting to access north of the railway corridor.

Options 1 has significant advantages over all options as traffic integration for all modes of transport is maintained with improvements to pedestrian facilities. Option 6 has some advantages when compared to Option 5 has no changes are made to the current bridge however has some disadvantages when compared top Option 1.

Land Use Integration

All options are consistent with the zoning objective in the Development Plan and are therefore considered neutral when compared against each other.

Government policy integration

All options relate to works on the bridges themselves, the tracks or lands immediately adjoining the bridges. As such they do not interfere with or contribute to community severance more than possible temporary impacts. The options are considered neutral when compared against each other.

Geographical integration

All international, national, regional, and local policies encourage improvements in relation to the efficiency of public transport. All options will facilitate the achievement of greater efficiency in public transportation along part of the east coast of the country and therefore comply with government policy.

5.5.8 Physical Activity

Options 1 and 5 improve pedestrian facilities along the new bridge with Option 5 have significant comparable advantages to the other options as this option includes 2 x 2m footpath and a 2.5m cycle track. Option 1 improves the pedestrian facilities by providing better horizontal road geometry and improving visibility around bends. Option 6 has significant disadvantages compared to the other options as there is no improvements for pedestrians and cyclists.

5.6 Construction Considerations

Constructability considerations for the shortlisted options are as follows. Options 1 and 5 have many design similarities and can thus be compared in a relatively structured manner. Option 6 has a substantially different form of construction and thus comparison to the others is across a broader spectrum.

5.6.1 Option 1

There is a reliance on obtaining an access agreement with parties developing the plot of land just north of McGrath's Lane (reference Planning ref 17/387). In particular, the developers' proposed new road off the R150 highway would need to be used by the DART+ project as both site access road and to provide continued access to a number of properties along McGrath's Lane. It would be very challenging to find an alternative access route for the DART+ works on the north side of the railway if developers did not provide access through their plot, at the required time.

The required phasing of the works means that the programme is likely to be the longest of the three options where the bridges are demolished.

Depending upon design development, the option is likely to need a similar amount of land for construction as Option 5, assuming access is provided satisfactorily through the developer's plot of land, and substantially less than Option 6. Options 1 and 5 will all need temporary land within the field adjacent to the north, including a construction compound. The majority of trees along the field boundary in the area are likely to need to be felled, along with the diversion of overhead electricity lines (presently on poles along McGrath's Lane). A small compound will also ideally be available on the south side of the tracks, but this may be impractical with existing nearby trees, properties, and ground slope.

The number of track possessions required is also likely to be similar to Option 5, though Option 5 may need marginally fewer as it has a narrower replacement bridge.

5.6.2 Option 5

As with Option 1, there is a reliance on obtaining an access agreement with parties developing the plot of land just north of McGrath's Lane (reference Planning ref 17/387). In particular, the developers' proposed new road off the R150 highway would need to be used by the DART+ project as both site access road and for permanent access to a number of properties along McGrath's Lane. It would be very challenging to find an alternative access route for the DART+ works on the north side of the railway if developers did not provide access through their plot, at the required time.

The required phasing of the works means that the programme is likely to be the second longest of the three options where the bridges are demolished. It is expected to be slightly shorter than Option 1 as the new bridge is less than half the width of the new Option 1 bridge.

Depending upon design development, the option is likely to need a similar amount of land for construction as Options 5 and 2, assuming access is provided satisfactorily through the developer's plot of land, and substantially less than Option 6. As with Option 1, temporary land within the field adjacent to the north will be needed for a construction compound. The majority of trees along the field boundary in the area are likely to need to be felled, along with the diversion of overhead electricity lines (presently on poles along McGrath's Lane). A small compound will also ideally be available on the south side of the tracks, but this may be impractical with existing nearby trees, properties and ground slope.

The number of track possessions required is likely to be similar to Option 5, though Option 5 may need marginally fewer than Option 1 as it has a narrower replacement bridge.

The level of disruption on the south side of the tracks is expected to be marginally less with Option 5 than with Option 1 as the new bridge is smaller and thus likely to need less land take and possibly smaller construction plant.

5.6.3 Option 6

Option 6 would need a substantial amount of trackwork and other facilities across a wide and busy area. Before developing a construction strategy, a detailed understanding of the level of acceptable disruption to the railway would need to be established. This would then lead into a phasing plan, and subsequently a programme.

In all cases, a large number of days of track closure would be needed to undertake necessary works. This would be for both widespread track and platform lowering (much on slabs) and repositioning of facilities such as wash unit, fuelling, watering and drainage. This would include much of the headshunt and stabling sidings as well as multiple crossovers and switches.

Environmental aspects of Option 6 works would be substantial compared with other Options, as there would be much demolition, excavation and new build works spread over a wide area and timescale.

The programme for Option 6 works would be significantly longer than for other options, in addition to levels of disruption on railway services.

5.6.4 Summary of options

From a construction perspective, Option 6 is significantly worse as it would be very disruptive to multiple railway users compared with the other options. Options 1 and 5 have the disadvantage of being reliant on sharing a new access road (yet to be built) with an adjoining third party. This may risk disrupting the DART+ programme should it not be available at the required time. This could be mitigated if suitable alternative routes are provided during the construction staging. Option 5 is better than Option 1 as construction of its new (smaller) bridge would be the easier of the two.

Option 1, however, is the overall preferred option as it has significant advantages over all options as traffic integration for all modes of transport is maintained with improvements to pedestrian facilities.

6. SUMMARY AND CONCLUSIONS

6.1 Non-preferred options

Option 6 is not preferred due to:

- Major impacts to the train functionality, particularly during construction.
- Major alterations to Drogheda Station and Depot facilities which equates to considerable higher costs, compared to all other options.
- A number of environmental impacts: landscape and visual quality, noise and vibration and Geology.
- No considerations to promoting walking and cycling.

Option 5 is not preferred due to:

- The removal of vehicle access to the northern side of the railway corridor negatively impacts integration with modes of transport. There is no policy or local support currently provided for amendments to road traffic movements in this area.
- Poor accessibility as vehicles cannot use the bridge. This impacts on the traffic functionality.

6.2 Preferred option

Option 1 have been chosen as the preferred option as it:

- Provides improved infrastructure crossing the railway corridor for vehicles, cyclists, and pedestrians. This provides a safer form of crossing the railway corridor and improves transport integration.
- Improves road alignment to current location.

Please refer to Appendix B for Preferred Option drawings.

6.3 Key risks/next steps

The following key risks and next steps have been identified as:

- To determine the exact alignment of the bridge.
- Land purchase is required for temporary road access. Discussions with landowners/developers to agree extent and timings are required.
- Construction phasing plans to be developed to minimise disruption to train operations.

Appendix A

OBB80/80A/80B MCA Matrix

Appendix B

Preferred Option drawings