DART+ South West

Volume 3I: Option Selection –

Heuston West Station - Report and Drawings

Iarnród Éireann

November 2021

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Glossary of Terms

Reference	Description
ABP	An Bord Pleanála
ACA	Architectural Conservation Area
APIS	Authorisation for Placing in Service
ASA	Application for Safety Approval
AsBo	Assessment Body
ASP	Auxiliary Supply Point
ASPSC	Application Specific Project Safety Case
ATP	Automatic Train Protection
CAF	Common Appraisal Framework
Cantilever	OHLE structure comprising horizontal or near horizontal members supporting the catenary projecting from a single mast on one side of the track.
Catenary	The longitudinal wire that supports the contact wire.
CAWS	Continuous Automatic Warning System
CBI	Computer-Based Interlocking
CCE	Chief Civils Engineers Department of IE
CCRP	City Centre Re-signalling Project
CCTV	Closed Circuit Television
CDP	County Development Plan
CIÉ	Córas Iompair Éireann
Contact wire	Carriers the electricity which is supplied to the train by its pantograph.
CPO	Compulsory Purchase Order
Cross overs	A set of railway parts at the crossing of several tracks which helps trains change tracks to other directions.
CRR	Commission for Rail Regulation (formerly RSC – Railway Safety Commission)
CSM RA	Common Safety Method for Risk Evaluation and Assessment
CSS	Construction Support Site, Interchangeable with Construction Compound
CTC	Central Traffic Control

Reference	Description
Cutting	A railway in cutting means the rail level is below the surrounding ground level.
D&B	Design & Build (contractor)
DART	Dublin Area Rapid Transit (IÉ's Electrified Network)
DART+	DART Expansion Programme
DeBo	Designated Body
DC	Direct Current electrical current that flows in one direction, like that from a battery.
DCC	Dublin City Council
DRR	Design Review Report
DSR	Design Statement Report
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
Electrification	Electrification is the term used in supplying electric power to the train fleet without the use of an on-board prime mover or local fuel supply.
EMC	Electromagnetic Compatibility
EMU	Electric Multiple Unit (DART train)
EN	European Engineering Standard
EPA	Environmental Protection Agency
EPO	Emerging Preferred Option
ERTMS	European Rail Traffic Management System
ESB	Electricity Supply Board
Four-tracking	Four-tracking is a railway line consisting of four parallel tracks with two tracks used in each direction. Four track railways can handle large amounts of traffic and are often used on busy routes.
FRS	Functional Requirements Specification
FSP	Final Supply Points
GDA	Greater Dublin Area
GI	Ground Investigation
HAZID	Hazard Identification

Reference	Description
Horizontal Clearance	The horizontal distance between a bridge support and the nearest railway track is referred to as horizontal clearance. Bridge supports include abutments (at the ends of the bridge) and piers (at intermediate locations).
HV	High Voltage
IA	Independent Assessor
IÉ	Iarnród Éireann
IM	Infrastructure Manager (IÉ)
IMSAP	Infrastructure Manager Safety Approval Panel
Insulators	Components that separate electricity live parts of the OHLE from other structural elements and the earth. Traditionally ceramic, today they are often synthetic materials.
KCC	Kildare County Council
Lateral Clearance	Clearances between trains and structures.
LCA	Landscape Character Area
Mast	Trackside column, normally steel that supports the OHLE.
MCA	Multi-criteria Analysis
MDC	Multi-disciplinary Consultant
MEP	Mechanical electrical and plumbing
MFD	Major Feeding Diagram
MMDC	Maynooth Multi-disciplinary Consultant
MV	Medium Voltage
NDC	National Biodiversity Data Centre
NIAH	National Inventory of Architectural Heritage
NoBo	Notified Body
NTA	National Transport Authority
OHLE	Overhead Line Equipment
Overbridge (OB)	A bridge that allows traffic to pass over a road, river, railway etc.
P&C	Points and Crossings
Pantograph	The device on top of the train that collects electric current from the contact wire to power the train.
PC	Public Consultation

Reference	Description
Permanent Way	A term used to describe the track or railway corridor and includes all ancillary installations such as rails, sleepers, ballast as well as lineside retaining walls, fencing and signage.
POAP	Plan-On-A-Page, high-level emerging programme
PPT	Phoenix Park Tunnel
PRS	Project Requirement Specification
PSCS	Project Supervisor Construction Stage
PSDP	Project Supervisor Design Process
PSP	Primary Supply Points
QA/QC	Quality Assurance/Quality Control
RAM	Reliability, Availability, Maintainability
RC	Reinforced Concrete
Re-signalling	Re-signalling of train lines will regulate the sage movement of trains and increase the capacity of train services along the route.
RMP	Record of Monuments and Places
RO	Railway Order
RPS	Record of Protected Structures
RSC-G	Railway Safety Commission Guideline
RU	Railway Undertaking (IÉ)
SAM	Safety Assurance Manager
SAP	Safety Approval Panel
SDCC	South Dublin County Council
SDZ	Strategic Development Zone
SET	Signalling, Electrical and Telecommunications
Sidings	A siding is a short stretch of railway track used to store rolling stock or enable trains on the same line to pass
SMR	Sites and Monuments Records
SMS	IÉ Safety Management System
TII	Transport Infrastructure Ireland
TMS	Train Management System

Reference	Description
TPH	Trains per Hour
TPHPD	Trains per Hour per Direction
TPS	Train Protection System
Track Alignment	Refers to the direction and position given to the centre line of the railway track on the ground in the horizontal and vertical planes. Horizontal alignment means the direction of the railway track in the plan including the straight path and the curves it follows.
TSI	Technical Specifications for Interoperability
TSS	Train Service Specification
TTAJV	TYPSA, TUC RAIL and ATKINS Design Joint Venture (also referred to as TTA)
Underbridge (UB)	A bridge that allows traffic to pass under a road, river, railway etc. The underneath of a bridge.
VDC	Direct Current Voltage
Vertical Clearance	For overbridges, an adequate vertical distance between railway tracks and the underside of the bridge deck (soffit) must be provided in order to safely accommodate the rail vehicles and the OHLE. This distance is known as vertical clearance and it is measured from the highest rail level.
WFD	Water Framework Directive

1. Introduction

1.1. Purpose of the Report

The purpose of this report is to provide technical input to the Option Selection Report to inform Public Consultation no.2 (PC2). This report shows the options considered as part of the project development and why the preferred option for PC2 was chosen.

This report provides a technical assessment associated with the provision of a new station at Heuston West which is to be provided as part of the DART+ Programme.

This report presents the approach to option development, options assessment, and options selection. This optioneering process incorporates assessment by the specialist Project Teams to determine a preferred solution which will fulfil the business needs and project requirements.

The requirements have been taken from the Project Scope of Works and meetings with IÉ.

The report focuses on two main elements

- The Station Configuration, which includes the platform layout and the track crossing needed for both passengers and pedestrians.
- Passenger links to Heuston station.

The report provides:

- An area overview and a detailed description of the existing railway infrastructure and challenges.
- The Project Requirements for this area.
- The technical and environmental constraints
- The options considered for this area.
- The option selection process leading to the identification of the Emerging Preferred Option, including the Sifting process and the Multi-Criteria Analysis process.
- A summary of the feedback received from the first public consultation which was held in May and June 2021.
- Provides an update on the design development
- Provides an overview of the proposed construction methodology and requirements in terms of construction compounds.

1.2. DART+ Programme Overview

The DART+ Programme is a transformative railway investment programme, that will modernise and improve the existing rail services in the Greater Dublin Area (GDA). It will provide a sustainable, electrified, reliable and more frequent rail service, improving capacity on rail corridors serving Dublin.

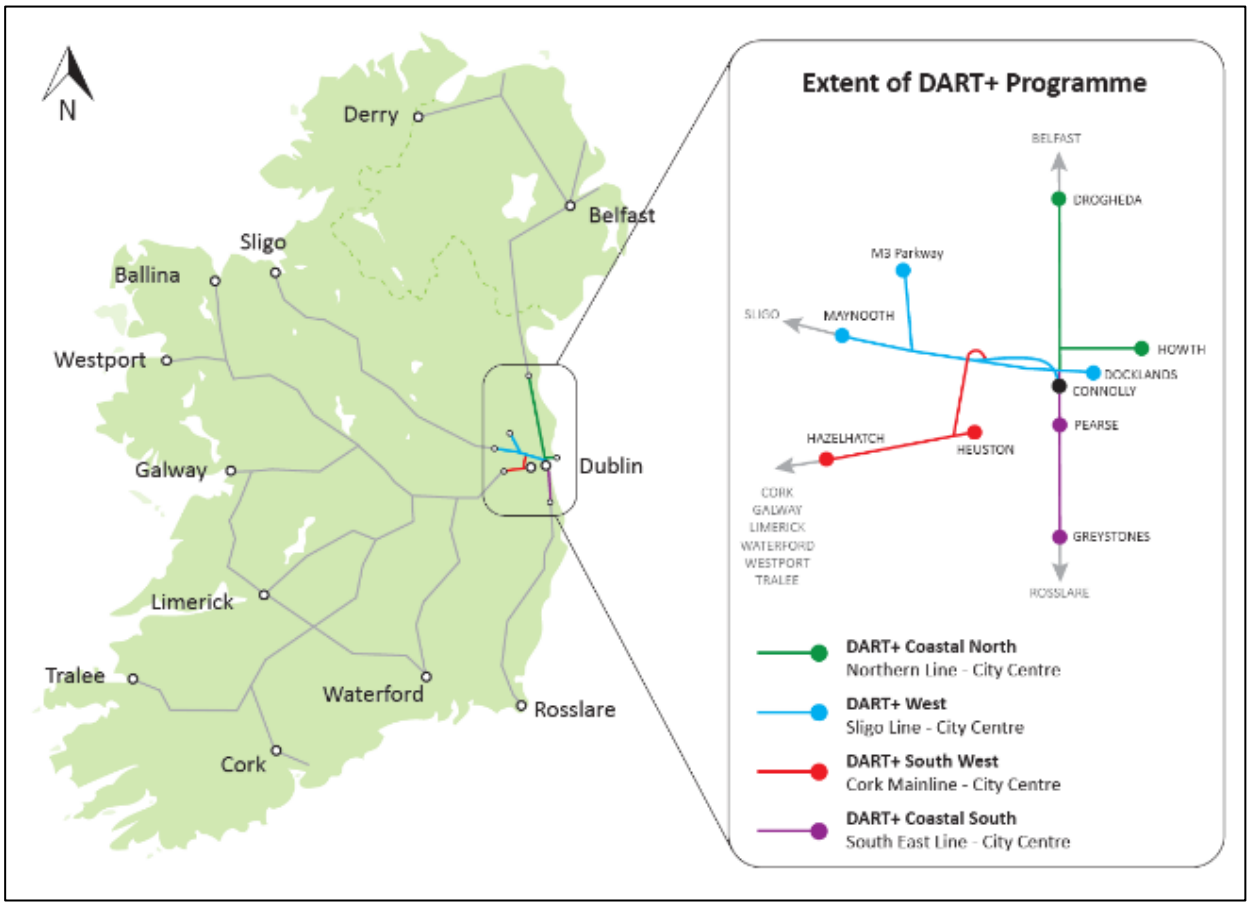


Figure 1-1 Schematic of Overall DART+ Programme

The current electrified DART network is 50km long, extending from Malahide / Howth to Bray / Greystones. The DART+ Programme seeks to increase the network to 150km. The DART+ Programme is required to facilitate increased train capacity to meet current and future demands, which will be achieved through a modernisation of the existing railway corridors. This modernisation includes the electrification, re-signalling, and certain interventions to remove constraints across the four main rail corridors within the Greater Dublin Area, as per below:

- DART+ South West (this Project) – circa 16km between Hazelhatch & Celbridge Station and Heuston Station and also circa 4km between Heuston Station and Glasnevin Junction, via the Phoenix Park Tunnel Branch Line.
- DART+ West – circa 40km from Maynooth & M3 Parkway Stations to the City Centre.
- DART+ Coastal North – circa 50km from Drogheda to the City Centre.
- DART+ Coastal South – circa 30km from Greystones to the City Centre.

The DART+ Programme also includes the purchase of new electrified fleet to serve new and existing routes.

The DART+ Programme is a key element to the national public transportation network, as it will provide a high-capacity transit system for the Greater Dublin Area and better connectivity to outer regional cities and towns. This will benefit all public transport users.

The Programme has also been prioritised as part of Project Ireland 2040 and the National Development Plan 2021 - 2030 as it is integral to the provision of an integrated, high-quality public transport system.

Delivery of the Programme will also promote transport migration away from the private car and to public transport. This transition will be achieved through a more frequent and accessible electrified service, which will result in reduced road congestion, especially during peak commuter periods.

Ultimately, the DART+ Programme will provide enhanced, greener public transport to communities along the DART+ Programme routes, delivering economic and societal benefits for current and future generations.

1.3. DART+ South West Project

The DART+ South West Project will deliver an electrified network, with increased passenger capacity and enhanced train service between Hazelhatch & Celbridge Station to Heuston Station (circa 16km) on the Cork Mainline, and Heuston Station to Glasnevin via Phoenix Park Tunnel Branch Line (circa 4km).

DART+ South West Project will complete four-tracking between Park West & Cherry Orchard Station and Heuston Station and will also re-signal and electrify the route. The completion of the four-tracking will remove a significant existing constraint on the line, which is currently limiting the number of train services that can operate on this route. DART+ South West will also deliver track improvements along the Phoenix Park Tunnel Branch Line, which will allow a greater number of trains to access the city centre.

Upon completion of the electrification of the DART+ South West route, new DART trains will be used on this railway corridor, similar to those currently operating on the Malahide / Howth to Bray / Greystones Line.

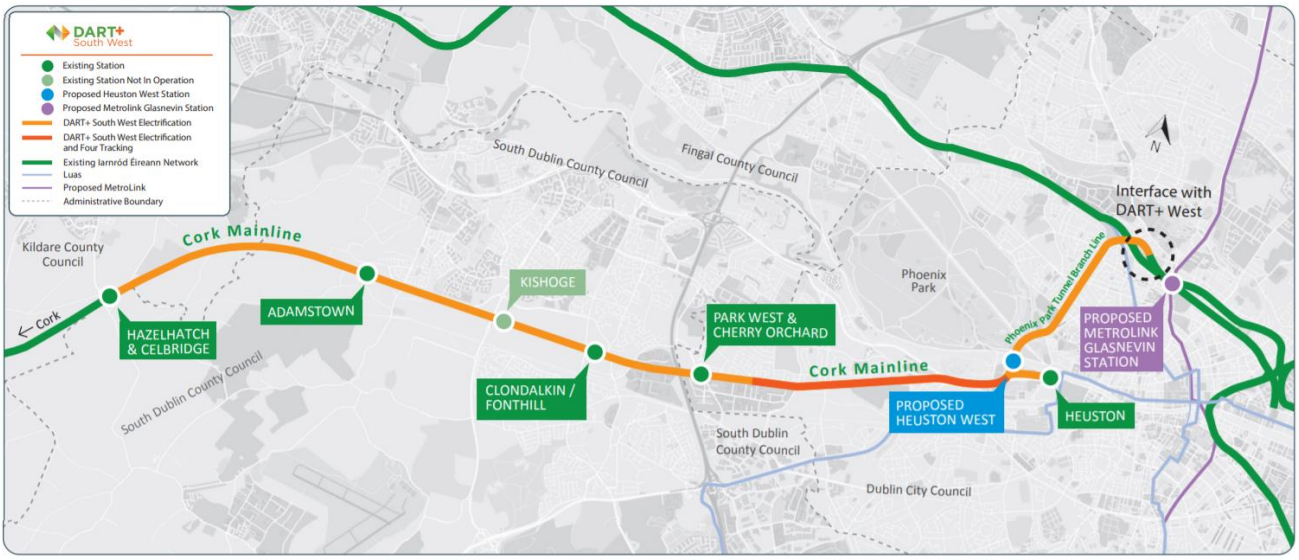


Figure 1-2 DART+ South West Route Map

1.4. Capacity Improvements Associated with DART+ South West

DART+ South West will improve performance and increase train and passenger capacity on the route between Hazelhatch & Celbridge Station to Heuston Station and through the Phoenix Park Tunnel Branch Line to the City Centre, covering a distance of circa 20km. It will significantly increase train capacity from the current 12 trains per

hour per direction to 23 trains per hour per direction (i.e. maintain the existing 12 services, with an additional 11 train services provided by DART+ South West). This will increase passenger capacity from the current peak capacity of approximately 5,000 passengers per hour per direction to approximately 20,000 passengers per hour per direction. Upon completion of the DART+ South West Project, train services will be increased according to passenger demand.

1.5. Key Infrastructural Elements of DART+ South West Project

The key elements of DART+ South West include:

- Completion of four-tracking from Park West & Cherry Orchard Station to Heuston Station, extending the works completed on the route in 2009.
- Electrification of the line from Hazelhatch & Celbridge Station to Heuston Station and also from Heuston Station to Glasnevin Junction, via the Phoenix Park Tunnel Branch Line, where it will link with the proposed DART+ West.
- Undertaking improvements / interventions of bridges to achieve vertical and horizontal clearances.
- Remove rail constraints along the Phoenix Park Tunnel Branch Line.
- Delivery of a new Heuston West Station.

The 'Preferred Option' will be compatible with the future stations at Kylemore and Cabra, although the construction of these stations is not part of the DART+ South West Project.

1.6. Route Description

The existing rail corridor extends from Heuston Station to Hazelhatch & Celbridge Station, the route also extends through the Phoenix Park Tunnel to Glasnevin. The area descriptions and extents are set out in **Table 1-1** and **Figure 1-2**.

Table 1-1 Route Breakdown

Area Name	Sub-area Description	Extents	Main Features
Hazelhatch to Park West	Area from Hazelhatch to Park West (Volume 3A)	West side of Hazelhatch & Celbridge Station to 50m to west of Cherry Orchard Footbridge (OBC8B)	Hazelhatch & Celbridge Station Adamstown Station Clondalkin/Fonthill Station Park West & Cherry Orchard Station
Park West to Heuston Station	Area from Park West to Le Fanu (Volume 3B)	West of Cherry Orchard Footbridge (OBC8B) to the East of the proposed Le Fanu Road Bridge (OBC7)	Cherry Orchard Footbridge (OBC8B) Le Fanu Road Bridge (OBC7)

Area Name	Sub-area Description	Extents	Main Features
	Area from Le Fanu to Kylemore (Volume 3C)	East of the proposed Le Fanu Road Bridge (OBC7) to the East of IE700B (i.e. the points for the Inchicore headshunt turnout)	Kylemore Road Bridge (OBC5A)
	Area from Kylemore to Sarsfield (Volume 3D)	East of IE700B (i.e. the points for the Inchicore headshunt turnout to the west of Sarsfield Road Bridge (UBC4)	Inchicore Works Depot Khyber Pass Footbridge (OBC5)
	Area from Sarsfield to Memorial (Volume 3E)	West of Sarsfield Road Bridge (UBC4) to the West of Memorial Road Bridge (OBC3)	Sarsfield Road Bridge (UBC4)
	Memorial Road (Volume 3F)	Area around Memorial Road Bridge	Memorial Road Bridge (OBC3)
	Area from Memorial Road to South Circular Road Junction (Volume 3G)	East of Memorial Road Bridge (OBC3) to East of St John's Road Bridge (OBC0A)	South Circular Road Junction South Circular Road Bridge (OBC1) St Johns Road Bridge (OBC0A)
	Area around Heuston Station and Yard (Volume 3H)	Area at the South side of the Heuston Station Yard (non-DART+ tracks)	Heuston Station Sidings around Heuston Station
Heuston West Station	New Heuston West Station (Volume 3I)	Area to the West of Heuston Station, adjacent to Liffey Bridge (UBO1)	Heuston West Station
St John's Road Bridge (Islandbridge) to Glasnevin Junction	East of St John's Road Bridge (OBC0A) (Islandbridge) to North of Phoenix Park Tunnel (Volume 3J)	East of St John's Road Bridge (OBC0A) (Islandbridge) to North of Phoenix Park Tunnel	Liffey Bridge (UBO1). Conyngham Road Bridge (OBO2) Phoenix Park Tunnel
St John's Road Bridge to Glasnevin Junction	North of the Phoenix Park Tunnel to Glasnevin Junction (Volume 3K)	North of Phoenix Park Tunnel to South of Glasnevin Junction	McKee Barracks Bridge (OBO3) Blackhorse Avenue Bridge (OBO4)

Area Name	Sub-area Description	Extents	Main Features
			Old Cabra Road Bridge (OBO5) Cabra Road Bridge (OBO6) Fassaugh Avenue Bridge (OBO7) Royal Canal and LUAS Twin Arches (OBO8) Maynooth Line Twin Arch (OBO9) Glasnevin Cemetery Road Bridge (OBO10)

1.7. Stakeholder Feedback

A large volume of stakeholder submissions were received during the six week public consultation period, which ran from 12th May 2021 to 23rd June 2021, an additional week was provided, extending the consultation period until 30th June 2021. All submissions received either via email, post, telephone, or through the online feedback form, were analysed and recorded by the project team on a dedicated consultation database. Each individual submission was analysed to identify the themes that were raised by the respondent and each submission was classified according to the themes raised. All feedback provided, was then anonymised before being analysed under each of the themes. In addition, further engagement with relevant local authorities and prescribed stakeholders has been ongoing. Engagement with potentially affected landowners has also taken place since the commencement of PC1.

All submissions received as part of the first round of public consultation have fed into the design process and the selection of the Preferred Option. The project team has analysed the submissions and considered all relevant information in re-evaluation and further development of design options leading to the selection of the Preferred Option. In summary, the PC1 stakeholder feedback for the provision of DART services to existing stations between Hazelhatch and Park West were welcomed. However, it was noted within the feedback that the stations are located around large undeveloped areas and there was concern for the lack of stations within existing urban neighbourhoods.

Feedback in relation to Heuston West station was generally positive, with submissions welcoming the proposition of a potential station at this location, and the increased connectivity it would bring to the wider transport network in the city and surrounding areas.

Specific feedback received from the public in relation to Heuston West Station primarily related to public access to the station and how it should be integrated with the surrounding area. In this regard, submissions suggested that, assuming the station would be located at Heuston Platform 10, pedestrian access from Islandbridge should be provided via a new opening in the Clancy Quay boundary wall.

Feedback also suggested that the station name, ‘Heuston West’, should instead by named ‘Islandbridge’ to better represent the local community and contribute to the identity of this area.

Notwithstanding the generally positive feedback in relation to Heuston West, several submissions expressed concern relating to visual impact and noise – both during construction and operational phases. Coordination of construction works was also highlighted as a concern.

Having regard for this feedback, the Design Team has noted the following:

- Connection with Clancy Quay was considered in the planning permission granted for its development. It included two possibilities, both to be used by pedestrians and cyclists (not vehicles) and not secured by gates, fences or similar.
- The proposed location for the Heuston West Station is adjacent to existing rail facilities to the east side, which limits the position and dimensions of access to the proposed station. As noted in Section 2.4, the National Train Control Centre (NTCC) is currently under construction, the facility is located adjacent to Platform 10 area. The facility will comprise of a 5,500m2 building constructed over 5 floors over basement.
- The road and pedestrian link to connect the proposed new Heuston West Station with Heuston Terminal Station and Luas stop is constrained by the existing rail buildings and facilities along the route.
- The proposed designs for the station and passenger transfer routes require some intervention in areas already occupied by existing operational areas..
- A significant interface is proposed with Dublin Bus and NTA (Outlined in more detail in section 6 of this report).
- Considerations in relation to visual and noise impact and works coordination will be regarded.

2. Existing Situation

2.1. Overview

The site for the proposed new station is located to the west of Heuston Station, adjacent to the Clancy Quay Development and the new National Train Control Centre (NTCC) site, as shown in **Fig. 2.1** below.

The site is within the Heuston Station environs which includes the main Heuston Station building, ancillary buildings, platforms, track areas, car parks and maintenance facilities. There is existing pedestrian and vehicle access which extends from the proposed site, along the existing access road to the main Heuston Station and the LUAS Red Line stop which is located at the front entrance to Heuston Station.

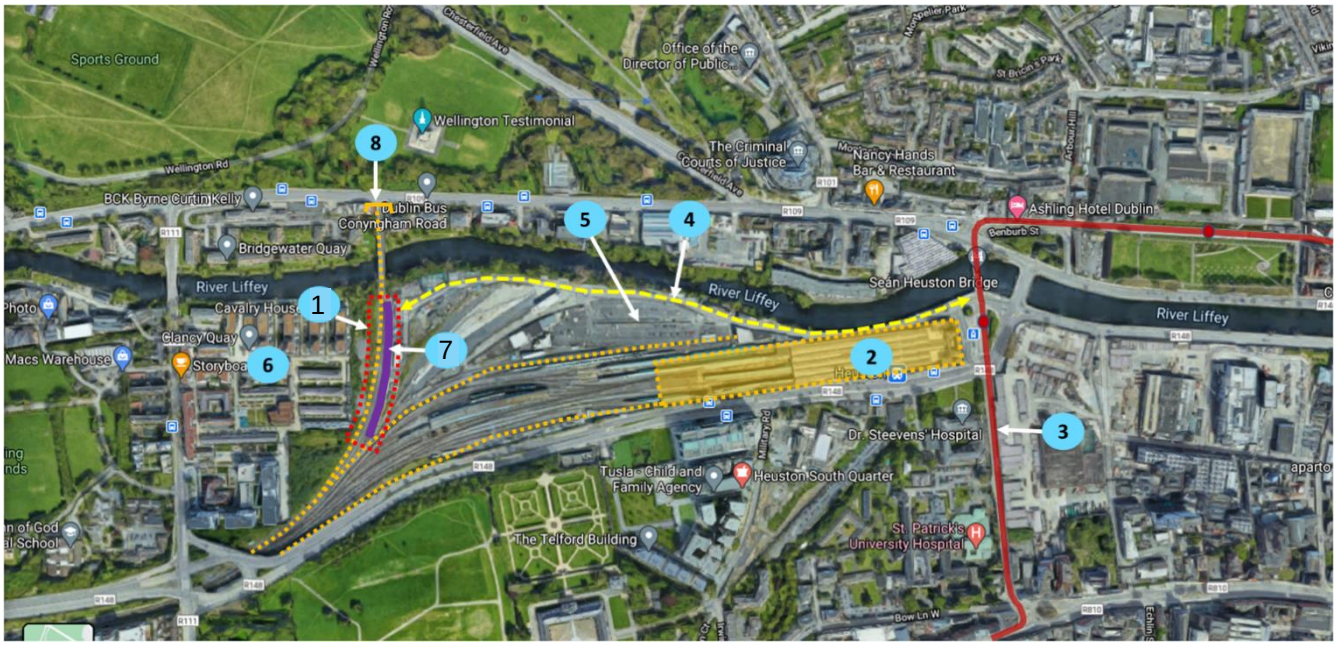


Figure 2-1 Heuston West Station Location and Surrounding Area

1) **Proposed Heuston West Station**
2) **Heuston Station**
3) **LUAS & Bus interchange**
4) **Existing route**
5) **Car park area**
6) **Clancy Quay development**
7) **Existing Platform 10**
8) **Phoenix Park Tunnel portal**

2.2. Challenges

The project objective for this section of the scheme is to provide a new station located to the west of the main Heuston Station. The new station to provide connectivity to other transport modes in the Heuston area.

Given the urban environment and the proximity of residential properties, a challenge is the urban integration of the new station, minimizing its impact and achieving proper urban connections for station users and neighbours.

2.3. Existing Structures and Facilities

Existing constructions and facilities around the station are as shown below:

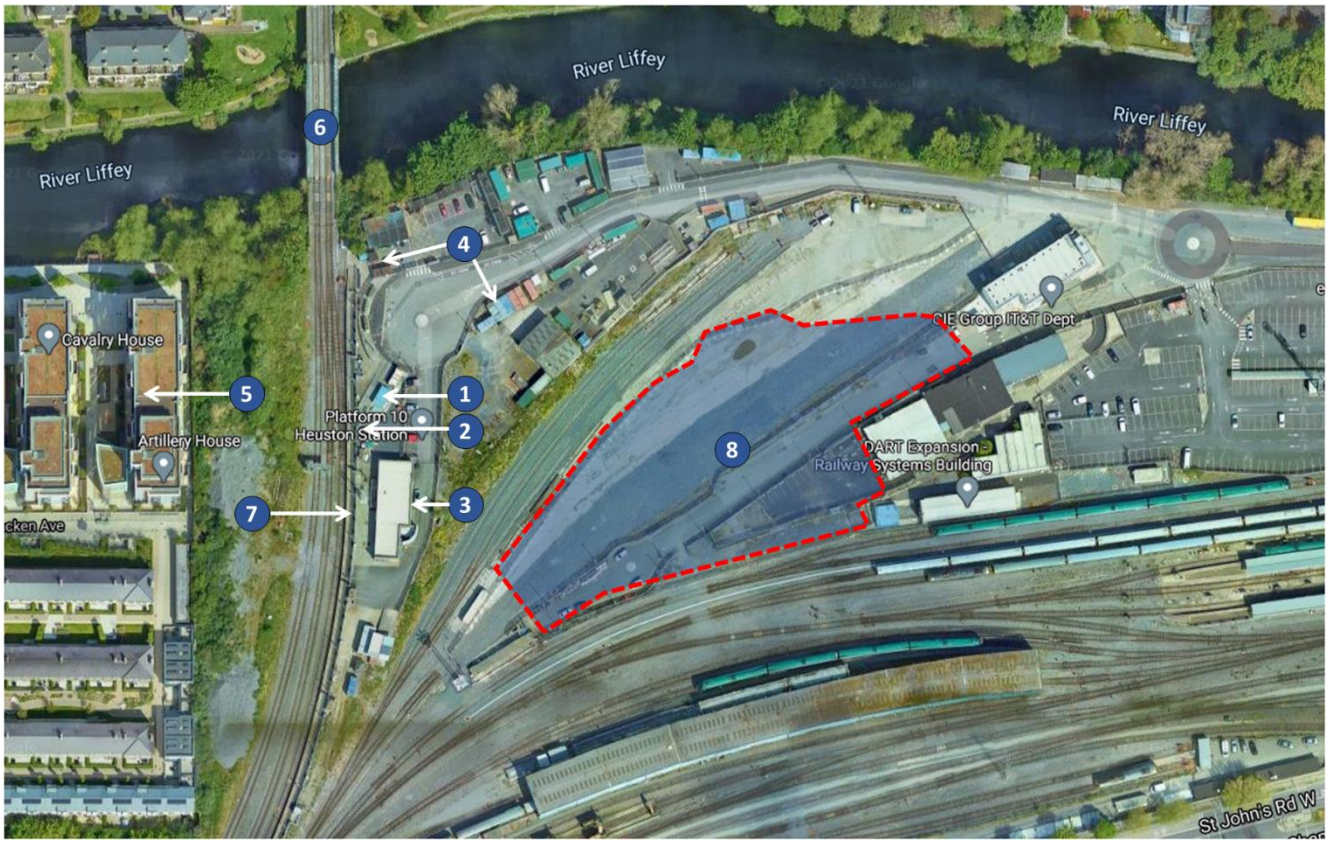


Figure 2-2 Heuston West station area

1) **Dublin Bus staff ablution block**
2) **Electrical /equipment block**
3) **Signalling building**
4) **Containers**
5) **Clancy Quay**
6) **Liffey Railway Bridge**
7) **Existing platform**
8) **New National Train Control Centre (NTCC)**

The Signalling building and compound is located on the eastern side of the existing platform 10, surrounded by a fence. There are other track and station maintenance facilities in the same area, generally with containers and temporary material storage.

2.4. Permanent Way and Tracks

The Permanent Way in this area currently consists of three tracks, the Up Branch, Down Brach and the Down Loop Line. The Up and Down Branch run from the east of Island Bridge Junction and continue on to Glasnevin junction via the Phoenix Park tunnel.

The Down Loop connects to the existing Platform 10 which, due to current operational constraints at Heuston, is not used for passenger services.

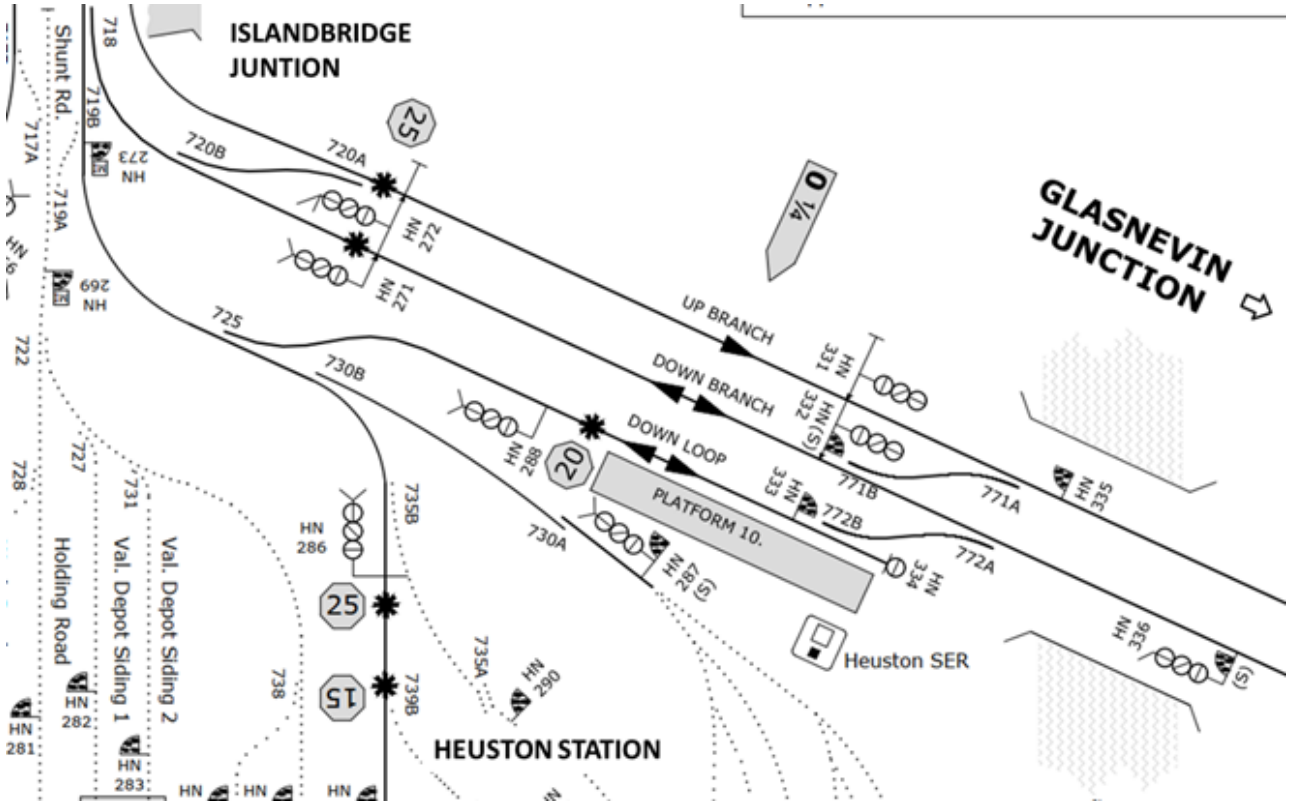


Figure 2-3 Track layout, Heuston Platform 10 Area

There are two crossovers north of Platform 10 (771AB & 772AB) and a siding buffer stop on the Down Loop. The platform is 200m (approximately) long.

Figure 2-4 Platform 10 aerial view

Figure 2-5 Platform 10, views facing north

2.5. Other railway facilities

2.5.1. National Train Control Centre (NTCC)

The National Train Control Centre (NTCC) is NTCC will be Iarnród Éireann's centre for the management and regulation of train movements on the Iarnród Éireann network. The new NTCC facility is currently under construction, the facility is located adjacent to platform 10 (See **Figure 2-6** below). The facility will comprise of a 5,500m2 building constructed over 5 floors over basement (See **Figure 2-7**).

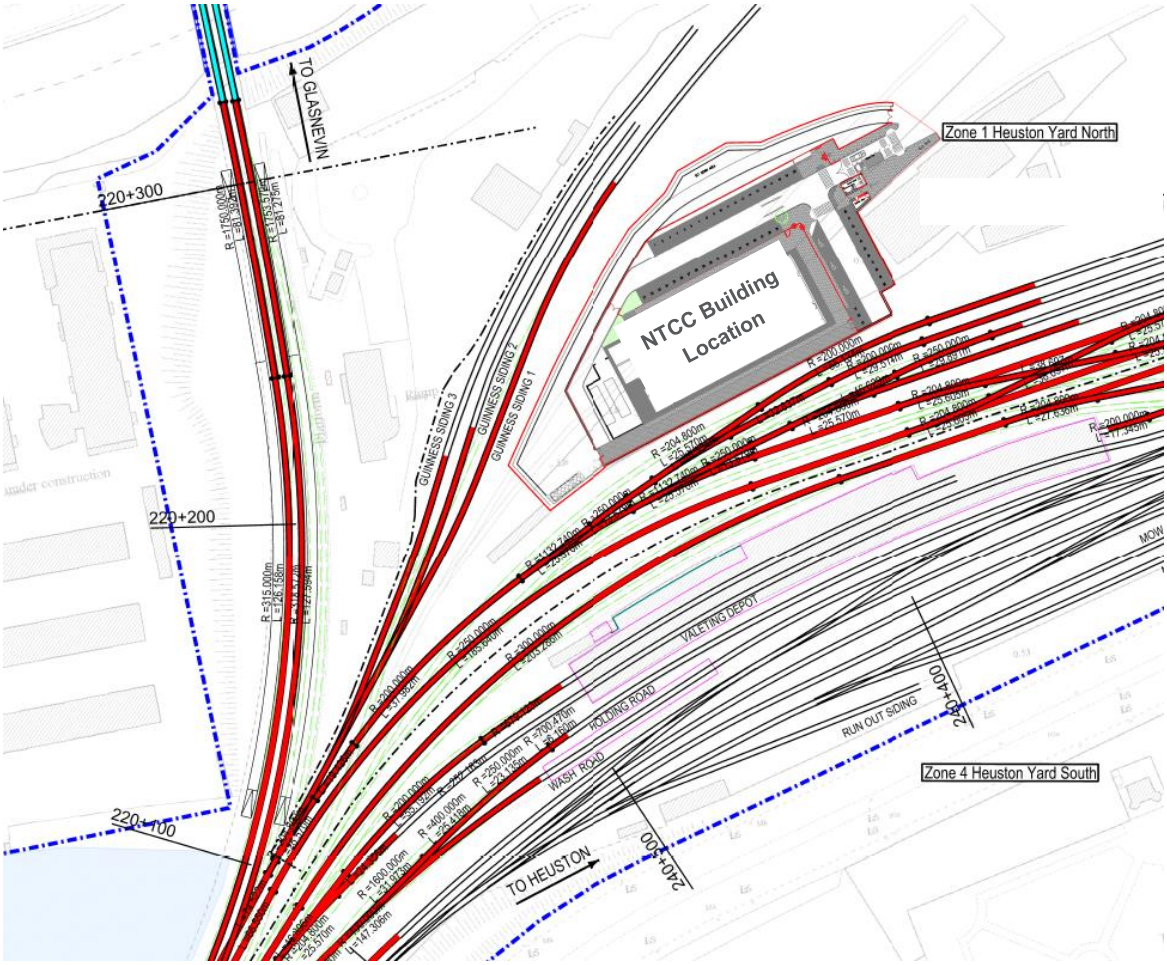


Figure 2-6 National Train Control Centre Location

Figure 2-7 Image of National Train Control Centre

Figure 2-8 National Train Control Centre Construction

2.6. Roads & Vulnerable User Routes

Currently the main Heuston Station access road commences east of the Heuston Terminal Station, (adjacent to the Frank Sherwin and Luas, River Liffey bridges). After crossing over the Luas and passing the Heuston Station

Luas stop it continues through an old access control entrance (with security building), immediately adjacent to the existing Heuston Terminal Station bus stops. The road continues onwards, parallel and adjacent to the River Liffey (north of the Terminal Station building); passing administrative buildings, the Terminal Station Carpark, The new NTCC, as well as operations and maintenance depots. The access road finally terminates with a turning circle at Platform 10. The circle/roundabout is large enough to facilitate large articulated and/or fixed axle HGVs.

The access road is comprised of a single lane carriageway with a variable width of 6.0-6.5m (approx.). Lanes are separated by a central lane line for the majority of the route but where space is particularly constrained, or the horizontal curves are tight due to proximity of adjacent building or fence line obstructions then plastic bollards or mini medians are used to segregate inbound and outbound traffic.

Figure 2-9 Site view. Heuston Terminal station

After the first 60m (approx.) is the entry for the Taxi set-down facility, which exits again 135m (approx.) further down the main access road. The next 140m (approx.) leading up to the entrance of the main station car park has administrative buildings (buildings of historical significance and new buildings, see **Figure 2-10**) in close proximity to the outbound and inbound running lanes, respectively.

Figure 2-10 Site view. Heuston Terminal platforms and car park entry

The road continues past the carpark entrance and continues for a further 165m (approx.) to a roundabout onto which the car park exits; and which is used by most of the Dublin Bus and Airlink buses to turnaround to get to their main station collect point, at the entrance gate to the station complex. The same roundabout provides a link to the new NTCC. This section of road runs the length of the car park with much of outbound side of the carriageway providing access to fuel storage, waste handling and station Management buildings and facilities (**Figure 2-11**).

The carpark is served by and opened sided but covered central walkway down the central spine.

Note: the Dublin buses can also continue straight through the roundabout, on to Platform 10, to a containerised toilet facility which is maintained by Dublin Bus under an MOU with Iarnród Éireann.

Figure 2-11 Site view. Carpark

The final stretch of main access road is from the Terminal Station Carpark roundabout to the cul-de-sac serving buses and HGV's at Platform 10; as well as providing access to the signalling control building and a number of maintenance yard accesses with containerised offices and storage.

Figure 2-12 Site view. Platform 10

2.7. Ground conditions

The topography of the site is flat, sloping gently to the north towards the River Liffey, where at the riverbank, there are steepened banks down towards the water's edge. To the west of the site, the ground level of the existing Clancy Quay development is approximately 4m to 5m below the existing track level.

A detailed Ground Investigation is currently ongoing to verify the data obtained in the historical investigations. The majority superficial geology in this area is anticipated to comprise urban (made ground) deposits. It is expected that a layer of till will exist below the made ground deposits overlying bedrock (limestone and shale). At

the northern (beneath the existing arches) and western extents of the site, the superficial deposits are described as gravel deposits overlying bedrock (limestone and shale).

The superficial deposits beneath the existing road between Sean Heuston Bridge and Platform 10 are shown to be varied due to the presence of several superficial boundaries and are shown to comprise urban (made ground), gravel and alluvial deposits. The gravel deposits are shown to predominately exist beneath the western extents of the existing access road.

Historical ground investigations show the ground conditions to typically comprise made ground, underlain by clays and gravels overlying limestone bedrock. Made ground generally consisted of clay gravel with concrete, red brick, steel with a maximum thickness of 3.50m. Made ground deposits were underlain by gravelly clay and gravel (of limestone) with occasional layers of sand. The current ongoing ground investigation indicates that made ground underlain by soft clay deposits are present at the Platform 10 location. Bedrock comprising of strong to moderately strong limestone with laminated mudstone and shale was encountered at depths ranging from 22.70m bgl (13.49m AOD) to 24.55m bgl (15.39m AOD).

Groundwater strikes were recorded at 7.50m bgl and 13.50m bgl with no rises recorded.

To the east, ground investigation records show the ground conditions at Heuston Yard to generally consist of similar sequences of strata with significant thicknesses of made ground, silt, clays and gravels underlain by bedrock. Groundwater levels recorded during these investigations to the east ranged from 4.40m bgl to 9.8m bgl.

Hazardous and non-hazardous material within the Made Ground was identified in the historical ground investigations carried out previously near the current location of the proposed National Train Control Centre at Heuston station in 2019.

Part of the area in contact with Clancy Quay development may be excavated to address the pedestrian access requirements, as the Clancy Quay area is approximately 4m to 5m below the proposed station level. Refer to the design options described in this report.

2.8. Environment

The station would occupy the former Platform 10 area with two (up and down) platforms. The design intent is to localise and integrate all the proposed station facilities into the areas currently in use at Platform 10. The exception to this, is the area adjacent to the east of Clancy Quay, where a new platform and station access would be built; requiring a new pedestrian access be provided between a much lower residential area and the new platform.

To the west of the proposed site, is residential housing, specifically the Clancy Quay. This relatively new development includes several residential types, outdoor amenity space e.g. playground and there is also reference to roof terraces and is one of Ireland's largest private sector rented residential developments. The potential for noise and vibration disturbance would therefore need to be considered. There are also several buildings and features listed on the National Inventory of Architectural Heritage (NIAH) that are associated with the Clancy Quay. The Liffey Bridge (UBO1) is also a listed heritage feature on the NIAH. As the design in this area progresses, mitigation of the noise and visual impacts, emanating from the proposed Heuston West station, will be assessed.

The station location is part of one of Dublin City Council's (DCC) Zones of Archaeological Potential which encompasses the historic core of the city, extending generally out northwards to Stoneybatter, east towards Dublin Connolly and the docklands, southwards to Mount Brown and westwards encompassing Islandbridge and Kilmainham. The whole of the Phoenix Park, the area south of St John's West Road and east of the South Circular Road encompassing the Royal Hospital Kilmainham, St Patrick's University Hospital and Dr Steven's Hospital, and the Heuston Station main building is part of a DCC Conservation Area also.

Heuston train station itself is listed by Fáilte Ireland as a visitor/tourist attraction in its own right. Several features in the vicinity are listed on the National Inventory of Architectural Heritage (NIAH). The station building dating from 1850-55 is also listed on the DCC Record of Protected Structures (RPS). A number of other attractions in the vicinity are also of heritage interest including the Royal Hospital Kilmainham, the War Memorial Gardens and the Phoenix Park. In addition to being visitor attractions, these sites contain features and sites of heritage value and include a range of statutory and non-statutory designations.

The Conservation Area is defined in the Dublin City Development Plan 2016-2022, as shown in Fig 2-12 below. The Red Line Hatched Conservation Areas as outlined in the Development Plan zoning maps are afforded the same level of planning consideration as Architectural Conservation Area (ACAs), although they do not enjoy the same level of statutory protection as an ACA. They also do not have specific character appraisals attached.

The design proposal for the new station considers the provisions of policy, taking into account the visual impact on the surrounding environs, not harm these spaces or its settings or features or constitute a visually obtrusive or dominant form (11.1.5.4 Dublin City Development Plan).

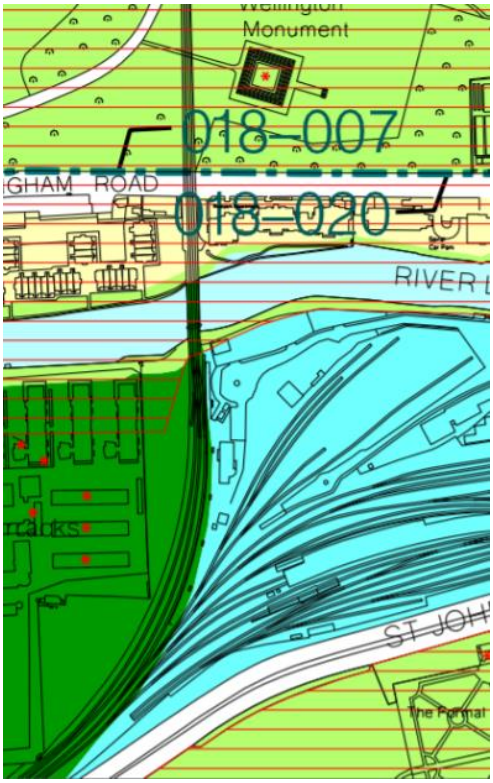


Figure 2-13 Map E of Dublin City Development Area 2016-2022. Red hatch is the conservation area

The river embankment is also within the Conservation Area. Alluvial deposits are found along the River Liffey. The station area is also in proximity to the River Liffey which is transitional at this location and includes Annex I habitat [Estuaries] in this area. It is also known to host salmonid fish species. There is a National Biodiversity Data Centre (NBDC) record of a live otter sighting downstream of Heuston (grid Ref. O136343) in June 2017. The 2020 ecology survey also noted a significant linear stand of Japanese knotweed running adjacent to the rail corridor from the Liffey bridge, past Platform 10, as far as the South Circular Road.

As the rail corridor follows the bend past Clancy Quay, it traverses the area of a historic gravel quarry, dating from the early to mid-20th century.

2.9. Utilities

There are a number of utilities within the new station footprint and along the station access road from the new station to the Heuston Terminal Station.

There are 3 no utilities in the immediate locality of the proposed new Heuston West Station. Shown below in **Figure 2-14**, they include 2 no. Irish Water combined sewer pipes, as well as 1 no. BT duct bank;

- CS-01: Crosses the tracks underneath the southern abutment of Liffey Bridge (UBO1).
- CS-02: This pipe is located along the east perimeter of Clancy Quay. Considering the earthworks required shown in **Section 4.6**, this service will need to be temporarily diverted.
- BT-01a: This duct is located beneath Heuston Yard; and BT confirmed that it crosses under the rail corridor and continues south parallel to the tracks on the west bank.. Consequently, this service will need to be temporarily diverted due to the works required for the proposed Heuston West station.

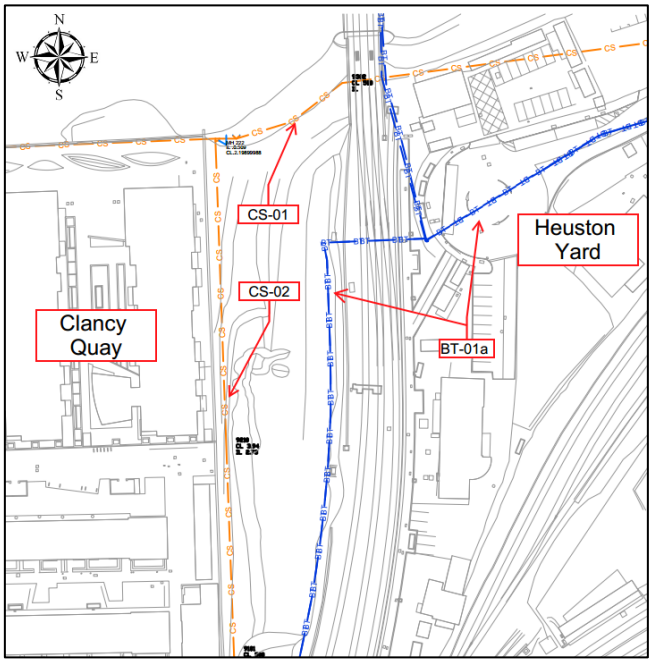


Figure 2-14 Existing Utilities

There are various utilities located under the link between the proposed new Heuston West Station and Heuston Terminal Station. These comprise BT, Eir, ESB, GNI, Irish Water combined sewers and Irish water watermain pipes (see **Figure 4-9** below).

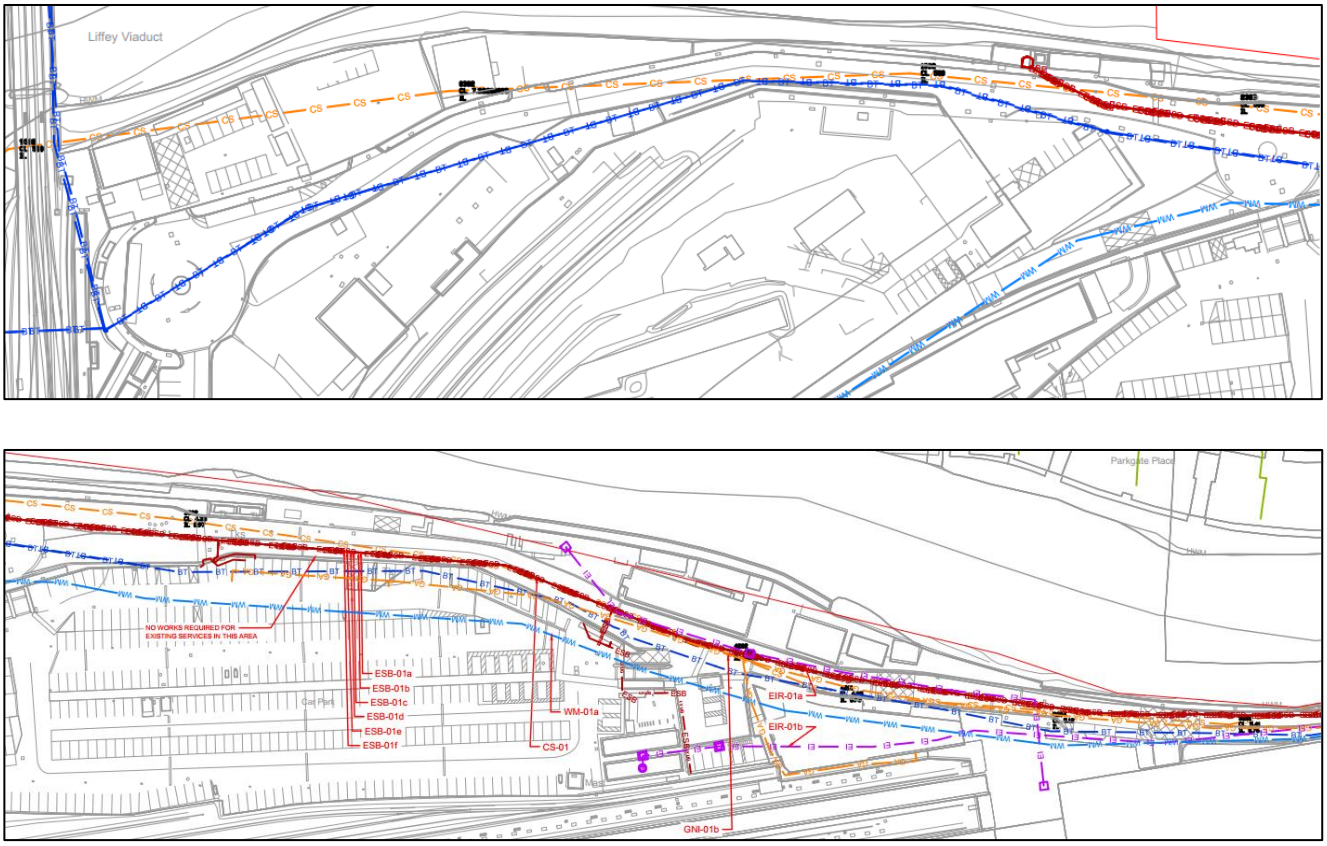


Figure 2-15 Utilities for Link Between Heuston West and Heuston Station

3. Project Requirements

3.1. Area Specific Requirements

In addition to the general feasibility requirements of constructability, general fitness for intervention and safety, the specific design requirements for the new station are:

- Two open platforms, each 174 m long, finished with ramps for maintenance and emergency access to the tracks.
- Pedestrian access to be provided – connecting both station platforms.
- Platforms will have a minimum width of 3m. The arrangement will include two refuges per platform.
- Platform shelters to be provided for weather protection. Furniture including seats, bins and shelters will be provided and provision for advertising.
- The platform area and track area will be secured with a perimeter fence. Station access will be closed during non-operation hours.
- The station will be unstaffed, with full CCTV coverage. CCTV and platform help points are to be monitored from the customer communications centre within the NTCC.
- The external circulation area accessing both platforms will have ticket vending machines and a ticket validation system – tag on / off validation poles.
- Cycle park areas will be located at both station sides.
- The station to be accessible by road, including a set-down area for vehicles, access to be provided for emergency services vehicles.
- SET services will be allocated in a separate building, adjacent to the track.
- In accordance with accessibility requirements, access to the footbridge or underpass should be via stairs and ramp, or by stairs and lift.
- Lifts, if installed, should have suitable weather protection in the waiting area. Lifts will need to be monitored via lift passenger call in addition to CCTV coverage, monitored from the customer communications centre in the NTCC.
- A footbridge structure would require adequate clearance from the top of rail level to provide track electrification clearance.

3.2. Systems Infrastructure and Integration

In addition to the track and civil infrastructure modifications relating to the DART+ South West Project, there is a requirement to provide Overhead Line Electrification Equipment (OHLE) signalling and telecoms infrastructure.

The electrification system will be similar in style to that currently used on the existing DART network and integrated and compatible across the DART+ Programme. It is proposed that a standardised approach to electrification will be adopted, but area-specific interventions will also be required. One substation will be provided in the Heuston Station / Islandbridge area to provide the requisite power for the network demand, refer to Voume 3J – Techncial Optioneering Report – St John's Road Bridge (OBC0A) to North of the Phoenix Park Tunnel for more details.

The Low Voltage and Telecommunications networks required for Signalling will be 'global systems' and are unlikely to vary significantly between or within the various areas. In order to achieve the necessary capacity enhancements and performance required for the introduction of the new new electric multiple unit (EMU) fleet, it will be necessary to upgrade the existing signalling system as well as replacing some of the legacy signalling system. This will include provision of equipment rooms, including Relocatable Equipment Buildings (REB) to accommodate signalling equipment and associated power supplies and backup.

Upgrades to the existing telecommunications infrastructure will be required to facilitate improvements to the radio-based technologies used on the network and for signalling and communication with the existing and future network control centres.

3.2.1. Electrification System

The OHLE system architecture is currently being developed. The DART wide programme will adopt a 1500V DC (Direct Current) OHLE system to provide electrical power to the network's new electric train fleet.

It should be noted that all OHLE diagrams in this report are for visual information only. Construction details will be determined during Detail Design, which will be developed at later stages of the project.

The OHLE concept comprises a simple (2-wire) auto-tensioned system, supported on galvanised steel support structures. See **Figure 3-1** for a typical OHLE arrangement in a two track open route.

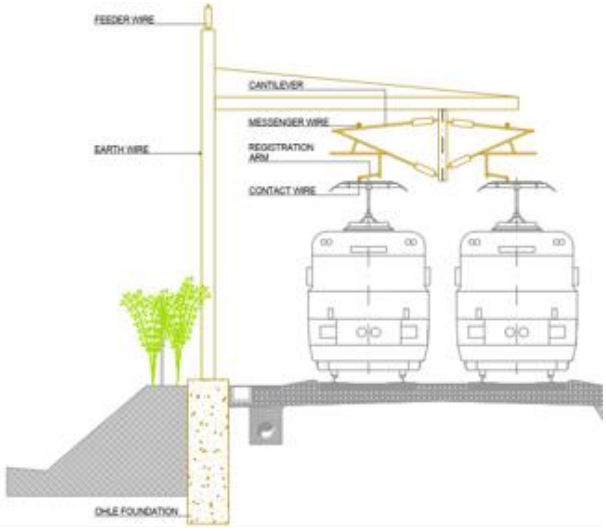


Figure 3-1 Typical OHLE Arrangements in 2-Track Section – on entry to the East of the Station

In the four track areas, Two Track Cantilevers (TTCs) will generally be placed on the north side of the line, to support OHLE on the northern two tracks. The project aims to achieve a minimum contact wire height of 4.4m throughout to ensure compliance with the relevant design standards, localised special conditions may be required.

Additional feeder cables will be supported from the masts at heights between 6.5m and 8m on each side of the track. An earth wire will also be suspended from the masts.

Maximum tension length is 1600m. Overlaps will comprise three spans, with spring tensioners used throughout. Midpoint Anchors (MPAs) will generally be of the tie-wire type, although the portal type may be needed in some locations.

At intervals of up to 1500m the OHLE wires will be anchored at an arrangement known as an overlap, and a new set of wires will take over. The anchors provide the mechanical tension that the wires need to perform reliably

and safely. In areas of crossovers and junctions, additional wiring will be provided for the extra tracks, and these will also be provided with anchors.See **Figure 3-2** for a typical anchor structure.

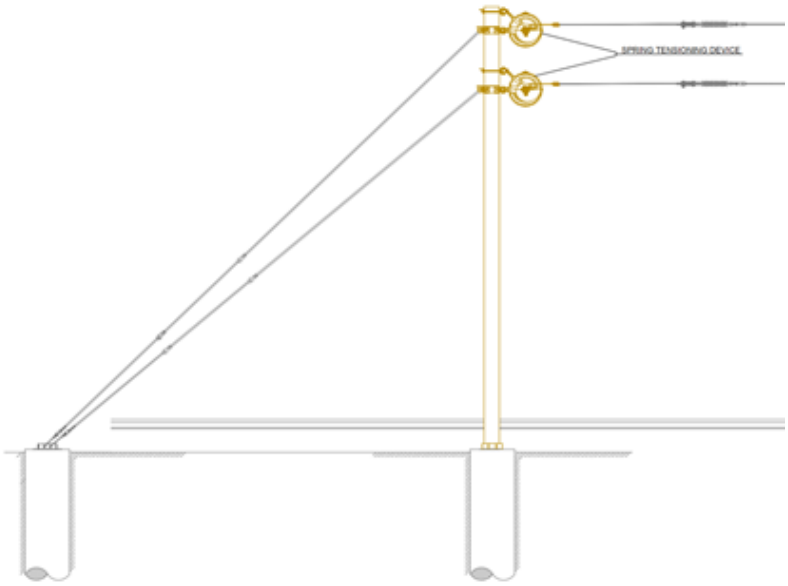


Figure 3-2 Typical anchor structure

The OHLE configuration through the overbridges for each track have been assessed using a clearance assessment tool derived from the System Wide Functional Requirement Specification (FRS) relating to Overhead Line Equipment (OHLE) and a set of configurations agreed with Irish Rail Signalling and Electrification Department through the Interface Coordination Document (ICD) process This includes level and graded free running options, as well as level and graded options with elastic bridge arms fitted to the bridge. See **Figure 3-3** for a typical arrangement on approach to a low bridge.

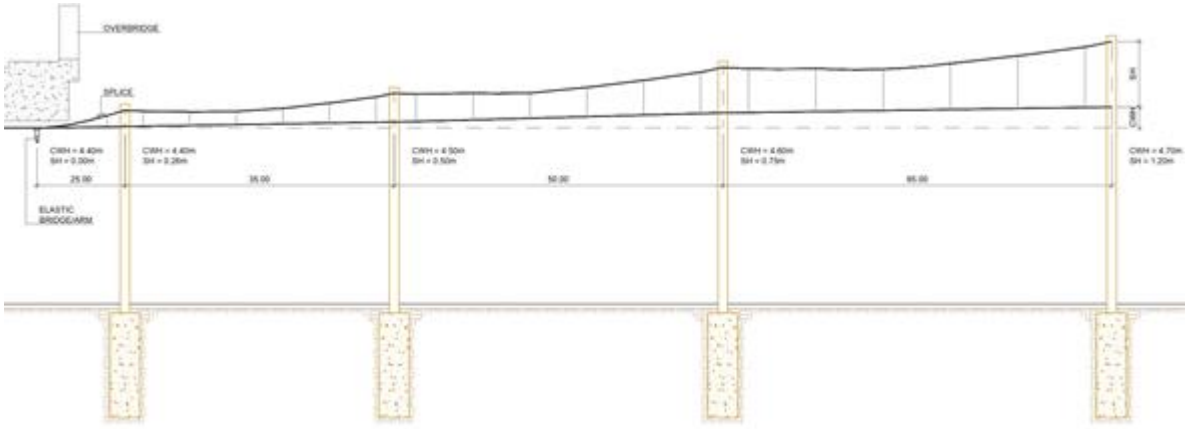


Figure 3-3 Typical arrangement on approach to a low bridge

3.3. Design Standards

The project design is governed by various technical and safety guidelines, which include European, National and Iarnród Éireann internal standards and specifications.

Compliance with these standards will be ensured via internal and external technical and safety assurance processes throughout the delivery and commission stages of the project.

3.3.1. Station Design Performance Standards

The forecast passenger numbers for 2043 have been used to assess the capacity and performance of the proposed station layout. Capacity of the proposed platform, stairs, footbridge, and bridge underpass have been assessed. The following section outlines the methodology that was used for the capacity calculations, based on Normal Operation.

3.3.1.1 Platforms

Considering the guidance used for other DART+ stations (Based on Fruin´s Level of Service methodology, as developed by many rail networks -Network Rail, London Underground-). 35% of platform load was considered to occupy 25% of platform. 0.93m^2 were considered for each passenger, and 1m was added as edge effect. The number of passengers is the platform load per headway, which is the average platform load per minute (boarding and alighting) multiplied by train service headway.

3.3.1.2 Stairs

For stairs, a level of service of 28 passengers/minute/m width was considered. It corresponds to Fruin Level of Service D. It was considered a two-way stairway and 0.3m was added to the overall required width as a central handrail will be required.

3.3.1.3 Passageways

Passageways (ramps, footbridge, or bridge underpass) were considered as two-way, as they will have mixed passenger flows. A level of service of 40 passengers/minute/m width, corresponding to Fruin´s Level of Service D. In this case, also 0.3m was added when central handrail is required. Ramps are expected to have central handrail.

	Required width (m)	Design width (m)
Down DART platform West Bound	1.30	3
UP DART platform East Bound	2.22	3
Stairs (same for UP and DOWN)	2.24	2.4
Ramp (same for UP and DOWN)	2.25	2.4.
Footbridge (same for UP and DOWN)	1.95	2.4
Bridge underpass (same for UP and DOWN)	1.95	3

Figure 3-4 Comparative table of required passageway widths and the proposed design widths.

4. Constraints

4.1. Environment

The key environmental constraints relate to:

- The proximity to Clancy Quay, considering potential visual and noise impact.
- The area is part of a Zone of Archaeological Potential of the Dublin City Council.
- The proximity to protected structures and listed buildings. such as the Heuston Station itself.
- Part of the north area of the future station and the Liffey River embankment are within a DCC Conservation Area. Visual impact in this area must be considered.
- The alluvial deposits along the Liffey River. This is known to host salmonid species and others recorded in the National Biodiversity Data Center such as the otter. A 2020 ecological survey noted a significant linear stand of Japanese knotweed.

Further desk and field survey work has been undertaken to inform the environmental constraints identified in Section 2.8. Together that information has improved the understanding of the environmental constraints in the study area. Details of the further desk and field survey work is outlined below.

Ecological field surveys of the route have been carried out to establish the baseline ecological conditions. Surveys for mammals (badger, bats), amphibians, invasive alien species, birds and terrestrial and freshwater habitats have been carried out to date.

In relation to Built Heritage, a comprehensive desktop assessment of built heritage assets within 50m either side of the railway centreline has been undertaken by a Heritage Specialist. This assessment confirmed the designated status of the features of heritage interest i.e., Protected Structure status and/or inclusion in the NIAH record, and/or inclusion in the Industrial Heritage Record. A meeting with Dublin City Council noted that a new City Development Plan for 2022-2028 is being prepared. The new City Development Plan for 2022-2028 may contain modifications (additions/deletions) to the Record of Protected Structures (RPS). A structure must be listed on the planning authority's RPS to qualify for protected status under the Planning and Development Act 2000 (as amended). The RPS will be monitored on an on-going basis by the Heritage Specialist.

The River Liffey crosses the railway line near Heuston Station. The ECFRAM maps indicate the risk of fluvial and coastal flooding. The ECFRAM maps indicate the River Liffey is impacted by river and coastal flooding in the 0.1% fluvial and 0.1% tidal Annual Exceedance Probability (AEP). The location is also influenced by the River Camac catchment, a tributary of the River Liffey.

A Flood Risk Assessment (FRA) is currently under preparation. The FRA will be completed in accordance with "The Planning System and Flood Risk Management – Guidelines for Planning Authorities" (DOEHLG, 2009). Detailed mitigation measures will be specified in the final FRA and will inform the EIAR which will be submitted to An Bord Pleanála for Railway Order approval.

4.2. Permanent Way

The Permanent Way constraints for Heuston West Station are:

- The Liffey River underbridge is a fixed point in the alignment of the branch line to Glasnevin.
- The proposed Islandbridge junction must be remodelled due to the four-tracking requirements. Access to the DART platforms must be provided from the Branch line.
- The position of the OBC1 overbridge is to be retained.
- Emergency exit and maintenance path at the north of the existing platform, from the bridge. It is a requirement to keep a gap between platforms and the bridge. This limits the position of the platforms to the north.
- The platform length will be 174m to comply with the requirements for the DART services.

The existing track radius in this section is approximately 315m. Since a new station is to be located here, it is advisable to achieve a compliant track radius of 500m, with a lower limit of 350m. This will depend on the feasibility of what is achievable due to the site constraints and will require a detailed analysis of the horizontal curvature of the alignment through the station.

4.3. Utilities

The majority of utilities present in Heuston West and Heuston Station are located beneath the station building and link road between each area.

The two main constraints for Heuston West station are the foul sewer and BT ducts (described in **Section 2.9** and shown in **Figure 4-1**). Each has been discussed with the relevant provider and a temporary diversion will be possible if required. Both services would need to be maintained or outage durations absolutely minimised.

- The BT fibre optic cables (utility ID: BT-01a) run through Heuston Yard, cross under the tracks and remain parallel to the tracks until Hazelhatch and Celbridge. These cables contain signalling and communication data used by Irish Rail to monitor and manage the rail network. As such, they will be diverted with the other Irish Rail trackside utilities within the rail corridor.
- The combined sewer (utility ID: CS-02) is located west of the tracks, adjacent to Clancy Quay. This area is the same area planned for the proposed attenuation tank and Heuston West Station. As such, this service will require a diversion. Temporary diversions will be required for both services to maintain service to customers and Irish Rail.

The various other utilities in this area are concentrated on the eastern and northern side of Heuston Terminal Station, and along the access road corridor. As the proposed works are predominately taking place on the western side of the yard, few utilities pose constraints to the required works for the proposed station, its compound nor the proposed improvements to the pedestrian route to the Heuston West Terminal Station and the Luas Stop.

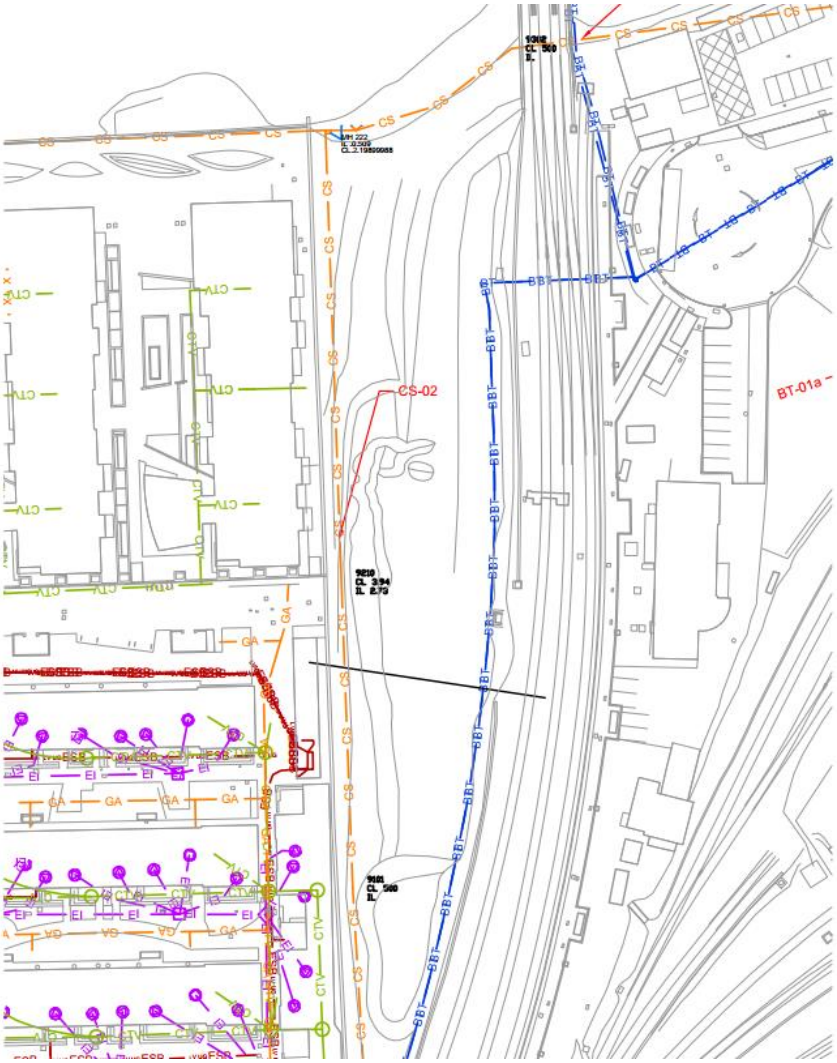


Figure 4-1 Utilities beneath Proposed Heuston West Station

4.4. Signalling

The distance between the top of the platform and the fouling point between the Slow line and the entrance to Heuston Platforms 6-7-8 is approx. 15m in the current solution. Signalling overlap requirements is 50 m. The standard signalling solution would require the overlap to be extended into the junction. Therefore, a train stopped in the platform 10 and 11 would block the entrance to Heuston tracks and accordingly the station capacity would have been affected.

It was checked that enough space was left before the Heuston junction to provide the required signals. The clearance point is more than 20m apart from the Heuston West Station platforms, which is at the same time 4m before the fouling point.

4.5. Structures

The proposed station platforms and the existing site constraints are shown in the below figure.

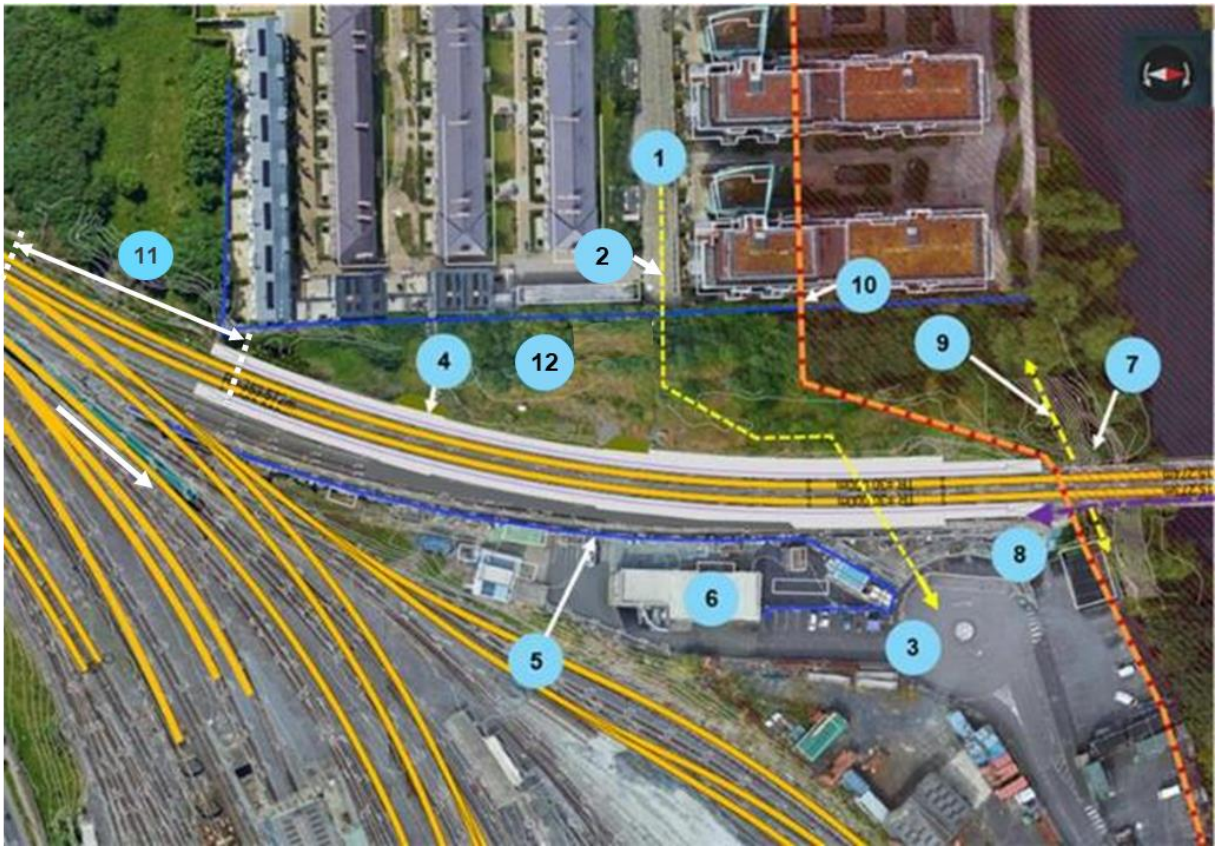


Figure 4-2 Site Constraints

1. **Proposed pedestrian route (Clancy Quay).**
2. **Ramp and stairs are needed for pedestrian connection at this point**
3. **East access from existing roundabout**
4. **174m platforms length.**
5. **Signals building compound**
6. **Existing Signals building**
7. **Bridge piers and abutment, river embankment**
8. **Evacuation/service route to bridge and tunnel**
9. **Bridge underpass option. Potential pedestrian route**
10. **Limit of DCC Conservation Area**
11. **Signalling constraint between east platform and southern track junction**
12. **Proposed location for an attenuation tank**

4.6. Geotechnical

Based on the current access options and pedestrian bridge options, significant excavations and earthworks will be required in this area. In addition to this, alterations to the existing retaining wall that forms the perimeter of the Clancy Quay development will be required to facilitate pedestrian access. Due to the presence of a geological

boundary, the ground conditions in this location are anticipated to comprise urban (made ground) and/or gravel deposits overlying bedrock (limestone and shale). Nearby ground investigation records indicate groundwater strikes at 7.50m bgl and 13.50m bgl with no rises recorded.

Based upon the existing historical and preliminary results obtained from the current ground investigation on, the ground conditions do not significantly impact any of the option proposals. It should be noted that any significant thickness of made ground excavated are unlikely to be suitable for re-use in earthworks. It is likely that this material will be excavated and replaced onsite with engineered fill. The current ongoing ground investigation indicates the made ground adjacent to the existing signals building location is underlain by soft clay deposits and station structures in this vicinity will require a piled foundation solution.

For options on the riverbank, earthworks re-grading or a retention system will be required to form the walkway platform that partially extends beyond the existing riverbank footprint.

4.7. Roads & Vulnerable User Routes

As noted in the **Section 2.6** figures; the main constraints are the road corridor width and the adjacent railway operations and maintenance areas and buildings, as well as the Heuston Terminal Station main car park.

The road is frequented by operational HGVs, as well as buses; and as such cannot be reduced in width but equally the remaining space from edge of carriageway to either the buildings or fence lines is minimal or non-existent.

Until such time as the overall Heuston Development station Masterplan is implemented, these spaces remain the constraint to providing larger segregated areas for vulnerable user groups.

4.8. Property

The proposed location for the Heuston West Station is adjacent to an existing signal control building and other rail facilities to the east side, which limits the position and dimensions of access to the proposed station. As noted in Section 2.5.1., the National Train Control Centre (NTCC) is currently under construction, the facility is located adjacent to platform 10. The facility will comprise of a 5,500m2 building constructed over 5 floors over basement.

The road and pedestrian link to the east is constrained by the existing rail buildings and facilities along the route. The proposed designs for the station and passenger transfer routes require some intervention in areas already occupied by different rail services.

Connection of the pedestrian link with the Clancy Quay was previously considered. An Bord Pleanála included a condition on the permission for Clancy Quay (DCC Reg. Ref 6113/04 and ABP Reg. Ref PL 29S.216060) which stated that:

"*Provision shall be made for public access from the development to Heuston Station. Details in this regard shall be submitted to the planning authority for written agreement prior to commencement of development".*

In response to this, the applicant submitted a copy of their landscape plan which highlighted two potential links (see below). They noted, however, that the links are delivered to the boundary of the site only, and that it would not be possible (for legal reasons) for the developer to provide any part of the links in lands in the ownership of Irish Rail.

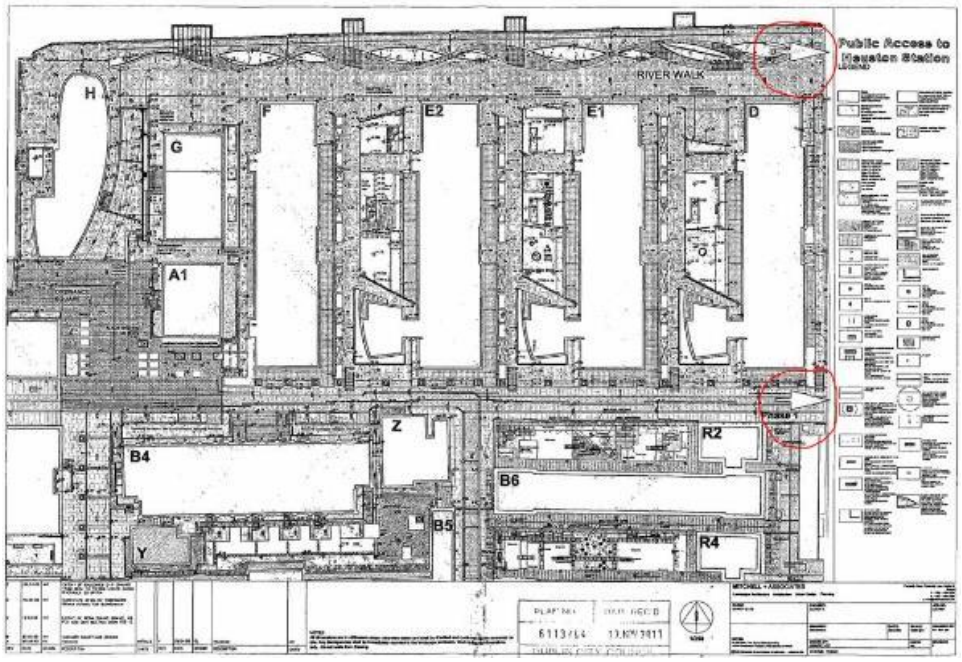


Figure 4-3 Clancy Quay Landscape plan

The first link is via the provision of a riverside walk along the front (northern boundary) of the site, and the second is between Blocks D and B6/R2 (circled these in red above). The applicant noted that both links would be open at all times and not secured by gates, fences or similar. The links would be used by pedestrians/cyclists, but not accessible to motorised vehicles.

There have been contacts between the owners of the Clancy Quay and CIE in relation to potential connectivity between the respective landholdings.

Figure 4-4 Aerial View –Proposed Station Location

To limit the impact to residential properties the south-east corner of Clancy Quay, the position of the platforms must be northernmost as possible, within the limitations defined by the radius of the track alignment and the space limitation between Liffey River Bridge to the north and Heuston Junction south.

4.9. Drainage

As part of the drainage system installation, it is proposed to install a new underground attenuation tank between Clancy Quay and the tracks. The location of the tank is a constraint and is to be considered and integrated into the station design options.

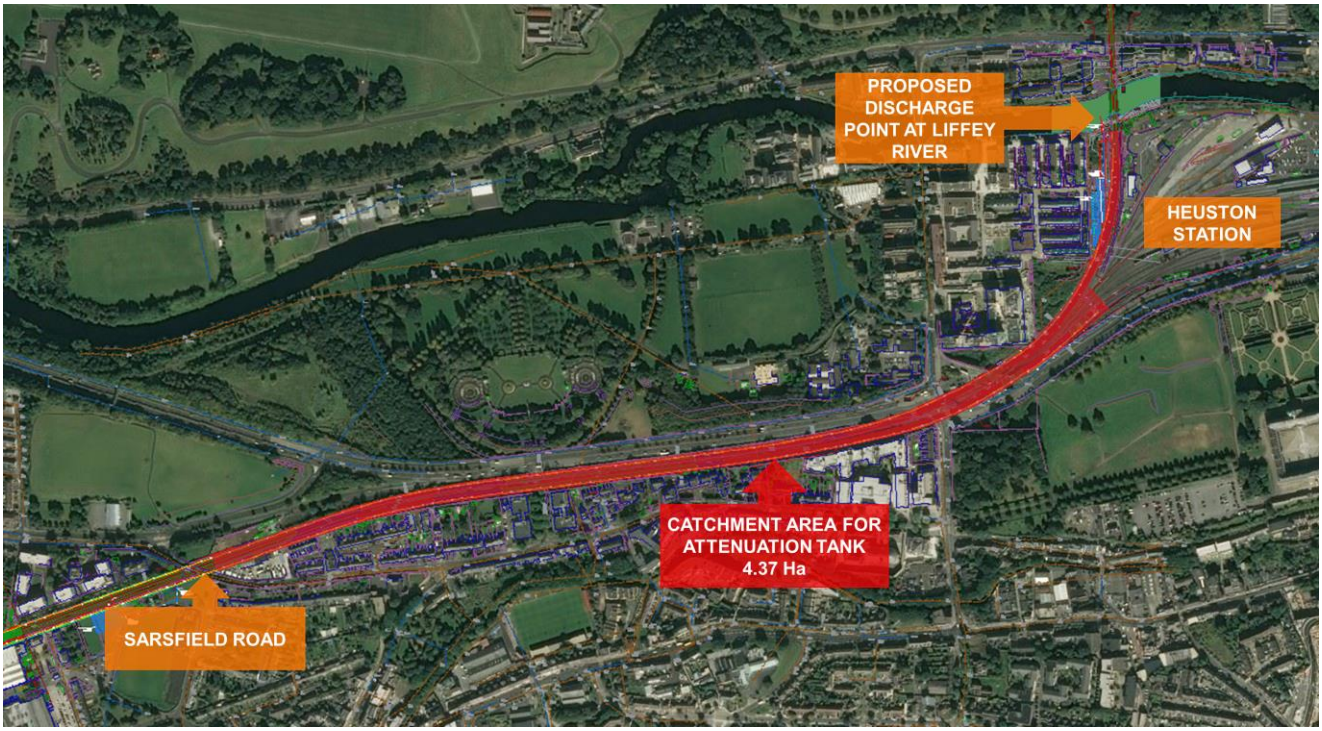


Figure 4-5:– Catchment area for the proposed attenuation tank

5. Options

This section presents the options associated with the Heuston West Station Design, primarily focusing on the station configuration and passenger access arrangements. The station configuration options included:

- A footbridge above the tracks
- An underpass under the arches of the Liffey Railway Bridge

5.1. Station Design Options

Following feedback at PC1, the delivery of a new station is now included within the scope of the Project. The main options which were considered for assessment included:

- The Do-nothing option means that the design endeavours to achieve the project requirements without any intervention to the existing infrastructure.
- All 'Do Something' Options were also 'Do Minimum Options' as the station will be located within Iarnród Eireann owned land

As this station is located wholly within in Iarnród Eireann's boundary (and more specifically at the location of the existing Platform 10) and having regard to the specific requirements for the station (as set out in Section 3), the options are largely a technical and design matter relating to the station's configuration, including access arrangements.

5.1.1. Option 0: Do Nothing

Do-Nothing Option represents the scenario of leaving the area as is without any intervention from IE.

5.1.2. Option 1: Do Minimum

The Do Minimum Options examine the proposed station configuration and station layout options to address the requirements as specified in Section 3, a total of 5 no. Do Minimum Options were developed for the station configuration and layout.

5.1.3. Station Options Summary

The design is based on a typical station at grade with two through-platforms, considering the latest IÉ designs. Based on these principles:

- Security and Safety
- Practical and Efficient Design
- Cohesive Design Style and Finishes
- Accessibility
- Sustainability and Environmental integration
- Cost Efficiency
- Flexibility

Several options have been developed for the station taking into consideration the site constraints and the project objectives and requirements. Each of the options have been assessed to determine if they are technically feasible and meet project requirements.

The proposed station layout and configuration is similar across all the options, the main differences relate to the station access. Two main alternatives were considered in relation to access for both station users and for pedestrians to cross the rail tracks:

- A footbridge above the tracks (Options A to B)
- An underpass under the arches of the Liffey Railway Bridge. (Options C to E)

Several alternative concepts were developed, based on either the provision of a footbridge or underpass. Table 5-1 below provides a summary of the various options that were developed and assessed.

Table 5-1 - Station Options summary

Option	Access	Description
Station Option A	Footbridge	Footbridge accessed by lifts and stairs.
Station Option B	Footbridge	Footbridge accessed by ramps and stairs.
Station Option C	Underpass	Underpass via the Liffey Bridge arches, accessed by lift and stairs (the stairs follow the embankment profile).
Station Option D	Underpass	Underpass via the Liffey Bridge arches, accessed by stairs and ramps. Ramps run parallel to Liffey River.
Station option E	Underpass	Underpass via the Liffey Bridge arches, accessed by lift and ramps. Ramps run parallel to platforms.

The connection between Clancy Quay and the station is considered independently of the option developed. It is much limited by the existing buildings and topography. Its details could be modified accordingly in all options.

5.1.3.1 Footbridge Options

These options propose a footbridge over the rail line to provide platform access for station users, also access for the public to cross the railway line towards Clancy Quay and the surrounding areas.

The main differences between the options relate to the bridge configuration and the means of access.

Option A: Footbridge with Lift and Stairs

In this option, pedestrians can enter the station at platform level or cross the footbridge to the other platform, access to the footbridge is by either lift or stairs.

Option B: Footbridge with Ramp and Stairs

In this option, pedestrians can enter the station at platform level or cross the footbridge to the other platform, access to the footbridge is by either stairs or ramps. As the ramp requires a larger area than the stairs, this option would have some impact on the adjacent rail facilities.

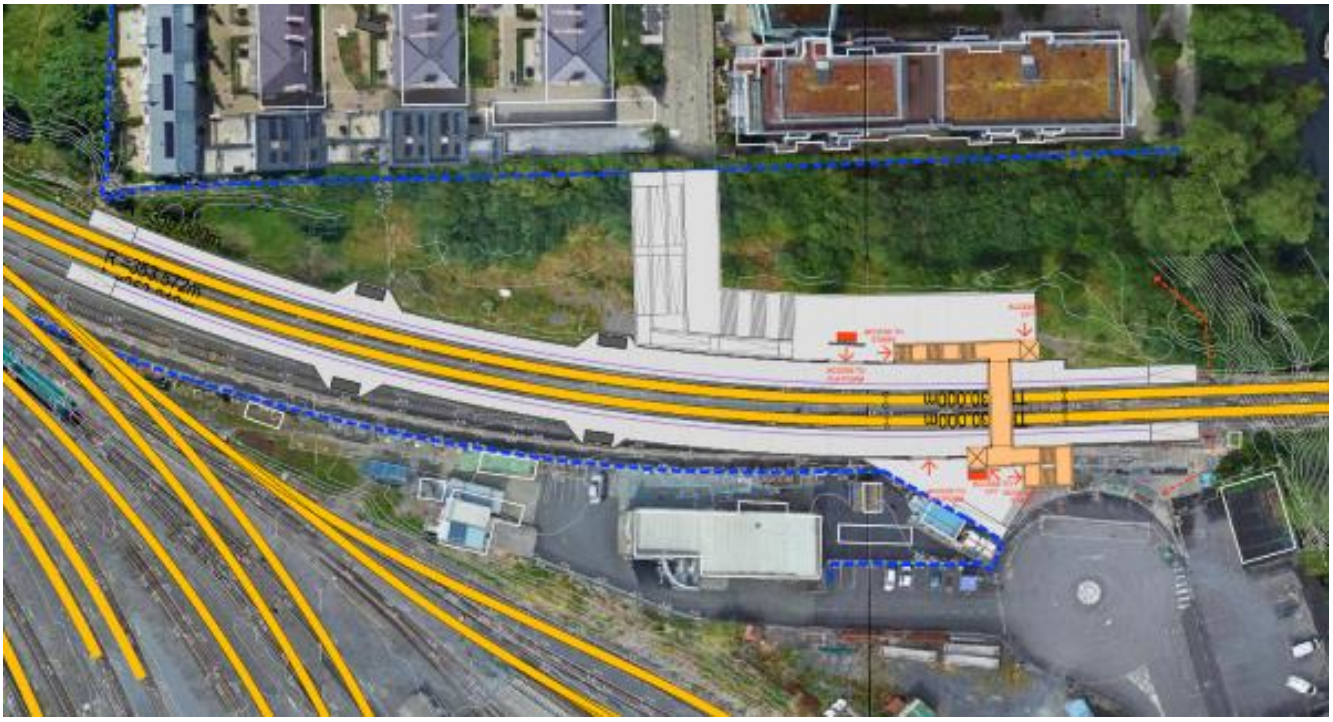


Figure 5-1 Station Option A – Footbridge with lift and stairs

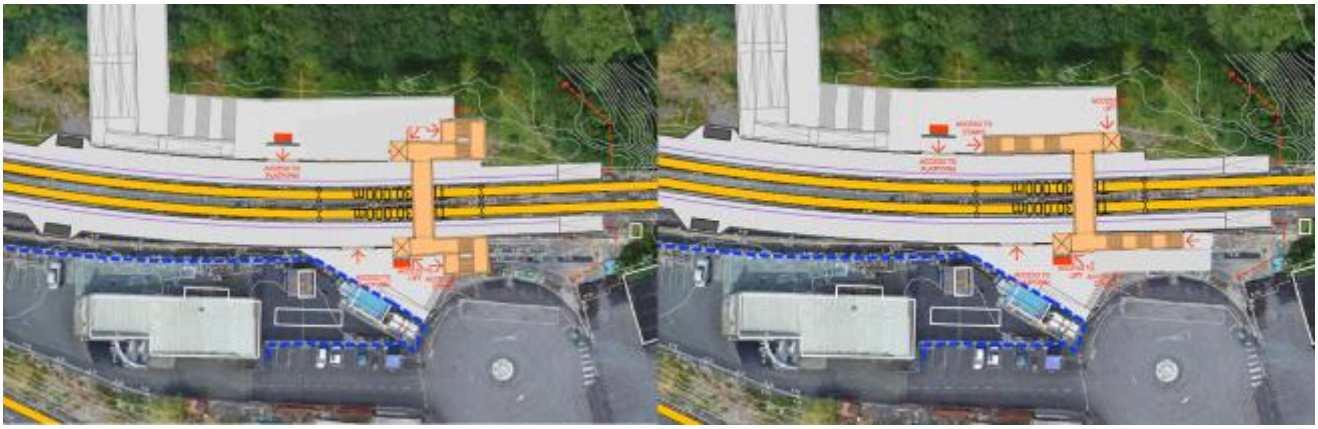


Figure 5-2 Station Option A. Alternative stairs configurations

Figure 5-3 Station Option B – footbridge with ramp and stairs

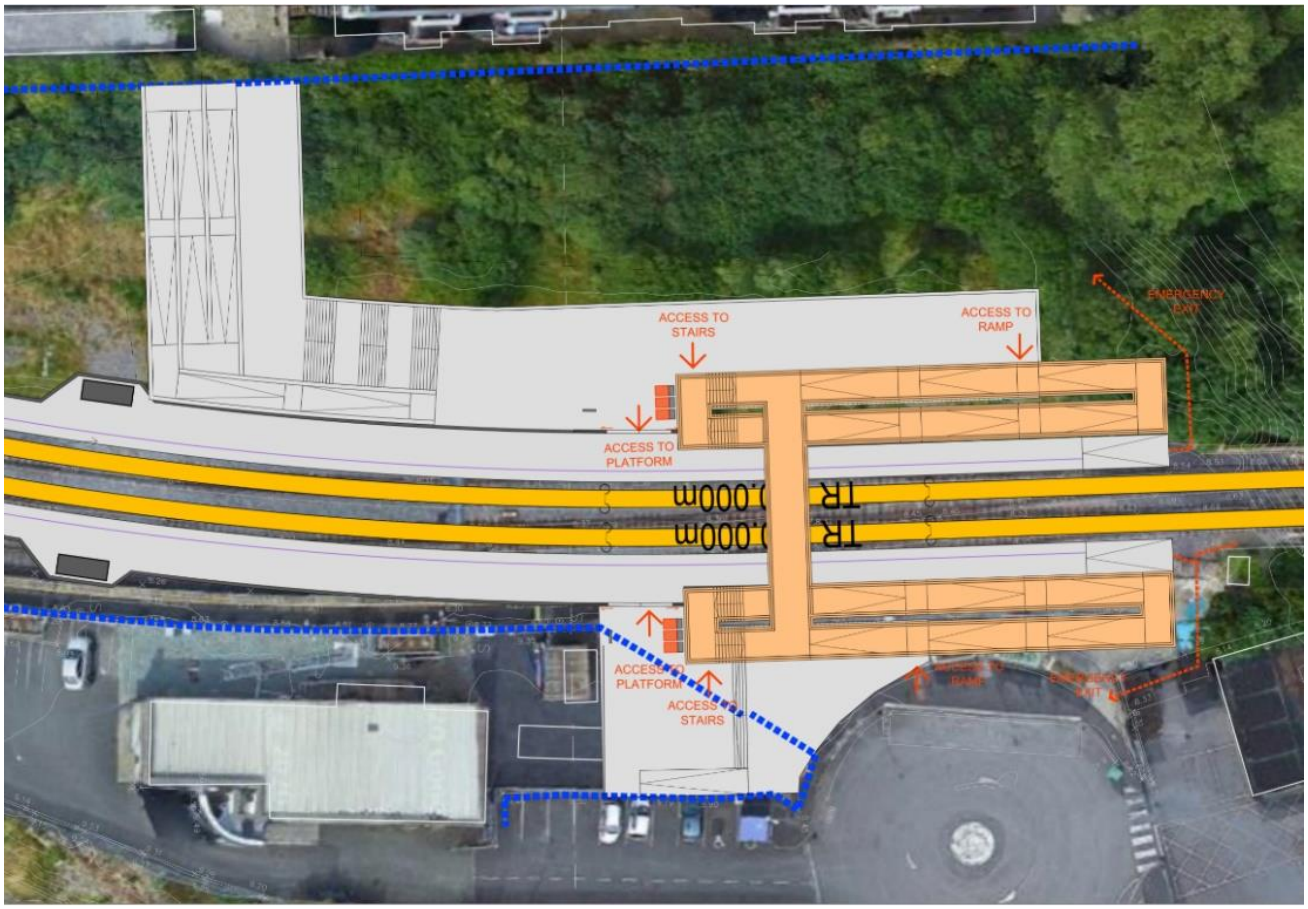


Figure 5-4 Station Option B. Access details

5.1.3.2 Bridge Underpass Options

These options propose an underpass below the River Liffey Bridge arches, under the existing bridge, to provide platform access for station users, also access for the public to cross under the railway line towards Clancy Quay and the surrounding areas. Access to the platforms will be by stairs, lift or ramps from the underpass.

A total of three main options were developed based on the use of the underpass as main access. The main differences between the options relate to the various stair, ramp, and lift configurations, the options include:

- Station Option C - Underpass, lift and stairs along the embankment's slope.
- Station Option D - Underpass, lift and ramps. Ramps parallel to River Liffey.
- Station option E - Underpass, lift and ramps. Ramps parallel to platforms.

Figure 5-5 Proposed station underpass location.

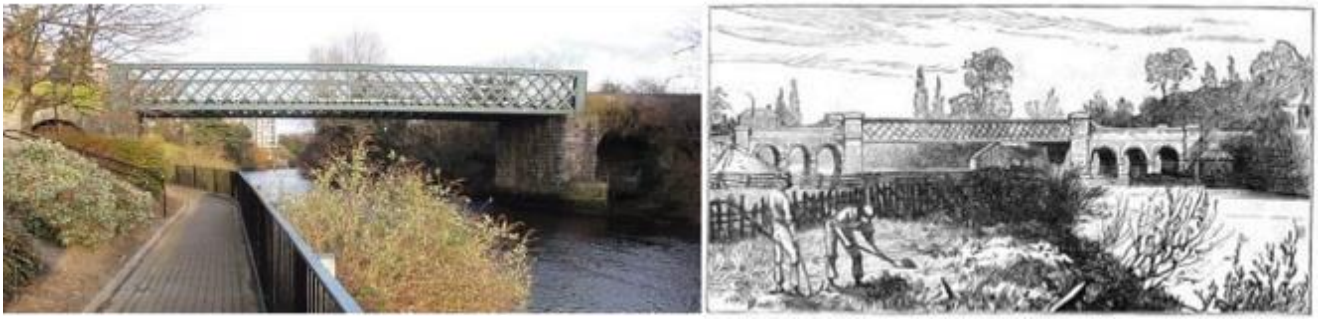


Figure 5-6 Liffey Rail Bridge. View from West and historic view

5.1.3.1.1. Option C. Bridge Underpass - Lift and Stairs

This option is based on the provision of stairs and lifts to connect the bridge underpass and platforms. Stairs would follow the existing embankment slope, minimising the earthworks requirements.

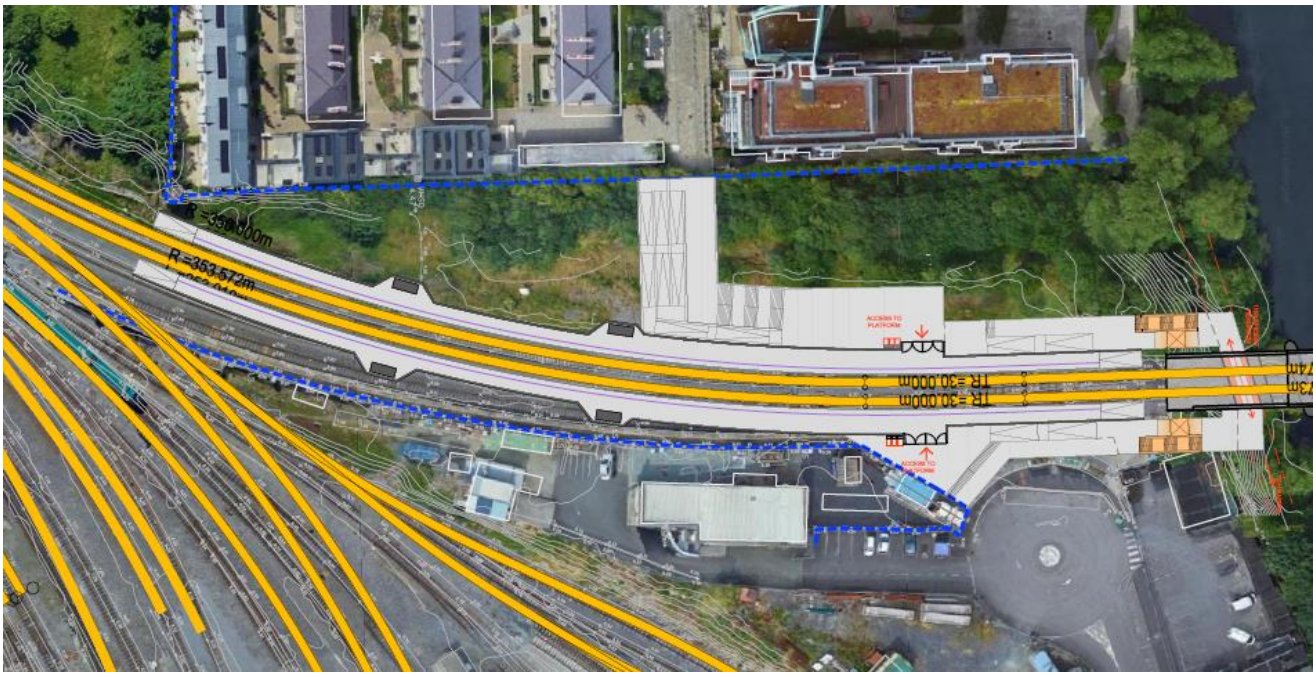


Figure 5-7 Station Option C – underpass with stairs and lifts

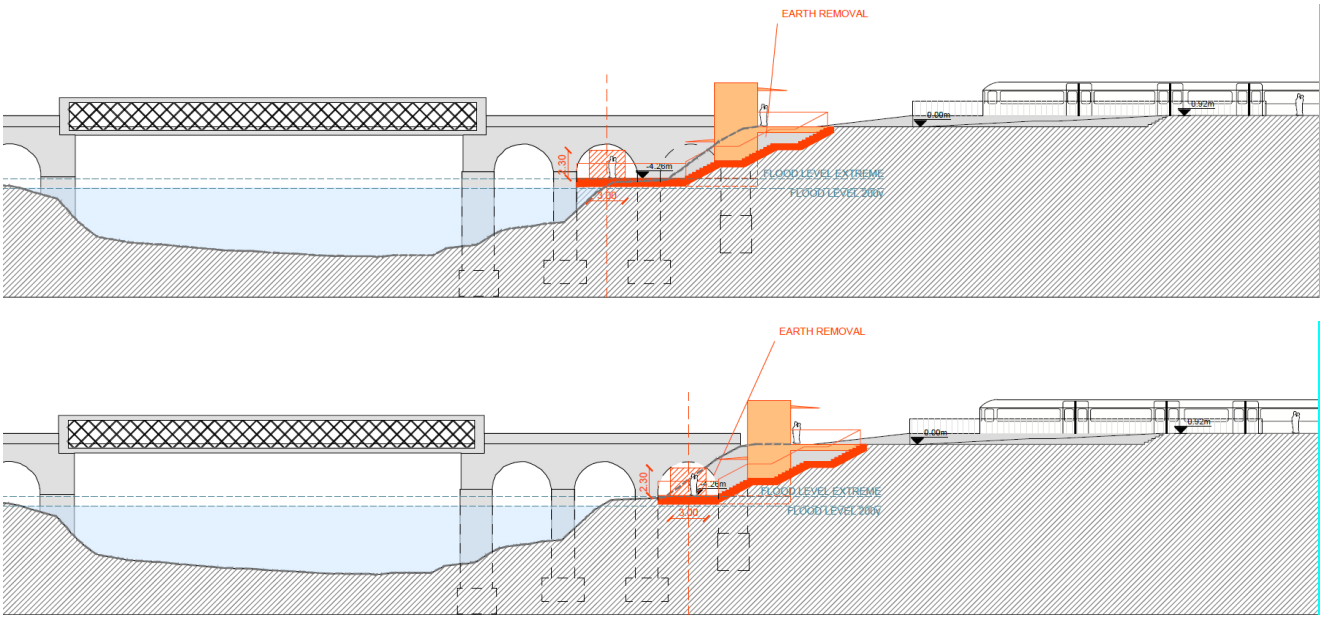


Figure 5-8 Station Option C - underpass with stairs and lifts – cross section options

5.1.3.1.2. Option D. Bridge Underpass - Ramp and Stairs

In this option, the ramps run parallel to the river and the stairs follow the slope of the embankment. The footprint of the ramps is large and would require a substantial intervention in the embankment.

Figure 5-9 Station Option D – underpass with ramp and stairs

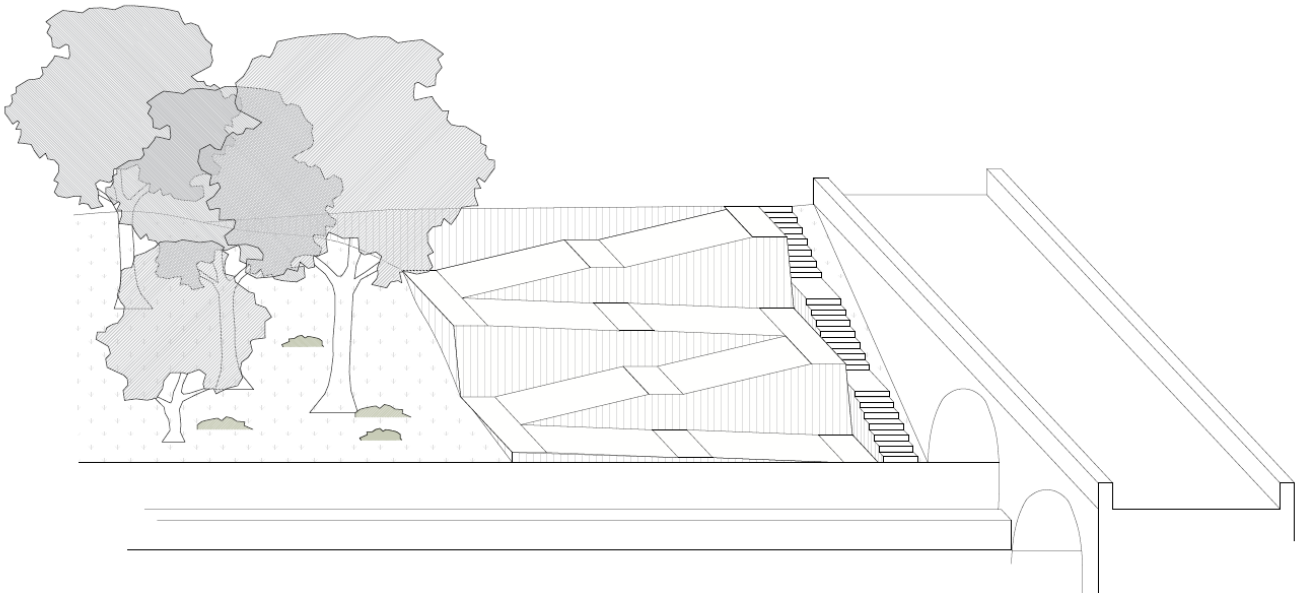


Figure 5-10 Station Option D - view of the proposed ramps scheme

5.1.3.1.3. Option E. Bridge Underpass - Ramp and Stairs

In this option, the ramps run parallel to the station platforms. Due to site constrains, the ramp turns three times, this option may lead to a perception of reduced personal security for users.

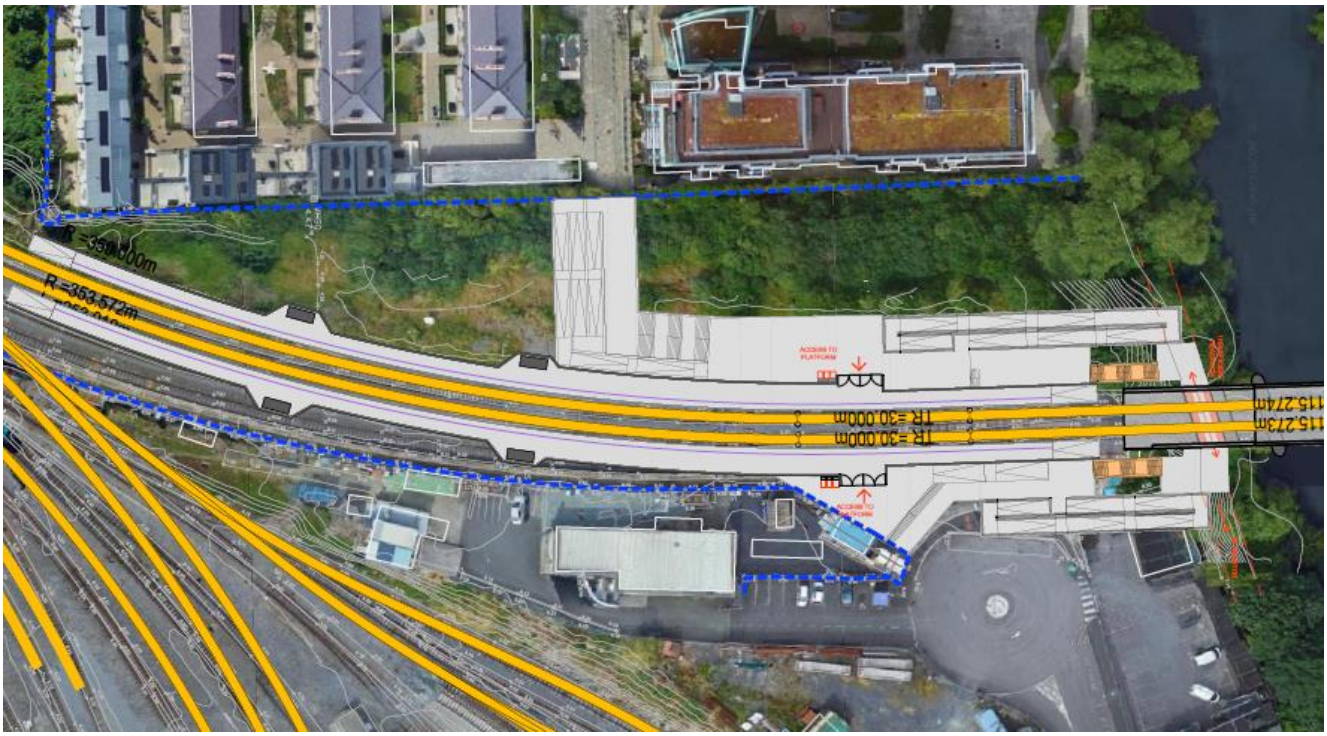


Figure 5-11 Station Option E – underpass with ramp and stairs

5.2. Construction Compounds

5.2.1. Heuston West

A construction compound is required to the west of Heuston Station, adjacent to the existing platform 10, for works to be undertaken to the new Heuston West Station (in addition to the Phoenix Park Tunnel and track work between St John's Road Bridge (OBC0A and the tunnel). A construction compound will need to be constructed on both sides of the existing railway, as access on the western side is also required for the installation of an underground attenuation tank which is to be located in this area and the utility diversions in advance of the track and station works. Equipment and material will need to be stored on this side of the railway due to the extent and type of work involved.

Due to the proximity of the proposed new underground drainage attenuation tanks on the western side of the tracks, the compound will need to be split and works phased to allow the construction of the of the new Heuston West station and the Phoenix Park tunnel works.

Outbound access to the main road network would be via the Heuston Terminal Station and Yard access road to Parkgate Street, Conyngham Road, Islandbridge Road and on to Chapelizod Bypass (Con Colbert Road) and onwards to the M50. Inbound traffic could use the Chapelizod Bypass (Con Colbert Road and St John's Road West) and access directly to the Heuston Station Access Road.

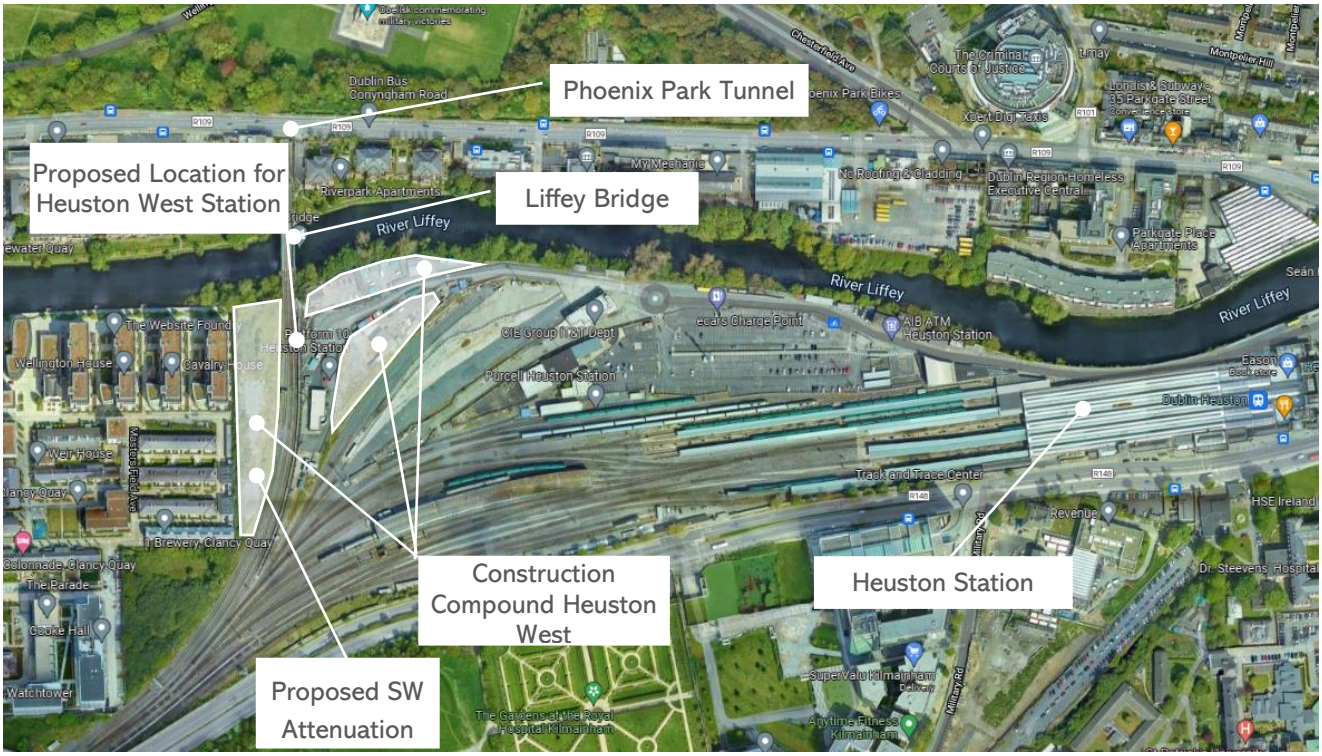


Figure 5-12 Construction Compound Heuston West Site Location

The proposed construction compound is located on Irish Rail property adjacent to Platform 10 and Clancy Quay. Due to the location of the proposed new station and the presence of existing rail lines to the east and south, no other suitable construction compound locations were identified in this very constrained area of the route. As a result, the selected construction compound location did not require multi-criteria analysis.

6. Options Selection Process

6.1. Options Selection Process Summary

A clearly defined appraisal methodology has been used in the selection of the Preferred Option for the Project. Consistent with other NTA projects, based on 'Guidelines on a Common Appraisal Framework for Transport Projects and Programmes' (CAF) published by the Department of Transport, Tourism, and Sport (DTTAS), March 2016 (updated 2020) and informed by TII's Project Management Guidelines (TII PMG 2019).

The Option Selection Process involves a two-stage approach (if / as appropriate):

- Stage 1 Preliminary Assessment (Sifting)
- Stage 2 Multi Criteria Analysis (MCA)

The starting principle of the optioneering process and a focus of the Project Team has been to reduce the potential impacts on the surrounding environs by accommodating necessary works and interventions within the existing rail corridor, where practicable. However, a number of discrete elements extend beyond the boundary of the existing railway. The optioneering process has focused on these elements for which alternative options manifest, options which are markedly different from one another, and which have varied impact on the local environment. Examples of such include four tracking, bridge replacements, and options for the location of substations and construction compounds.

The above selection process has been used to assess the options associated with the design of Heuston West Station.

6.1.1. Stage 1 Preliminary Assessment Process (Sifting)

The Stage 1: Preliminary Assessment (Sifting) involves an initial assessment of a long list of options, each of which are assessed against Engineering, Economic and Environmental criteria.

The assessment is based on whether an option meets the Project Objectives / Requirements and whether the option is technically feasible. All feasible options are brought forward to the second stage of the assessment process (MCA) to be explored in greater detail.

The options assessed for selecting the Preferred Option for the Project, ranged from a 'Do-Nothing' Option, Do-Minimum' Option to a range of 'Do-Something' Options, each of the options were assessed to determine if they were feasible and met the Project Objectives / Requirements. Where the sifting results in only one feasible option, a multi-criteria analysis (MCA) is not required for that one option.

6.1.2. Stage 2: Multi-Criteria Analysis (MCA)

Stage 2 of the optioneering process comprises a detailed multi-disciplinary comparative analysis of the feasible options that passed through Stage 1: Preliminary Assessment (Sifting).

The options are assessed against the criteria of Economy, Safety, Environment, Accessibility and Social Inclusion, Integration and Physical Activity in line with the criteria required for multi-criteria analysis under the Department of Transport, Tourism and Sport (DTTAS), Common Appraisal Framework (CAF) for Transport Project and Programmes (March 2016). These parameters were split into a number of sub-criteria considered relevant to the DART+ South West Project.

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

Relevant considerations include:

- This is a comparative analysis between the various options, not an impact assessment of each option. The impact from the Emerging Preferred Option will be assessed in the environmental impact assessment report (EIAR) in the next phase of the development.
- Not all sub-criteria and qualitative and/or quantitative indices may be relevant in every case.
- For each Option there are potential design variations. In due course design variations will be subject to detailed technical analysis (in respect of the Preferred Option).
- For each Option an indicative envelope was identified for permanent and temporary works, property and/or land take; a worst-case scenario was considered. Detailed design, technical and construction related solutions will seek to minimise land take in respect of the Emerging Preferred Option.
- The envelope around each Option was used to spatially represent environmental constraints within / proximate to the options.

The options which were brought forward from the Preliminary Screening were developed further to facilitate the more detailed Stage 2 Multi Criteria Analysis.

The process adopted for the Stage 2 MCA involved assessing the performance of each option against relevant quantitative and qualitative indicators, the assessment was carried out by a multi-disciplinary team including commercial, technical, safety and environmental specialists.

Presented in a matrix format, each specialist included a commentary of his/her analysis for each option. They then compared the options relative to each other based on whether an option had a 'some' or 'significant' advantage or disadvantage over other options or whether all options were 'comparable / neutral'. This basis of comparison is consistent with the NTA Guidelines which use the following five-point ranking scale when comparing options against each other for comparative analysis.

Table 6-1 Comparison Criteria

Comparison Criteria 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

6.2. Proposed Heuston West Station Option Selection

6.2.1. Station Design - Stage 1 Sifting

Five Options have been identified for Heuston West Station, the 'Do Nothing' Option was excluded as it will not deliver the Project objectives or meet the project requirements. All 'Do Something' Options were also 'Do Minimum Options' as the station will be located within Iarnród Eireann owned land.

Table 6-2 Preliminary Assessment (Sifting) Findings for Heuston Station West

Preliminary Assessment (Sifting) for Heuston West Station		
Option	**Description**	**Findings**
Option 0: Do Nothing	The existing infrastructure remains unchanged. There is no new station.	**Will not deliver Project objectives or requirements.**
Station Option A	Footbridge accessed by lifts and stairs.	**Pass**
Station Option B	Footbridge accessed by ramps and stairs.	**Pass**
Station Option C	Underpass via the Liffey Railway Bridge arches, accessed by lift and stairs (the stairs follow the embankment profile).	**Pass**
Station Option D	Underpass via the Liffey Railway Bridge arches, accessed by stairs and ramps. Ramps run parallel to Liffey River.	**Pass**
Station option E	Underpass via the Liffey Railway Bridge arches, accessed by lift and ramps. Ramps run parallel to platforms.	**Pass**

The summary of the findings of the Preliminary Assessment (Sifting) were that all five options met the necessary Engineering Feasibility and Project Requirements and were brought forward to Stage 2: MCA for detailed assessment.

6.2.2. Station Design – Stage 2 Multi Criteria Analysis

As explained in previous section, all options brought forward are considered feasible. Therefore, the options that will undergo the MCA assessment are A to E. Table 6-2 below, shows the summary findings of the comparative assessment undertaken during the Stage 2 MCA, the detailed matrix is provided in Appendix B MCA Process Backup.

Table 6-3 MCA Summary

CAF Parameters	Option A	Option B	Option C	Option D	Option E
1. Economy	Some Comparative Disadvantage over the Other Options	Some Comparative Advantage over the Other Options	Some Comparative Disadvantage over the Other Options	Some Comparative Advantage over the Other Options	Some Comparative Advantage over the Other Options
2. Integration	Some Comparative Advantage over the Other Options	Some Comparative Advantage over the Other Options	Some Comparative Disadvantage over the Other Options	Some Comparative Disadvantage over the Other Options	Some Comparative Disadvantage over the Other Options
3. Environment	Some Comparative Advantage over the Other Options	Some Comparative Advantage over the Other Options	Some Comparative Disadvantage over the Other Options	Some Comparative Disadvantage over the Other Options	Some Comparative Disadvantage over the Other Options
4. Accessibility and Social Inclus	Some Comparative Disadvantage over the Other Options	Some Comparative Advantage over the Other Options	Some Comparative Disadvantage over the Other Options	Some Comparative Disadvantage over the Other Options	Some Comparative Disadvantage over the Other Options
5. Safety	Comparable to the Other Options / Neutral	Comparable to the Other Options / Neutral	Comparable to the Other Options / Neutral	Comparable to the Other Options / Neutral	Comparable to the Other Options / Neutral
6. Physical Activity	Some Comparative Advantage over the Other Options	Some Comparative Advantage over the Other Options	Some Comparative Disadvantage over the Other Options	Some Comparative Disadvantage over the Other Options	Some Comparative Disadvantage over the Other Options
Conclusion	**Some Comparative Disadvantage over the Other Option**	**Some Comparative Advantage over the Other Option**	**Some Comparative Disadvantage over the Other Option**	**Some Comparative Disadvantage over the Other Option**	**Some Comparative Disadvantage over the Other Option**

The options were assessed in accordance with the CAF guidelines against the relevant criteria as outlined below:

- Economy: options with ramps were assessed as more favourable, due to the operational and maintenance costs associated with the provision of lifts. Other matters considered the footprint of the various options, the underpass options were considered less favourable due to the amount of space required to provide compliant ramps and stairs, particularly when considering future urban regeneration plans for the area.
- Integration: the bridge options were assessed as marginally better in terms of integration, the bridge options have a smaller footprint, minimise disruption during construction, the underpass works require considerable civils works to build the necessary access route on the embankments.
- Environment: in this case, the options with the bridge underpass have a higher impact in the Conservation Area than the footbridge ones. There is considerable visual impact on the Liffey River embankment in options C, D and E. These options also require considerable earthworks.
- Accessibility and social inclusion: All options provide compliant access routes to the station and to the surrounding environs via a new access route through Clancy Quay. The ramp and stairs options provide a shorter and more direct access route to the station.
- Safety: From the perspective of Transport Safety there is no difference between the options.
- Physical activity: in this case, like the previous point, the options of the bridge underpass require longer travel routes. The urban connection of these options is less advantageous. Only if a riverside walk were to be developed, this situation would improve, but in the current state the urban connection of options C to E is more disadvantageous.

6.2.3. Station Design Preferred Option

Based on the outcome of the Stage 2 MCA, Option B is the preferred option. This option includes the provision of a footbridge accessed by ramps and stairs, it provides the most direct connection to the station platforms and between east and west areas.

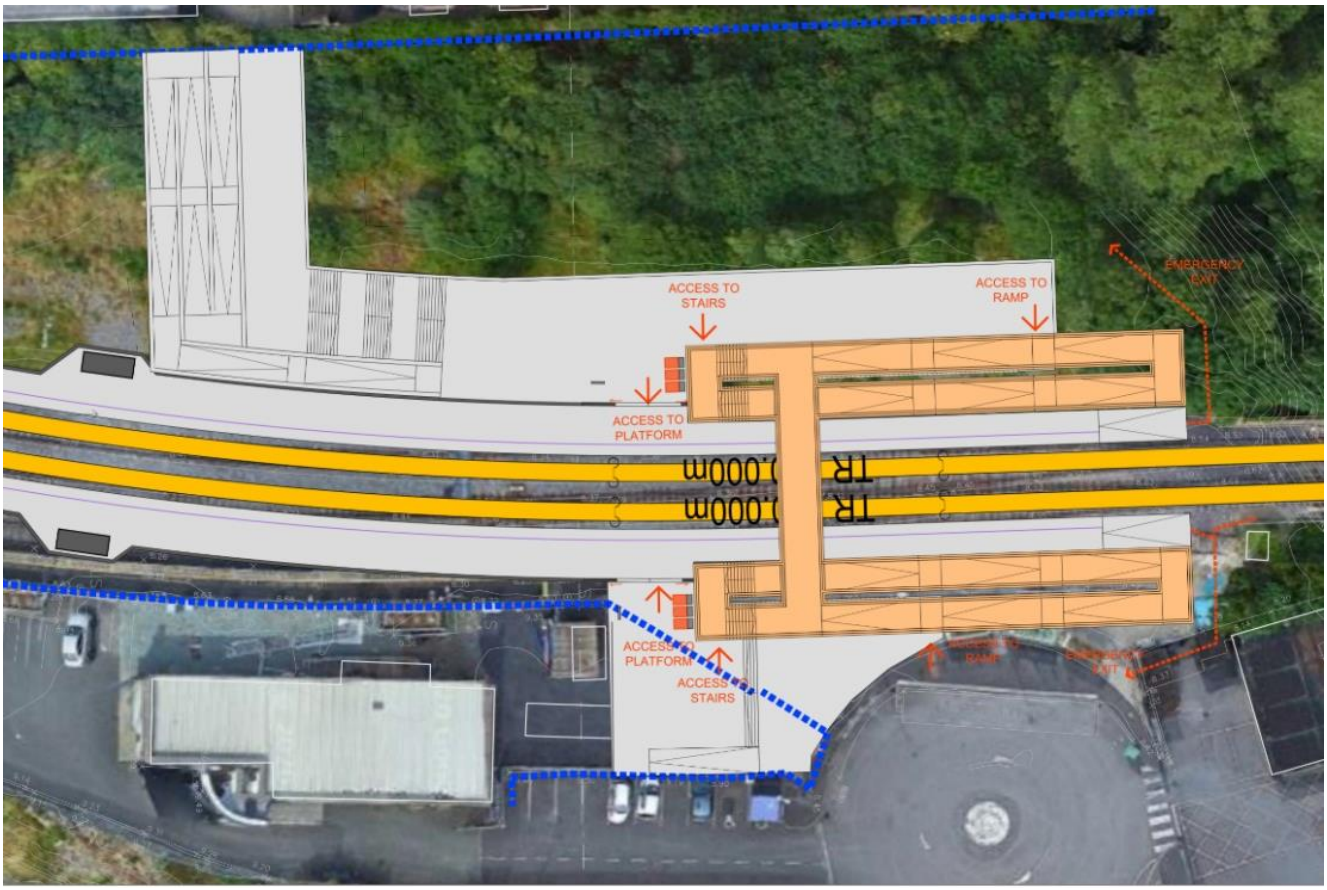


Figure 6-1: Heuston West Station Preferred Option

6.3. Passenger Transfer Route Option Selection

As described in Section 2.6 (Exiting Situation) and 4.7 (Constraints); the Heuston Terminal Station with its current layout of Operational & Maintenance Yards and Depots provides little possibility for direct and shorter vulnerable user routing of passengers to the Main Terminal Platforms, Bus collection points and the Luas stop than what has been proposed as the Preferred Option in **Section 7**.

While the options to enhance the existing pedestrian route between the Heuston Terminal Station and the proposed new Heuston West Station were limited, they were nevertheless reviewed for feasibility of implementation. The Heuston Development Masterplan which is under refinement and seeks to provide more conducive spaces for commuter interaction, directness, safety and comfort. The proposals for the pedestrian route upgrades were assessed with the future upgrade works in mind. The enhancements to the existing pedestrian route (listed and further represented in the figures to follow) are considered interim initiatives for pedestrian transfer until such time at the overall Heuston Master Plan development proposals come to fruition. The options proposed below are also not considered the main passenger mode of transfer between the Heuston Terminal Station/Luas Stop and Heuston West. Owing to the distance between the Luas and proposed station the main mode of transfer proposed will be via buses, as well as the use of various private and rent for use cycle options; the latter be subject to further planning and stakeholder negotiation.

The are 3 no. distinct Areas identified along the pedestrian route (See **Figures 6-2** to **6-4**):

- Area 1 - Heuston West Station to the Heuston Terminal Station carpark exit. (Maintenance Area)
- Area 2 - Heuston Terminal Station carpark exit to the Heuston Terminal Station taxi rank. (Parking Area)
- Area 3 - Heuston Terminal Station taxi rank to the Heuston Terminal Station Bus and Luas boarding and alighting points. (Operational Area)

Figure 6-2 Area One – Pedestrian Route Layout plan

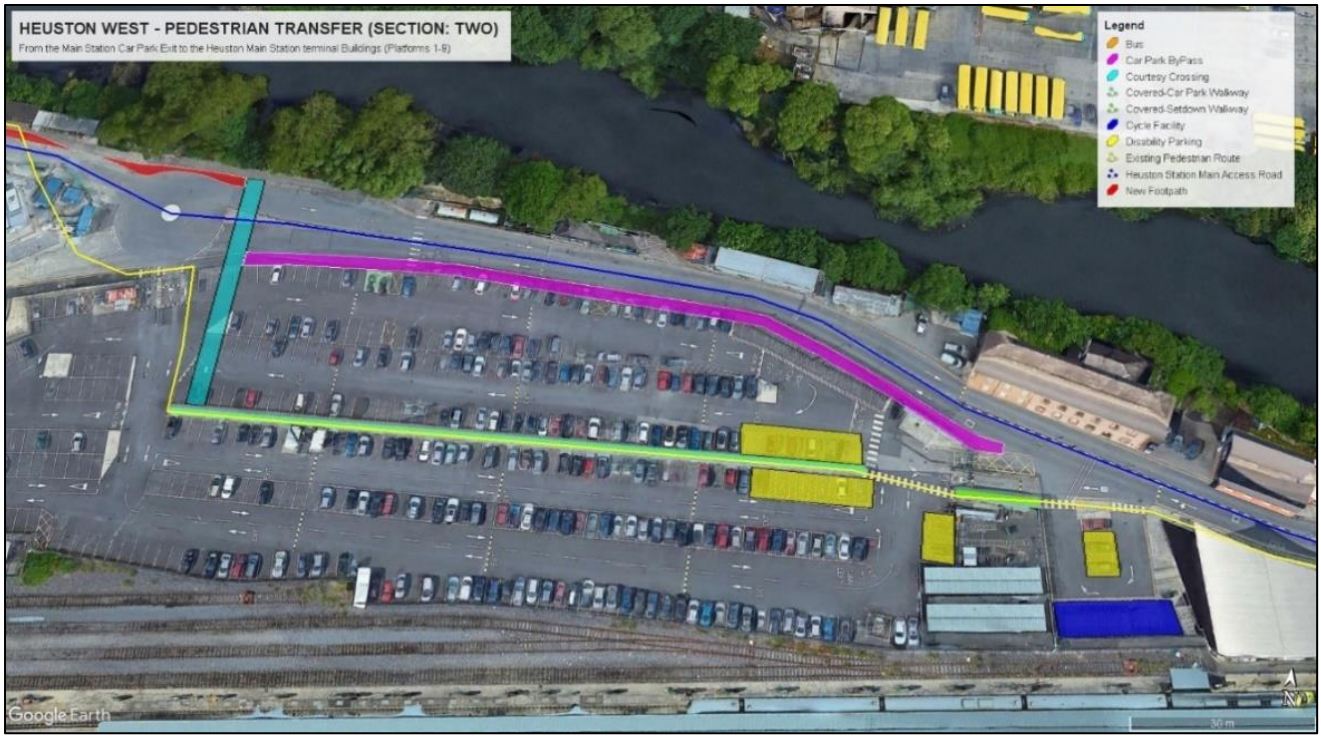


Figure 6-3 Area Two – Pedestrian Route Layout plan

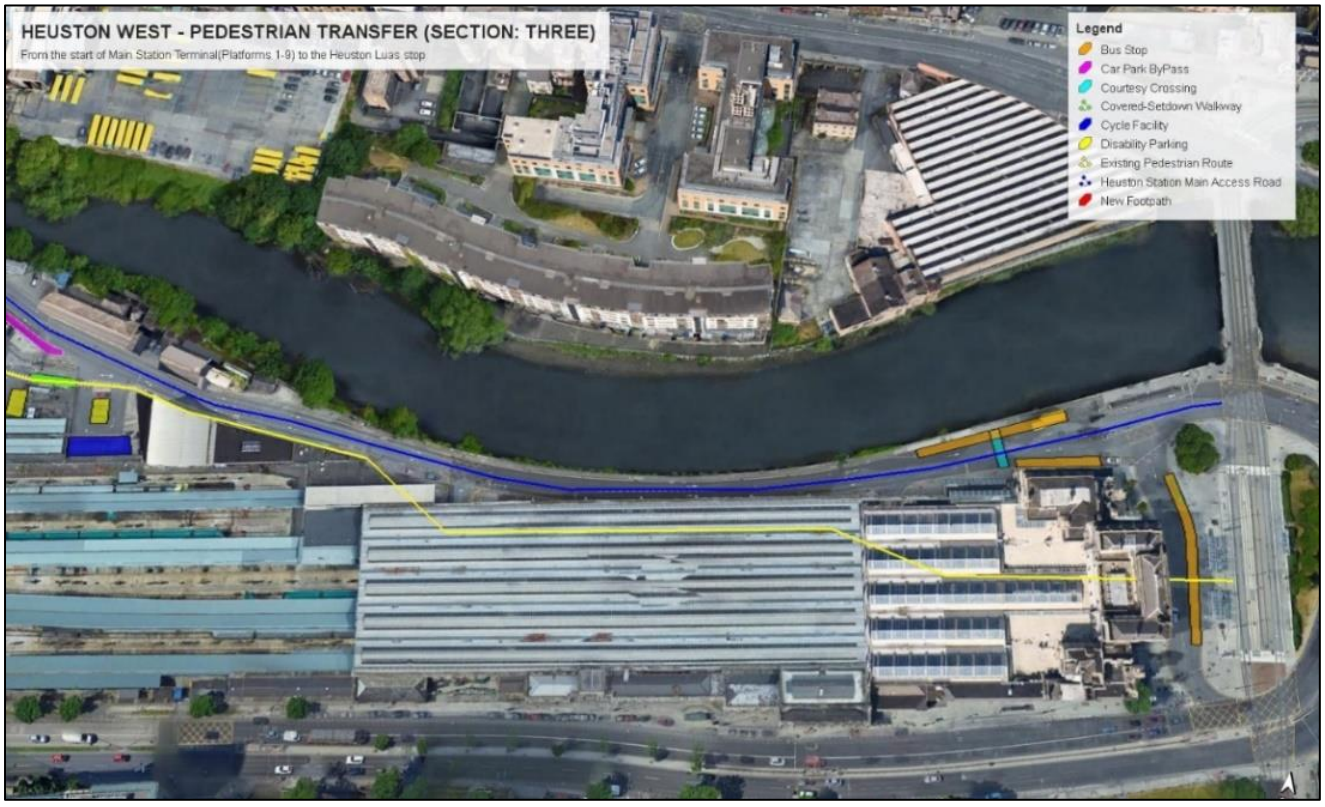


Figure 6-4 Area Three – Pedestrian Route Layout plan

6.3.1. Pedestrian Route Enhancement - Stage 1 - Sifting

1. Widening the footpath in the narrower Area 1 to provide greater than the 1.8m to between 2m and 2.5m; which is available throughout Area 2 and Area 3.
    - This would require a reduction in carriageway width or removal of Depot fencing and containerised offices local to the widening; neither of which was considered feasible.
2. Providing cantilevered footpath covering in Section 1 to provide a similar level of coverage to Area 2 (main carpark covered walkway) and Area 3 (the covered areas of the main terminal building).
    - This would require a widening of the space similar or even greater than the additional footpath widening to provide necessary safety clearances to buses and HGVs. This would be a significant abortive cost for little benefit particularly as it is not envisaged to be the main modal transfer option for passengers and as such was not deemed feasible.
3. Travellator options for the 3 no. Areas were reviewed and based on the required operation and maintenance regimes, topography and/or constrained space these were not considered interim feasible proposals.

6.3.2. Pedestrian Route Enhancement - Stage 2 -Multi Criteria Analysis

In light of the findings above and the integration imperatives of the Heuston Station Master Plan no Multi Criteria Analysis was required for acceptance of the following minimum footpath enhancements.

- Provide a minimum width footpath of 1.8m between the proposed new Heuston West Station and Luas stop; essentially only required in Area 1. As noted in **Section 2** of the report; the majority of the route already has footpath widths of 2m or greater. There only 4 no. localised areas noted for widening.
- Existing pedestrian crossings at the various vehicular accesses to operations and maintenance depots will be improved to provide greater priority to the passenger. This route was historically more for operational personnel. This will include reconstructed drop kerbs and repainting of line marking and include enhanced signage.
- Provision of pedestrian priority road crossings with appropriate priority markings and signage at 3 no. locations; namely, from footpath to main car park, across the carpark and between the Main Terminal Station and the existing Bus stops adjacent to the River Liffey.
- A number of emergency phones are currently located along the route and CCTV exists at the Depots and Main Station Carpark. Additional cameras to be provided to focus on the route and the station itself and to be integrated into the overall security management system of Heuston Station.
- Regular street lighting is located along the route; during detailed design additional supplementary lighting may be identified to further enhance the existing lighting.

6.4. Construction Compounds

As there are no other suitable alternative locations for the Construction Compound in this area, multi-criteria analysis was not required. Please refer to **Section 8** for further details in relation to the Construction Compound.

7. Preferred Option Design Development

7.1. Review of Emerging Preferred Option

The original scope of the DART+ South West Project included a Feasibility Report and Concept Design for a potential new station at Heuston West. Having regard to public feedback, the progress made on the Feasibility Report and Concept Design, and having regard to the location of the potential station within Iarnród Eireann's lands at Heuston (and more specifically at the location of the existing platform 10), Iarnród Éireann has made the decision to include the new Heuston West Station in the scope of the Project to be brought forward for Railway Order (RO)

Option B was assessed as the preferred station option including a footbridge connection accessed by stairs and ramps, was developed at a concept design level.

7.2. Review of Stakeholder Feedback

Feedback in relation to Heuston West station was generally positive, with submissions welcoming the proposition of a potential station at this location, and the increased connectivity it would bring to the wider transport network in the city and surrounding areas. Specific feedback received from the public in relation to Heuston West Station primarily related to public access to the station and how it should be integrated with the surrounding area.

Notwithstanding the generally positive feedback in relation to Heuston West, several submissions expressed concern relating to visual impact and noise – both during construction and operational phases. Coordination of construction works was also highlighted as a concern. Considerations in relation to visual and noise impact, and works coordination will be regarded

7.3. Design Development

The design has been updated to take into account detailed topographical survey information. Other modifications include the requirement to accommodate an underground attenuation tank (shown below in dashed line Fig 6-1), as well as an updated Permanent Way model. The design drawings of the preferred option are included in the Appendix C.

The connection with Clancy Quay was modified to facilitate the attenuation tank, the modification provides a more gradual route in terms of gradient, between the platform and Clancy Quay. The access to the station is by means of either stairs and/or a 6%-stepped ramp. The ramp route and the footbridge provide an overview of the adjacent Liver Liffey area.

The proposed design allows for a track access point north of the platforms for the maintenance services access.

The design proposes the use of curved shapes in the station structures to soften visual impact.

Platforms will be 174m long, 3m wide. The station will be equipped with the equipment and services described in **Section 5.1** of this report.

An initial assessment of the proposed station performance indicates a 2.4m width for stairs and ramp will be appropriate to carry the peak hour passenger load.

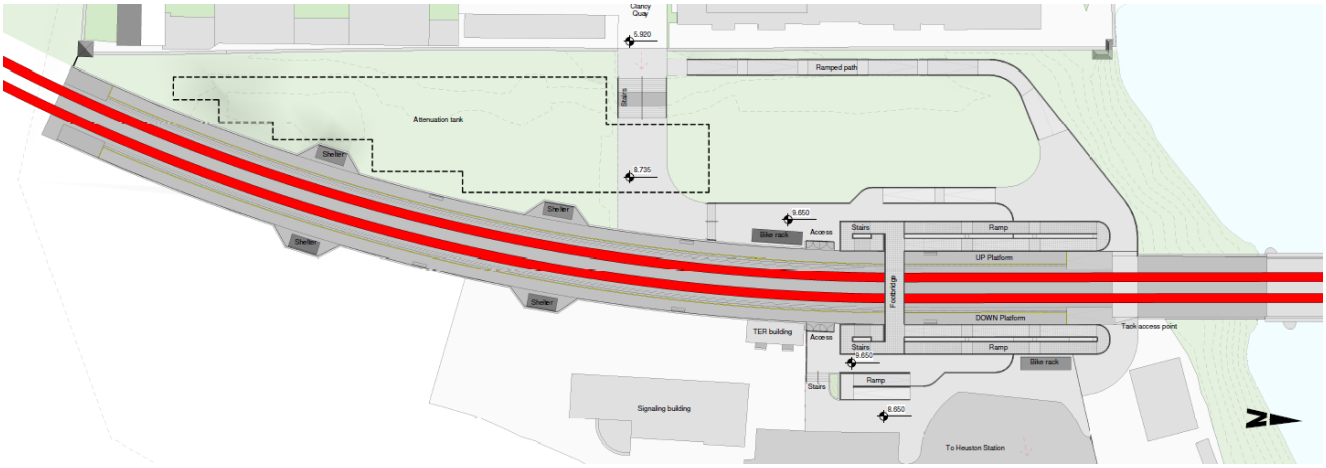


Figure 7-1 Proposed Heuston West Station Plan

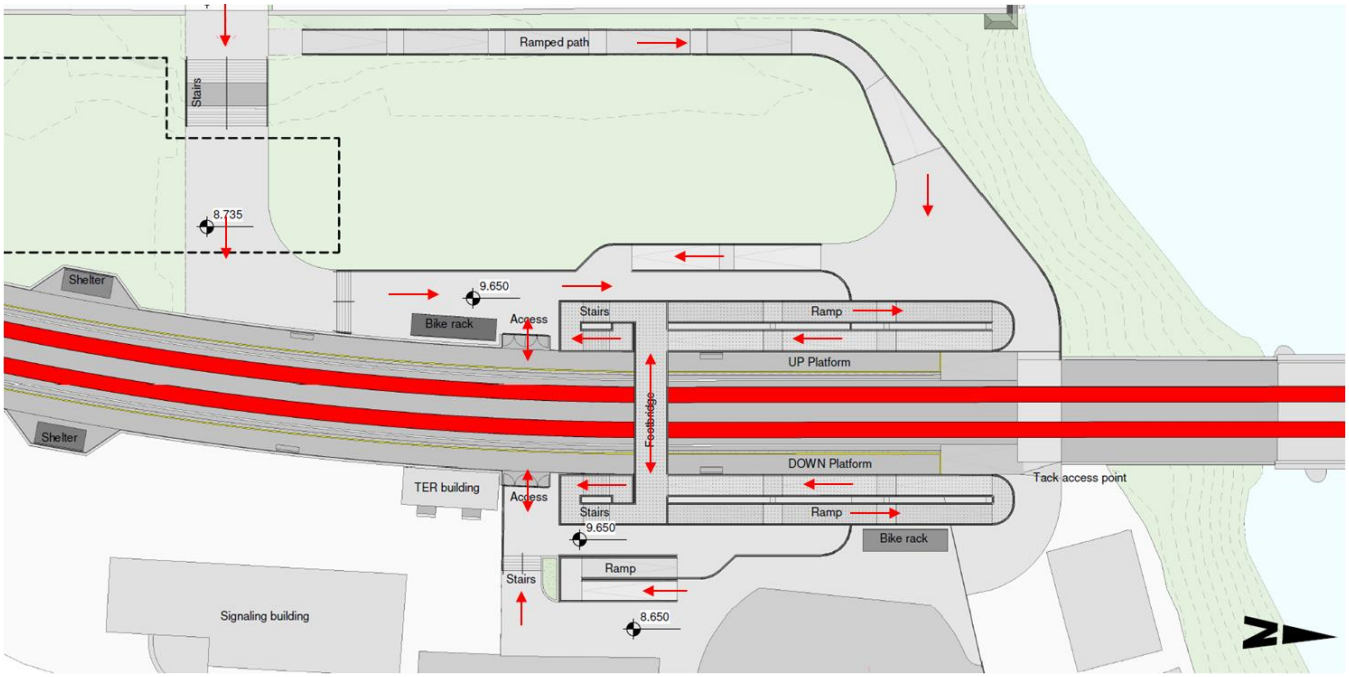


Figure 7-2 Proposed Heuston West Station Plan & Detailed Access Routes

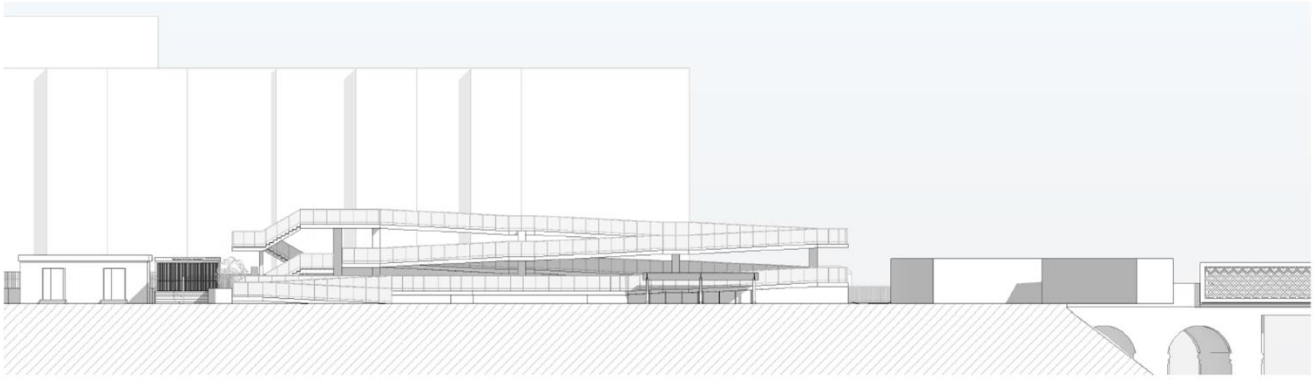


Figure 7-3 Proposed Heuston West Station, Elevation, East Elevation

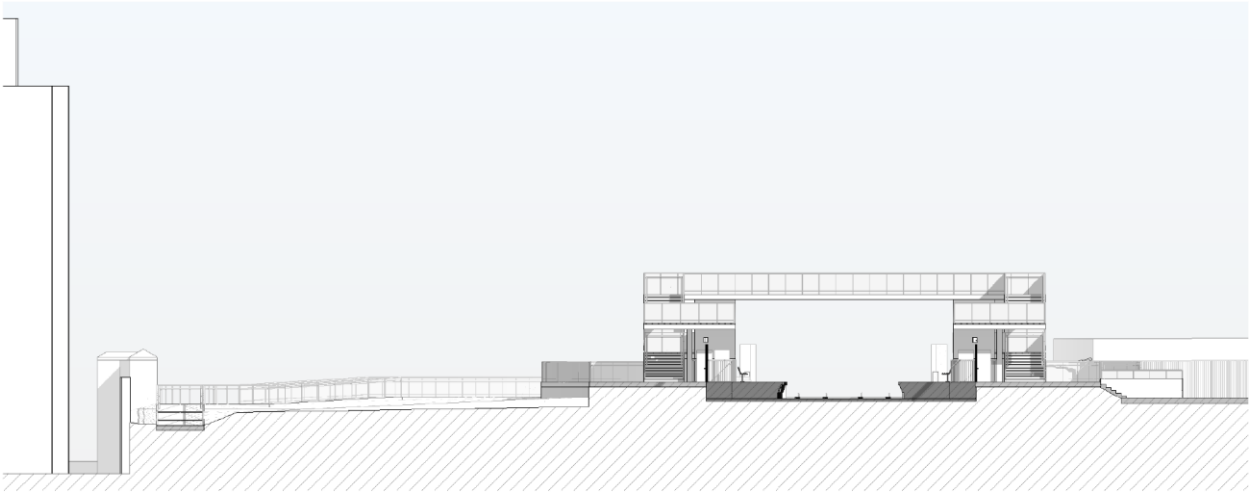


Figure 7-4 Proposed Heuston West Station, Cross Section Facing North

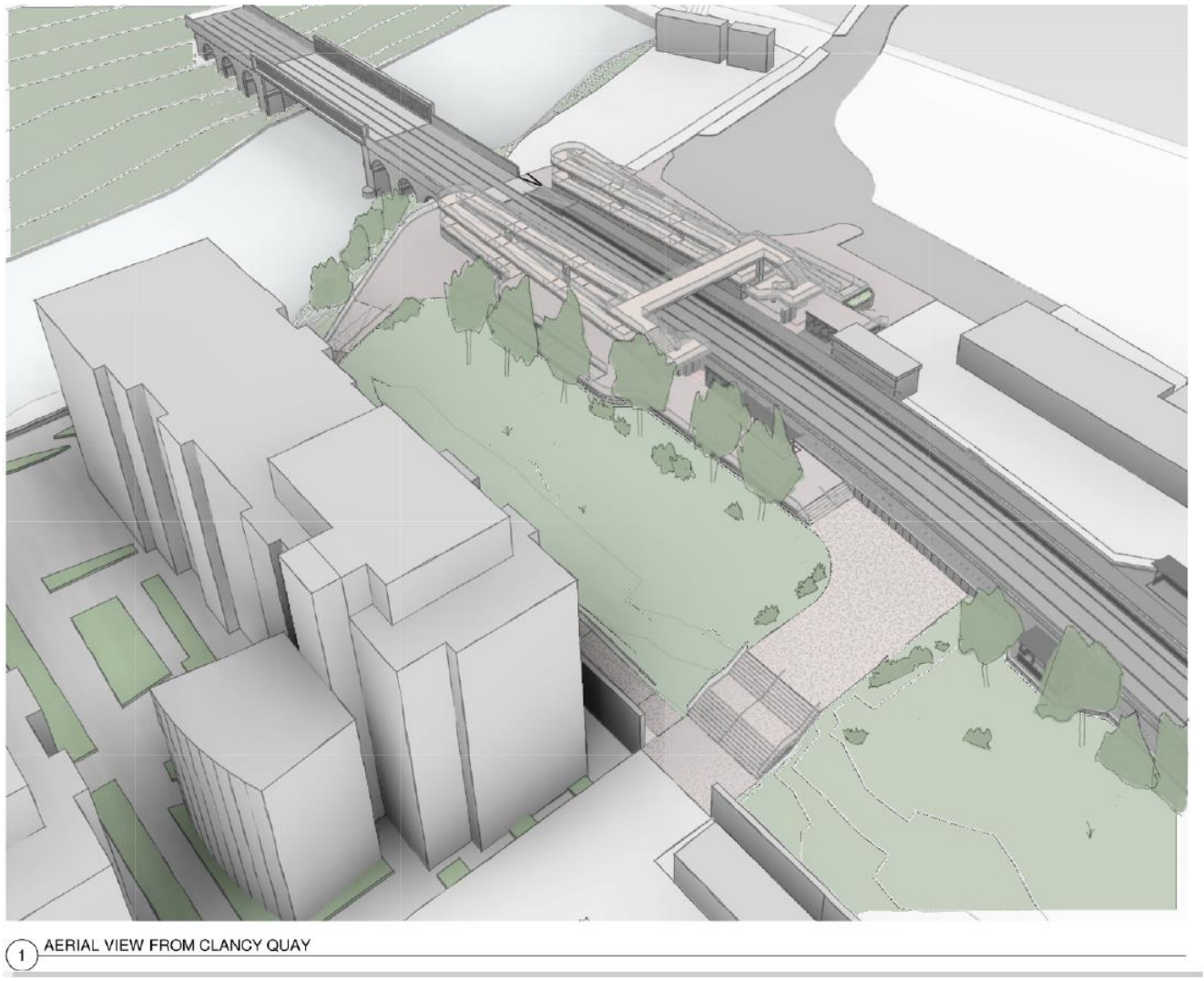
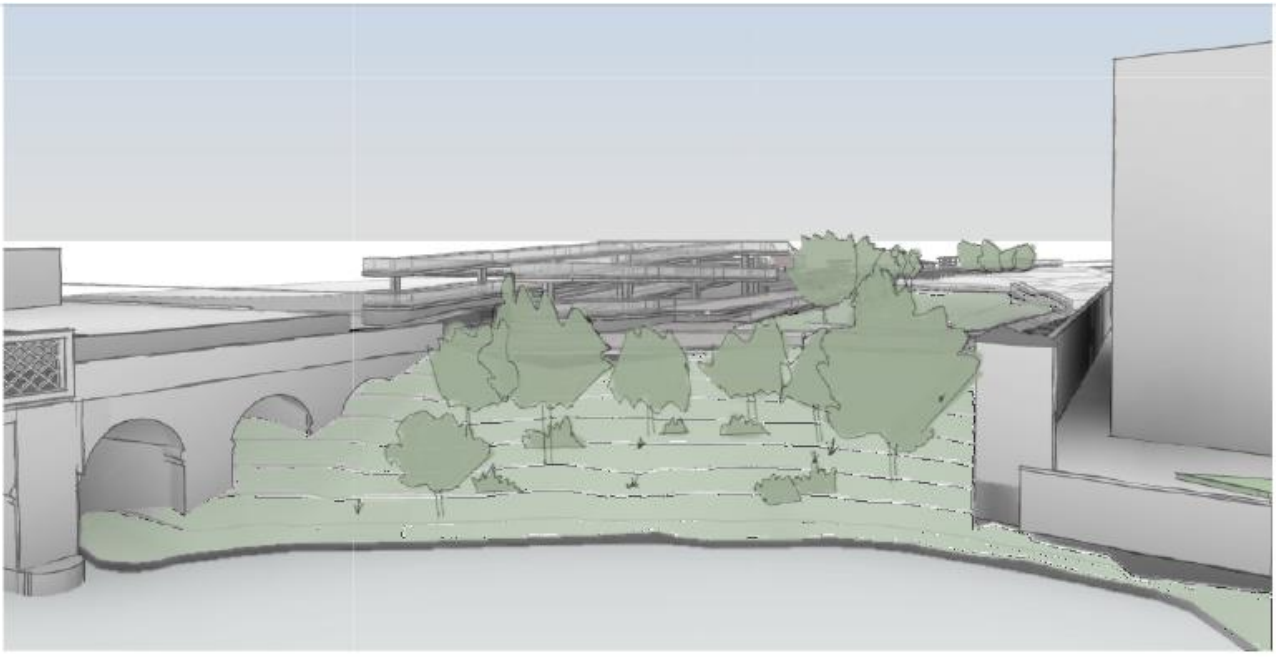


Figure 7-5 Proposed Heuston West Station Views



2 VIEW FROM RIVER

3 VIEW FROM EAST

Figures 7-6 Proposed Heuston West Station Views

7.3.1. Permanent Way

The proposed layout comprises 4 tracks at the start of the section to the east of St John's Road Bridge (OBC0A) - the 3 existing tracks being realigned on the south side of the corridor plus the addition of a new track on the north side.

The 2 northern tracks tie-in to the existing GSWR branch lines and become the electrified Slow lines, whilst the Fast lines to the south approach Heuston Station. There are also other connections from the Slow lines into Heuston Station, as well as the Slow lines passing through new Heuston West Platforms 10 and 11.

The track layout through Heuston West Station was optimised at PC1 and remains unchanged for PC2.

Horizontally, it has only been possible to achieve a track radius through the platforms of 350m – which is the absolute minimum permitted. Note that this is a betterment over the existing 315m radius through the existing Platform 10.

For the operational speed of 25mph (40 kph) the track can remain uncanted, though the platform edge will need to be offset with an allowance for vehicle throw due to the aforementioned track curvature. Vertically, a level gradient of 0.000% has been achieved – compliant with track standards.

The layout is illustrated in the figure below.

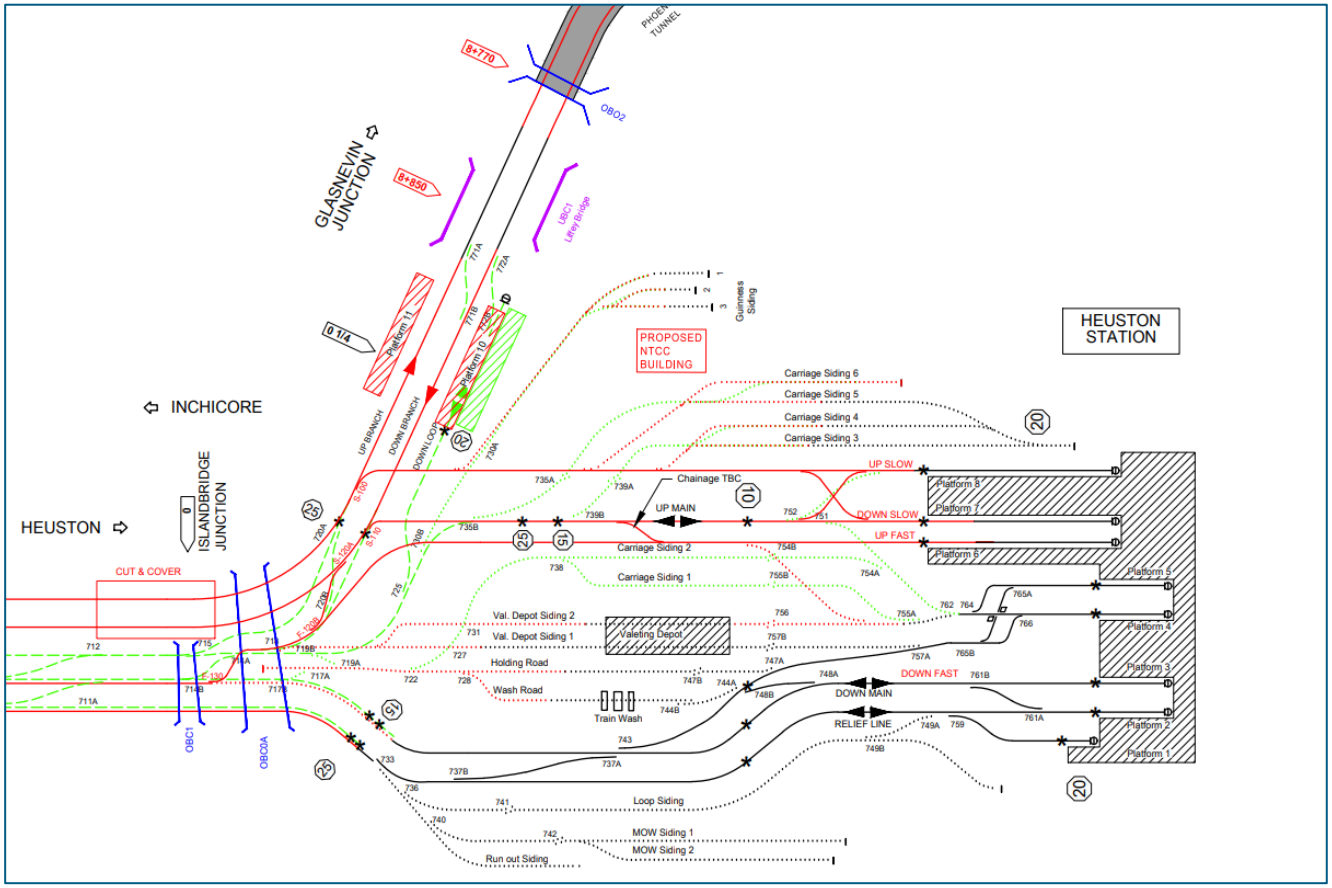


Figure 7-7 Heuston West Station – Track Plan Layout

7.3.2. Signalling, Electrical and Telecommunications (SET)

This section provides detail on the proposed SET equipment and components which will be distributed along this section of the railway. More information on the typical SET equipment is included **Volume 2 Option Selection – Technical Report.**

7.3.2.1. Signalling

The signalling system is used to safely control and monitor train movement on the Irish Rail network. The system comprises a network of sensors, controls, signs and lights. It also includes localised control cabinets and cabins.

A Signalling scheme plan has been developed for the entire route, the section pertaining to this area is detailed in **Figure 7-8**. The scheme plan shows the number and type of signals that will be allocated on this section of the route and the points and crossings that they interface with.

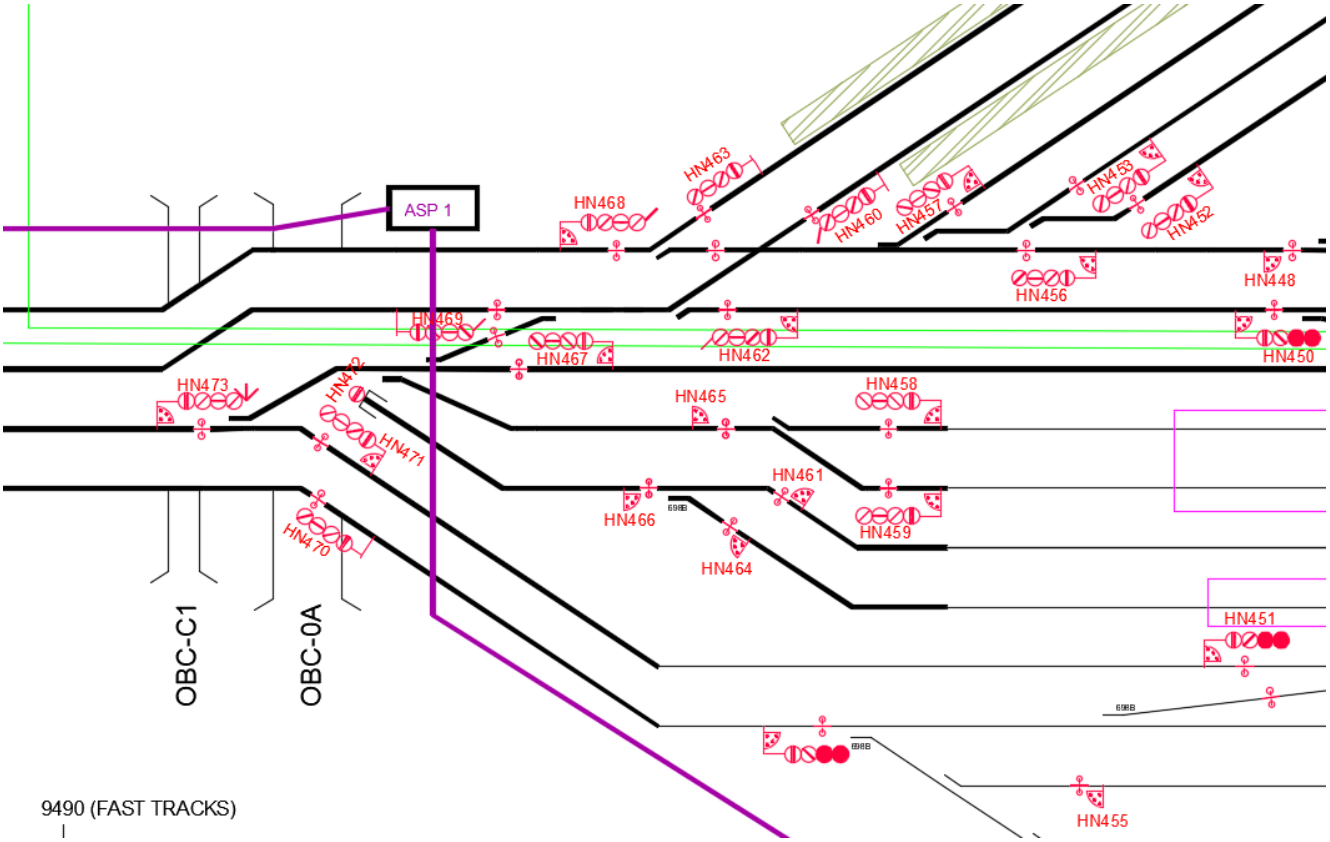


Figure 7-8 Signalling Scheme Plan (Heuston Station)

The following section details the physical signalling infrastructure that will be installed. The physical signalling infrastructure has been developed and is indicated in **Figure 7-9**. This figure shows an ASP in the area. All equipment is expected to be located within the existing IE land boundary to minimise the impact to the public.

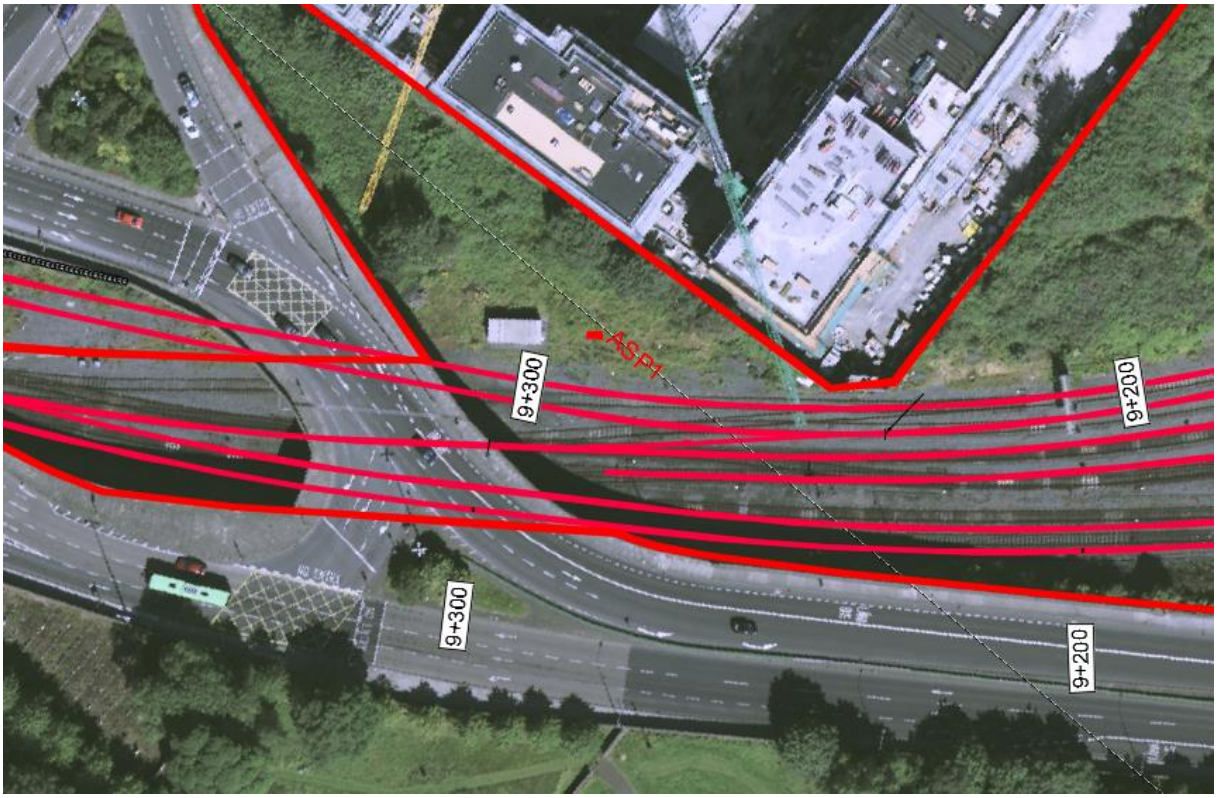


Figure 7-9 Signalling main Infrastructure: SER and LOC's

Infrastructure highlighted as follows:

- Red box – Auxiliary Supply Power

7.3.2.2. Signalling Post

There are currently no proposed signalling cantilevers or gantries in this section and trackside signals would be located on signal posts adjacent to trackside. A typical signal post is shown in **Figure 7-10**.

Figure 7-10 Typical Signalling Post

7.3.2.3. Object Controller Cabinet (OBJ)

In the railway system, the movement of the train is controlled by an interlocking system. Such an interlocking system consists of different parts. From a logical perspective, there is a central device (computer) that controls and senses the condition of important equipment such as switches, signals, track circuits, etc. This equipment is collectively referred to as an object or rail side object. The equipment that handles the interface between the central device and the object is referred to as an object controller. A typical Object Controller Cabinet is shown in **Figure 7-11**.

Figure 7-11 Typical Object Controller Cabinet

7.3.2.4. Location Case

Location Cases (Locs) accommodate railway signalling equipment to detect the location of trains, control the trackside signals and switch the points. They link the physical asset to the control equipment within. Additionally, they are used to accommodate the required power distribution to the signalling equipment. A typical Location Case is in **Figure 7-12**.

Figure 7-12 Typical Location Cases

7.3.2.5. Cable Containment

A cable containment strategy has been progressed and following review of several alternatives such as traditional concrete troughing and direct burying cable routes, a secure trough antislip walkway is the preferred alternative, with ladder rack being used on tunnel walls (see **Figure 7-15**). This takes up the same footprint as traditional concrete troughing but is of lighter more manageable construction. As this trunking also acts as a designated non-slip walkway it will help to mitigate space constraint issues along the route as well as minimise the aesthetic impact to the public. It also has the added advantage that it provides security of cabling from theft and damage as well as providng easy maintenance going forward.

Figure 7-7-13 Containment walkway

Cable containment route will run adjacent to the track in accordance with standard railway practice and will cross under the track where required using under track crossings (UTX) and secure turning chamber. Type of containment at each stage of the track will be highlighted in the design drawings.

7.3.2.6. Electrification

In the Heuston West Station section, in the twin track area, the electrification equipment will be supported by TTC structures at north side of the lines to support OHLE on both tracks, as detailed in Section 3.2.1.

Electrical sectioning (insulated overlap) shall be positioned at each side of the station for Isolation and maintenance purposes. Anchor structure of the insulated overlap at the north end of the station has been designed to terminate the OHLE before the station platform to mitigate the tripping hazard due to tie in the station area. TTC type OHLE masts shall be positioned through station area to minimise the OHLE masts on one platform. The OHLE masts shall be placed to avoid clashing with station footbridge and shelter.

With OHLE configuration as stated above with graded down contact wire, the required safety clearance of 3m for 1500V to the passengers standing on the future station is achievable.

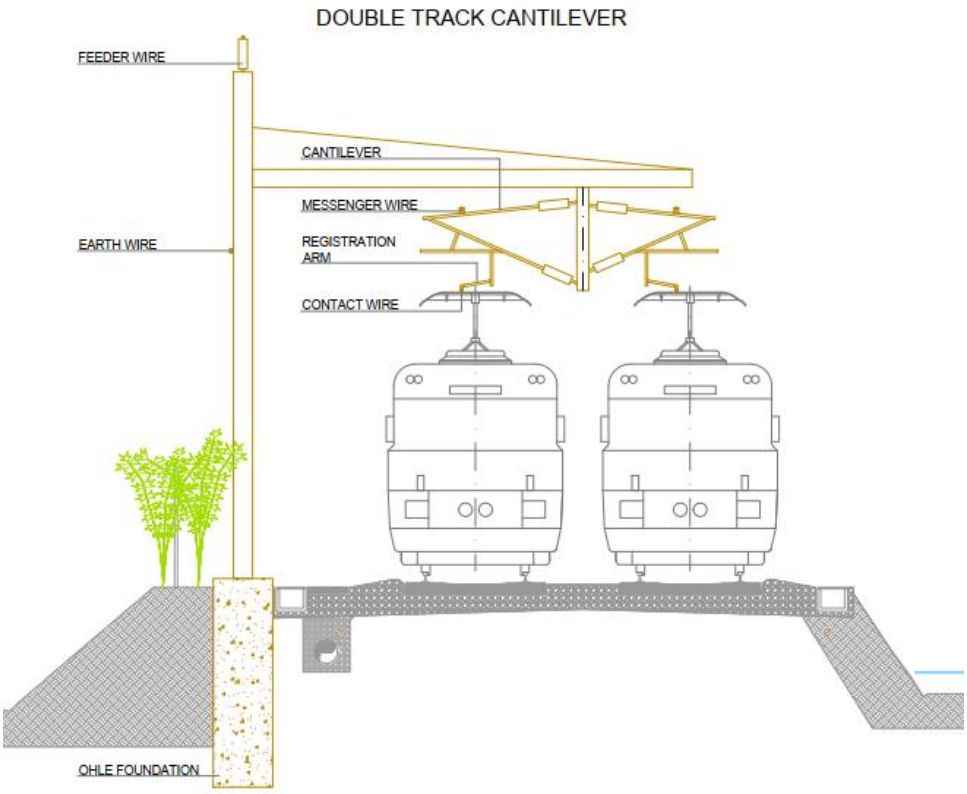


Figure 7-14 Typical OHLE arrangement in two track open route – Facing East.

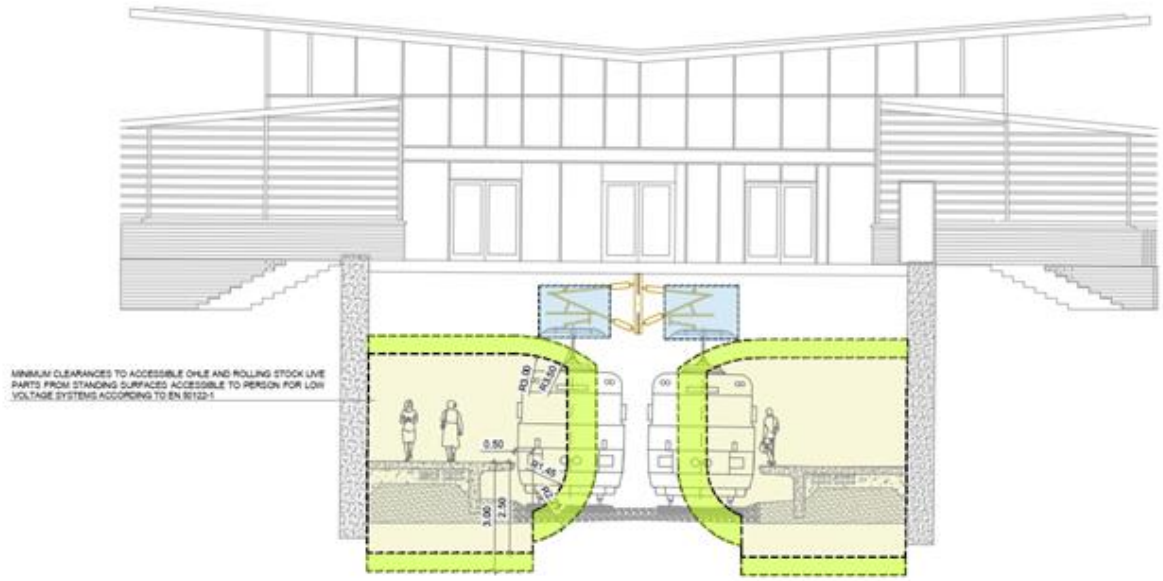


Figure 7-15 Example OHLE system in station area with clearance

7.3.3. Drainage

The proposed track drainage system includes filter drains to collect runoff waters from the ballast and surrounding areas, and carrier pipes to convey collected runoffs to the proposed attenuation structure and discharge point, located at Liffey River. The proposed filter drains discharge into the collector pipes through manholes, which are to be spaced between 30 to 50 metres.

The drainage network for this track section consists of a single pipe branch running parallel to the track beneath the ballast layer.

An attenuation tank is proposed In Irish Rail Land between the proposed Heuston West Station and the Islandbridge – Clancy Quay, in order to retain rainfall volumes and comply with the discharge rates required by Dublin City Council.

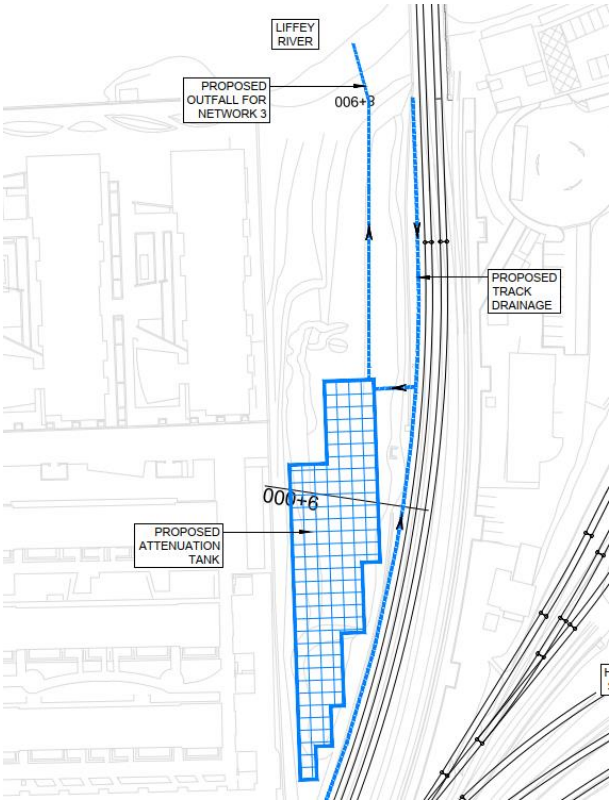


Figure 7-16 Proposed Track Drainage Layout at Heuston West

7.3.4. Pedestrian Transfer Route

The access route to the proposed Heuston West Station will initially be via the same access road serving the existing Heuston Terminal Station main carpark and operational control centres as well as Platform 10. The existing carriageway and lane widths in the main will not be altered as the road corridor as it is generally constrained with existing buildings, limited footpaths width availability, due to River Liffey embankments, fencing, parapets and building walls. Most of the central median traffic calming in non-pedestrianised sections of the route will also remain as is.

The lack of lateral space does not afford the opportunity to provide dedicated/segregated cycle lanes, however there is a low volume of vehicular traffic using the access road and there is a 15km/hr speed restriction. However additional signage and line marking will be provided to inform vehicular users that cyclists have priority on the access road to leading to the proposed station. The core enhancements will be those that improve passenger

safety as they transfer between Heuston Terminal Station (as well as the Luas and Bus stops) and the proposed new Heuston West Station; the proposed interventions are listed below and visible in **Figures 7-17 to 7-20**.

Main recommendations for the **Preferred Option for Area 1** are listed below (See to **Figures 7-17** and **7-18**):

1. Widen footpath into the road at 2 no. locations.
2. Widen footpath after compounds between existing fence and path.
3. Install courtesy crossing east of roundabout (zebra would give absolute priority).
4. Line marking a shared use cycle lane with vehicles, between the Heuston Terminal Station entrance and the proposed Heuston West Station.

Figure 7-17 Section One (East) - Pedestrian Route Preferred Option Enhancement Proposals

Figure 7-18 Section One (West) - Pedestrian Route Preferred Option Enhancement Proposals

Figure 7-19 Area Two - Pedestrian Route Preferred Option Enhancement Proposals

Main recommendations for the **Preferred Option for Area 2** are listed below (See to Figure **7-19**):

1. Install new Pedestrian Gate at location of new courtesy crossing east of roundabout.
2. Install courtesy crossing inside car park from new Pedestrian Gate to existing walkway
3. Line marking a shared use cycle lane with vehicles, between the Heuston Terminal Station entrance and the proposed Heuston West Station.

Main proposals for the **Preferred Option for Area 3** are listed below (See **Figures 7-20** and **7-21**):

1. Install courtesy crossing at River Liffey side bus stop.
2. Restrict Access to River Liffey side footpath using bollards and or other method to be agreed.
3. Line marking a shared use cycle lane with vehicles, between the Heuston Terminal Station entrance and the proposed Heuston West Station

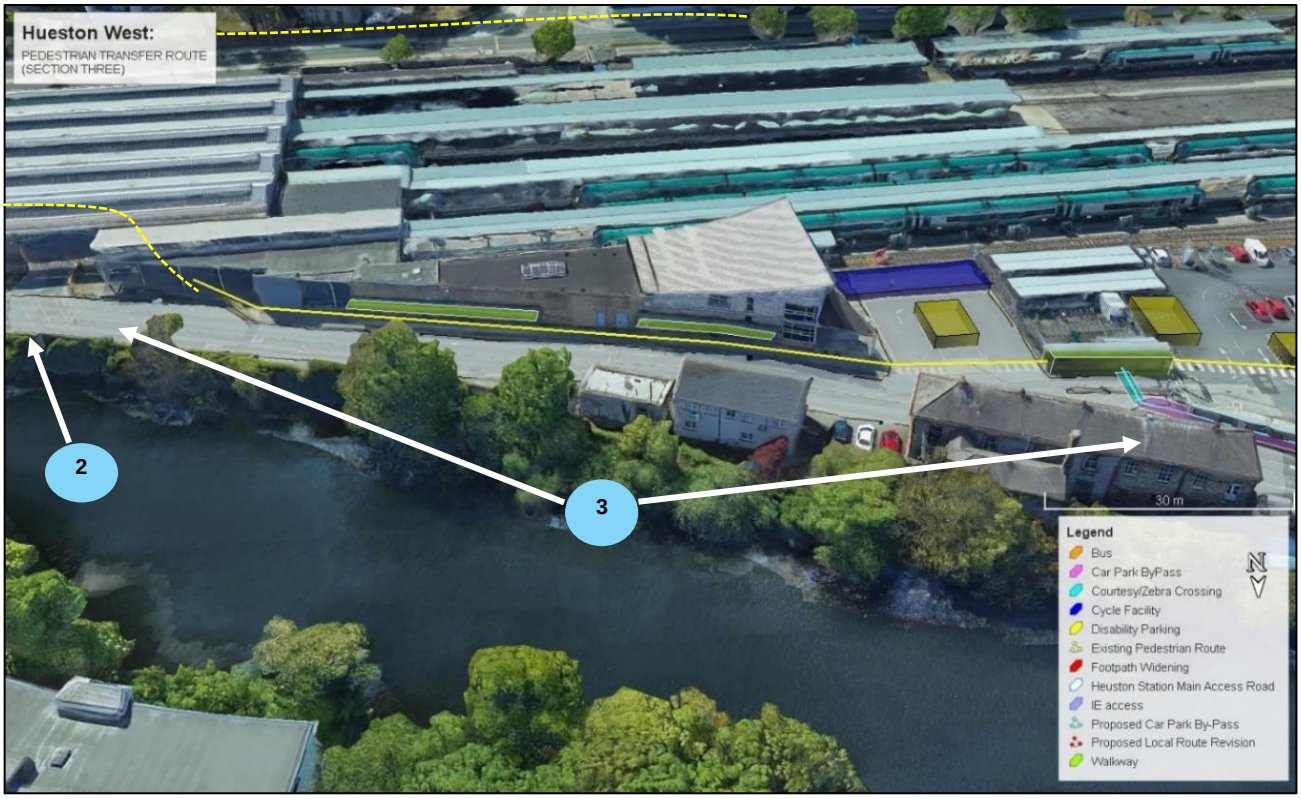


Figure 7-20 Area Three (West) - Pedestrian Route Preferred Option Enhancement Proposals

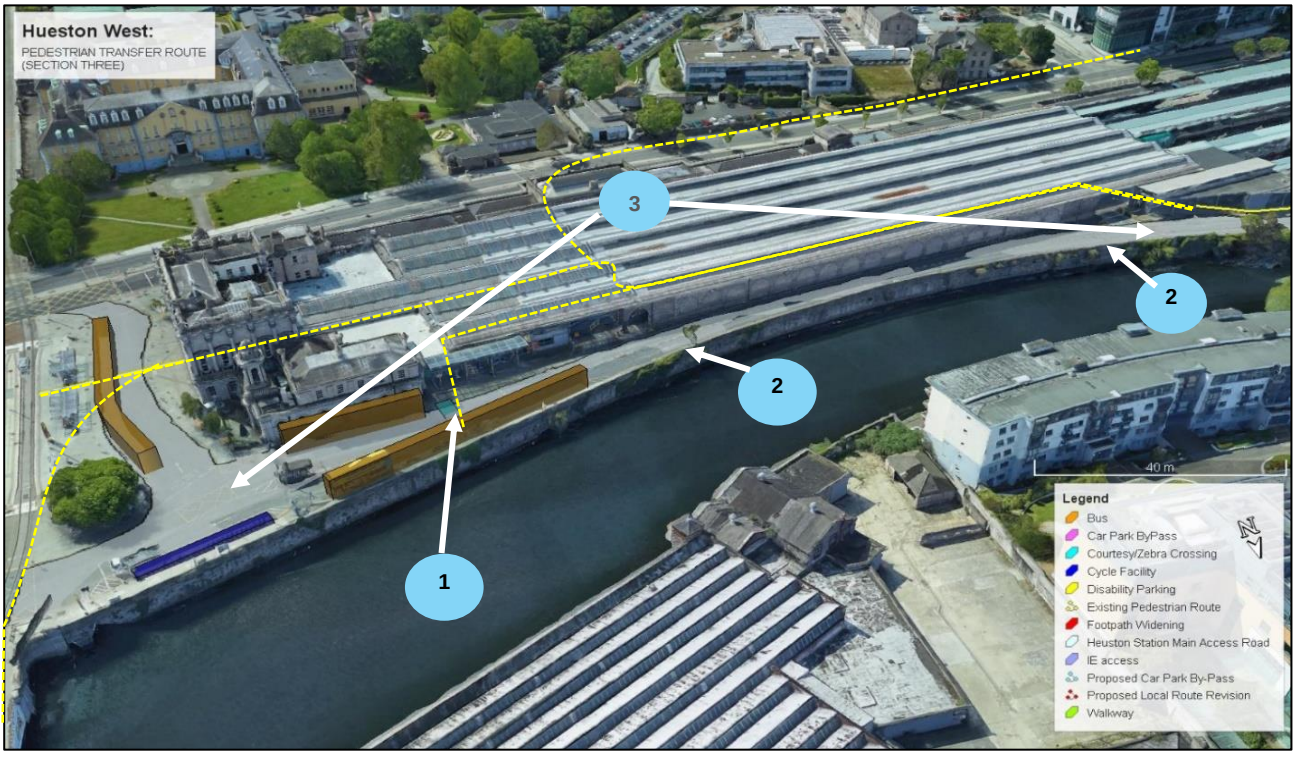


Figure 7-21 Area Three (East) - Pedestrian Route Preferred Option Enhancement Proposals

7.3.5. Utilities

7.3.5.1 Impact at the Proposed New Heuston West Station

Based on the Prefered Option for the proposed new Heuston West Station; it is confirmed that the utilities identified in **Section 4.3** will require diversion and/or protection. The details of the same are subject to further design development of the new signalling system, the attenuation tank and the Clancy Quay access ramp);

- The BT fibre optic cables (utility ID: BT-01a) will be diverted with the other Irish Rail trackside utilities within the rail corridor.
- The combined sewer (utility ID: CS-02) is located west of the proposed attenuation tank and Heuston West Station and in close proximity to the Clancy Quay wall. Impact at the Proposed New Heuston West Station.

7.3.5.2 Impact from proposed pedestrian route enhancements

The proposed pedestrian route improvement works are not currently anticipated to require the diversion of any public utilities. However where the pedestrian road crossing locations are being enhanced it is anticipated that additional protection will be provided to shallower utilities in accordance with the standard requirements for each utility company.

8. Construction

This section of the report sets out the approach in relation to the construction methodology for the works associated with the new Heuston West Station.

8.1. Summary of the Proposed Works

The works include alterations to the track layout. A new platform is to be constructed on the western side, while on the eastern side, the existing Platform 10 will be reconstructed which will include platform widening and extension to improve track curvature through the new station section as well as platform capacity. A footbridge with both stairs and ramps to be built above the tracks to provide connectivity between Islandbridge (Clancy Quay), the 2 no. platforms and the Luas stop.

The use of precast concrete elements will reduce cost and construction duration.

The connection to Clancy Quay will require including retaining wall works, in addition to the construction of the attenuation tank.

8.2. Retaining Structures

Retaining structures are required to provide the connection with Clancy Quay.

8.3. Drainage

Excavation and spoil removal required to facilitate the installation of the new attenuation tank and tie ins with the drainage system. The works will be carried out in close proximity to the existing residential dwellings and the operational tracks.

8.4. Permanent Way

New track alignment will be required through this area to facilitate the provision of electrification to the Slow lines. Works will comprise:

- Diversion or closure of the operational track, utilities, and ancillary infrastructure
- Where excavations are significant, support of adjacent operational track
- Excavation of track bed
- Excavation of sub strata
- Replacement of utilities and ancillary infrastructure
- Construction of new track bed

8.5. OHLE Infrastructure

Structures will be required at a maximum spacing of 60m along the track to support the catenary cables. The support structures are generally supported from one side of the track (cantilever) or from both sides (portal) depending on the permanent way layout. Where there are adjacent walls the support structure can be fixed to the walls negating the need for vertical supports (stanchions).

Support structures will be either founded by means of piles or spread foundations, depending on soil conditions or the contractor's preferred methodology.

It is envisaged that the OHLE will be constructed in safe zones adjacent to the live railway or in night-time possessions.

Through the GSWR line there are only 2 no. tracks so possessions of the tracks will be required to install all OHLE equipment.

8.6. Construction Compounds

Works on this linear scheme will require Construction Compounds at specific locations. The sites will need to accommodate offices for the contractor and client teams, storage facilities, recycling facilities, parking for cars and plant and potentially fabrication areas. It is a prerequisite that the construction compounds are located close to and ideally with direct access to the site. The sites must be fully serviced with electricity, water, sewerage, and telecoms and must have good access to the public road.

The construction compounds are required at specific construction sub-sites and they are also distributed along the scheme by geographical features. For example, compounds will be required at each of the bridge reconstruction locations plus will be required to for material processing and storage of construction components. The construction compounds will be used to support earthworks, ecological clearances, enabling works, site clearance, utility diversions work, civil works, the demolition of bridges, OHLE, track installation, signalling and telecoms equipment and all ancillary works.

Fencing and in some cases screening along with topsoil bunds where topsoil has been removed may be required for each construction compound. Noise screening and temporary guide rail fencing may be required at access locations to the railway corridor. Security fencing will be required for security purposes of both the workforce and the public. Gated access to the site and compounds will be required to check vehicles and personnel arriving on site are permitted to gain access. An access road will also be required from each compound to the site and also joining up to the public road. These access roads will be the main route for vehicles entering the site, including deliveries and arrival and departure of the workforce.

The construction compounds will be located such that they require minimal modification, if any, over the duration of the construction programme. The compounds will typically consist of areas of hardstanding for vehicles and materials and therefore the water runoff with be managed and treated as required.

Section 5 Options outlines the preferred location for the construction compounds required for this area; **Section 6 Options Selection Process** provides a detail of the option selection methodology.

The proposed location for the construction compound at Heuston West is required to facilitate the localised works, it is also the proposed location for the new Heuston West station. It is located on Irish Rail property adjacent to platform 10 and the Clancy Quay. **Figure 8-1** shows the preferred indicative site layout for Heuston West construction compound.

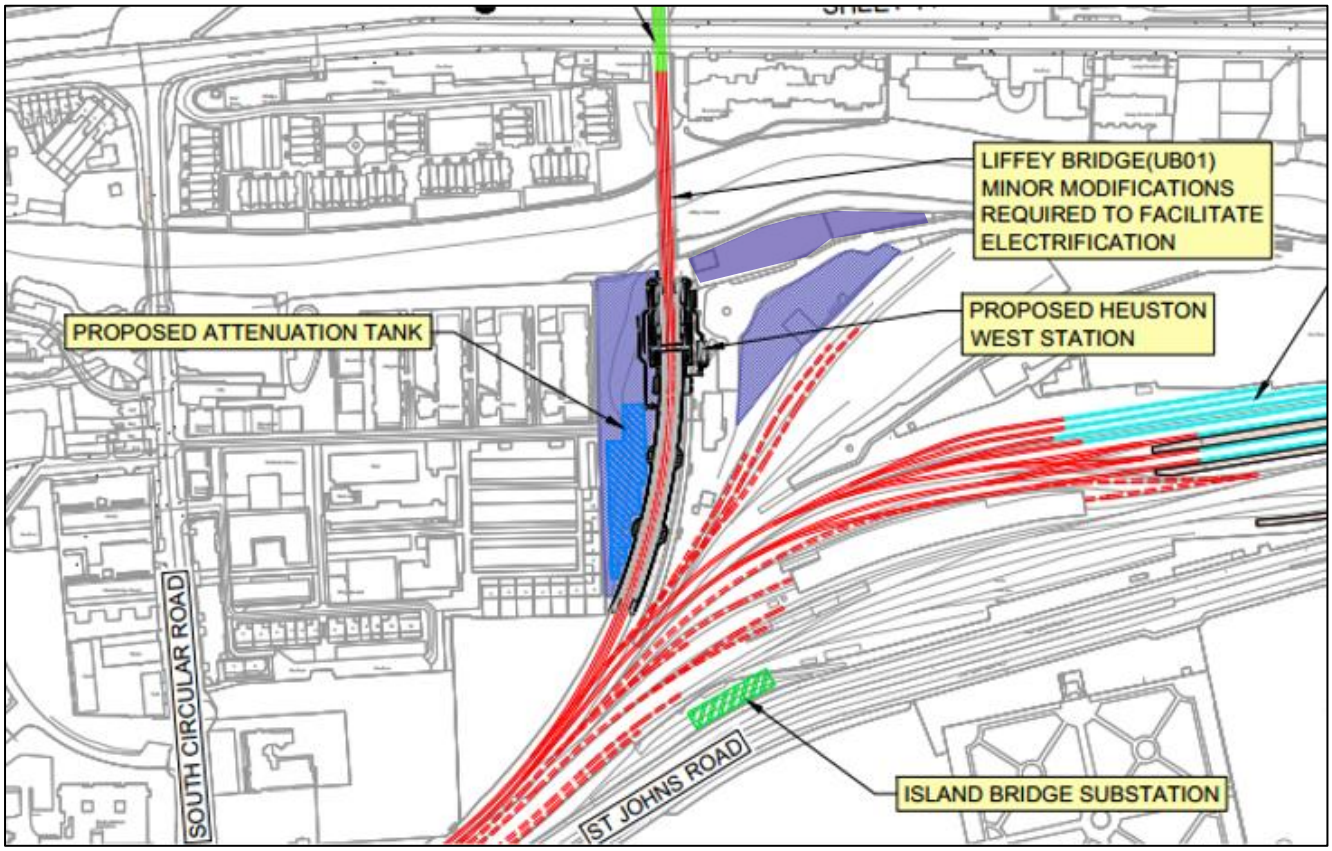


Figure 8-1 Construction Compound Heuston West – Preferred Option Indicative Site Layout

8.7. Temporary Traffic Management

The construction works along the access road to facilitate footpath widening, improvement of signage, and security measures as well as the main road crossing points will not substantially affect existing road users.

8.7.1. Private and Irish Rail Vehicular Users

The proposed works are localised and generally in the few locations where lateral space is not as constrained. As has been the case with the current NTCC building construction these localised diversions have been effectively managed with automated and manual signal control and road works protection barriers in accordance with Chapter 8 of the Traffic Signs Manual.

8.7.2. Vulnerable Users (Pedestrians, Wheelchair users and Cyclists)

The proposed works are localised and generally in the few locations where lateral space is not as constrained. As has been the case with the current NTCC building construction these localised diversions have been effectively managed with automated and manual signal control and road works protection barriers in accordance with Chapter 8 of the Traffic Signs Manual. The majority of the works are in an area restricted to operational personnel until the station is brought into operation

8.7.3. Public Transport

Busses usually using the access road typically turn at the existing Heuston Terminal Station carpark roundabout; however, during the proposed works for the enhanced pedestrian crossing from the footpath north of the access

road and into the main carpark the buses will be diverted to the roundabout at Platform 10 (the location of the new station). The bus waiting area (not the bus passenger collection point) adjacent to the main carpark will be reduced in length during construction of the crossing but not closed. In addition during the construction of the proposed new station the existing Dublin Bus toilets will need to be relocated.

During major public events (concerts and sporting particularly) the Platform 10 roundabout and existing marked bus areas are used as waiting points to collect those arriving by train. Alternative arrangements to the manage these irregular events, as well as the restricted potential use of Platform 10 for overflow operations during the station construction would be subject to further review of the overall programme with strategic stakeholders.

8.8. Restrictions

There are restrictions associated with working on or adjacent to the live railway line. Irish Rail will mandate a safe system of work which will invariably include barriers between the live tracks and the working area or full possession of the railway (no trains running). Possessions will need to be booked in advance with Irish Rail team and are generally planned weeks if not months or years in advance depending on the length of possession time required. possessions can vary from night-time slots to full weekend closures. Very rarely and depending on the importance of the line, longer periods of time can be organised for very complicated works.

Working under possessions means that the work needs to be planned in smaller phases. The possessions will also normally include a clean-up and check phase before the railway can be given back to Irish Rail. The short period working and need for pre handover checks leads to longer construction times than could be achieved on a non- railway environment site.

Materials delivery times will predominantly be outside peak traffic hours; particularly for construction Heavy Good Vehicles (HGV's) known to restrict natural flow of traffic; this is also governed by the Dublin City HGV Cordon for vehicles above 5 axles for project areas east of South Circular Road. Special Permitting will be required for departures from this in accordance with the City Cordon conditions of access. In addition, where possible, long duration night works will be limited in areas close residential units unless appropriate noise mitigation can be provided.

Work adjacent to the live railway can be undertaken in safe zones, which are areas which are suitably guarded to give protection to the railway. A full methodology of the set up and construction methods must be sympathetic to the railway operation and will be fully reviewed and signed off by the Irish Rail team in advance. Operations may be somewhat restricted in safe zones to eliminate the risk of movement, spillage or collapse on to the railway by plant, labour, or materials.

Appendix A – Sifting Process Backup

- App A.1. Sifting Process Backup – Heuston West Station

Appendix B – MCA Process Backup

- App B.1. MCA Process Backup – Heuston West Station

Appendix C – Supporting Drawings

The following drawings accompany the Technical Report:

Station drawings:

DP-04-23-DWG-BU-TTA-36312-V01-S3: Site plan

DP-04-23-DWG-BU-TTA-36313-V01-S3: Perspective views

DP-04-23-DWG-BU-TTA-36314-V01-S3: Station and platforms' elevations and floorplan

Permanent Way Drawings

DP-04-23-DWG-PW-TTA-31990