DART+ Programme

Docklands Station Options Study

Summary Report

05 August 2020

DART+ Programme Docklands Station Options Study

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1.0	05-Aug-20	Final Draft	Gillian Sisk	Eoin Gillard	Hugh Creegan

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1 INTRODUCTION

1.1 Study Wider Context

This study is one of a number of elements of the DART+ Programme. The DART+ Programme is identified for delivery within the period of the National Development Plan 2018–2027. It includes investment in new trains, new stations, electrification, and other infrastructure enhancements, in addition to major station capacity enhancements at Connolly Station. This series of projects is to support a planned future service requirement of up to 44 trains per direction per hour (tpdph) travelling into the Connolly/Docklands area, from the Northern, Maynooth and Phoenix Park Tunnel lines. Figure 1 shows the location of the existing Docklands station in relation to the various routes feeding into the area. The existing Docklands station does not have the connectivity nor the capacity to accommodate the planned future service requirement. The station is not linked to the Northern or Phoenix Park lines and has only 2 platforms.

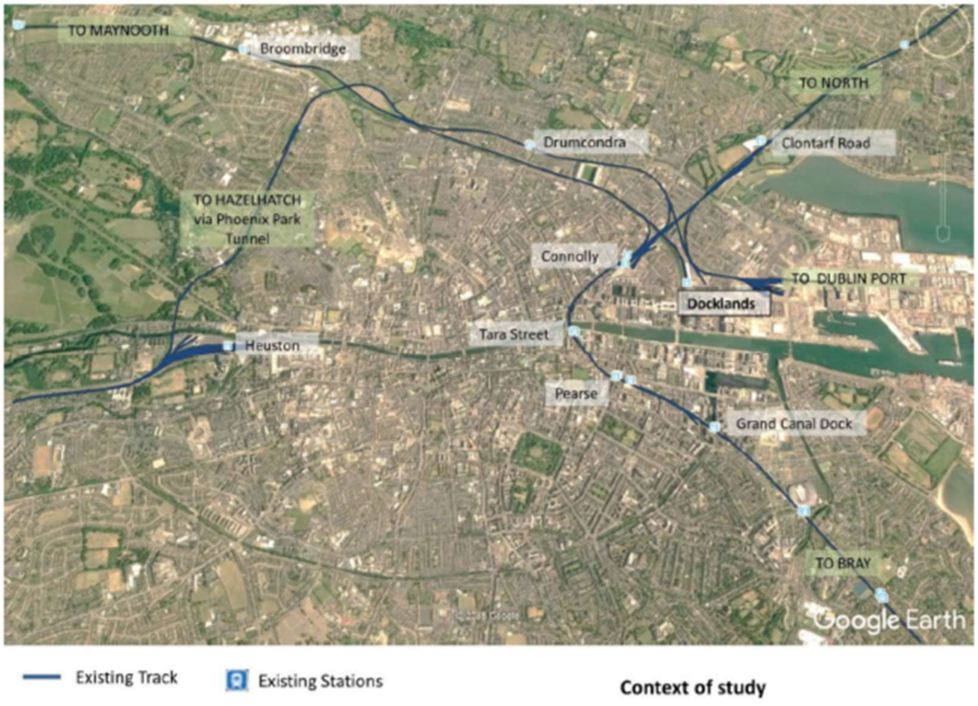


Figure 1: Existing Docklands station in the context of the Dublin rail network

1.2 Summary Report Context

The National Transport Authority (NTA) appointed AECOM to undertake a Docklands Station Options Study to determine the optimal location and layout of Docklands DART Station. This summary report

* Report References:

1. Docklands Station Options Study Options Sift 1 Report, January 2019
2. Docklands Station Options Study Sift 2 Report, February 2019
3. Docklands Station Options Study Addendum Transport Modelling Report, February 2020

aims to summarise the output of the assessment carried out by AECOM for the redevelopment and potential relocation of Docklands Station. The main purpose of this summary paper is:

- Summarise the output of the assessment carried out by AECOM for the redevelopment and potential relocation of Docklands Station.
- Include more detailed accessibility/catchment mapping for the two Emerging Preferred Options, Option A and Option B.
- Facilitate the NTA decision making processes.

2 DOCKLANDS STATION OPTIONS STUDY

2.1 Objectives

The overriding objectives of the Docklands Station Options Study are:

- To identify the optimal location and layout of Docklands Station with to the aim of achieving the minimum train capacity requirement, which would best serve the needs of the Docklands area and maximise interchange potential with the Luas; and
- To carry out a comprehensive study for the Docklands Station and how it is accessed, including all connecting rail alignments from the DART radial routes bounded by and including Newcomen, North Strand and East Wall Junctions and freight traffic from East Wall Yard. This study will take cognisance of the station’s interface with a potential future DART Underground Station and alignment.

2.2 Process of Assessment

The process of assessment can be divided into distinct stages consisting of:

- Sift 1 assessment – The objective of the Sift 1 process was to generate a short list of options from an initial long list agreed by AECOM, NTA and Irish Rail. The long list of options consisted of twelve options for consideration as part of Sift 1. These long list site options were then assessed by a team of subject matter experts and engineering professionals to determine the suitability of each option. Options were subjected to a high level pass/fail assessment which considered technical, environmental and planning constraints.

Figure 2: Shortlist of Site Options

- Sift 2 assessment - Following completion of Sift 1, four options were short listed (Figure 2) and were assessed in Sift 2 through Multi Criteria Analysis (MCA). The aim of this Sift 2 process was to identify an Emerging Preferred Option. Options were assessed against three main criterion, economy, integration and environment and several sub criterions. The performance of each option was then ranked against this criterion.

3 EMERGING PREFERRED OPTIONS

Following the engineering development, multi criteria assessment and operational assessment carried out as part of the Sift 2 assessment, two emerging preferred options were identified. The remainder of this report will focus on these two options, referred to as Option A and Option B with subsequent sections describing both options and the output of their assessment. The reader is referred to the AECOM reports included in the Appendices for details on the other options considered.

3.1 Option A

Option A is located on the existing site of the current Docklands Station.

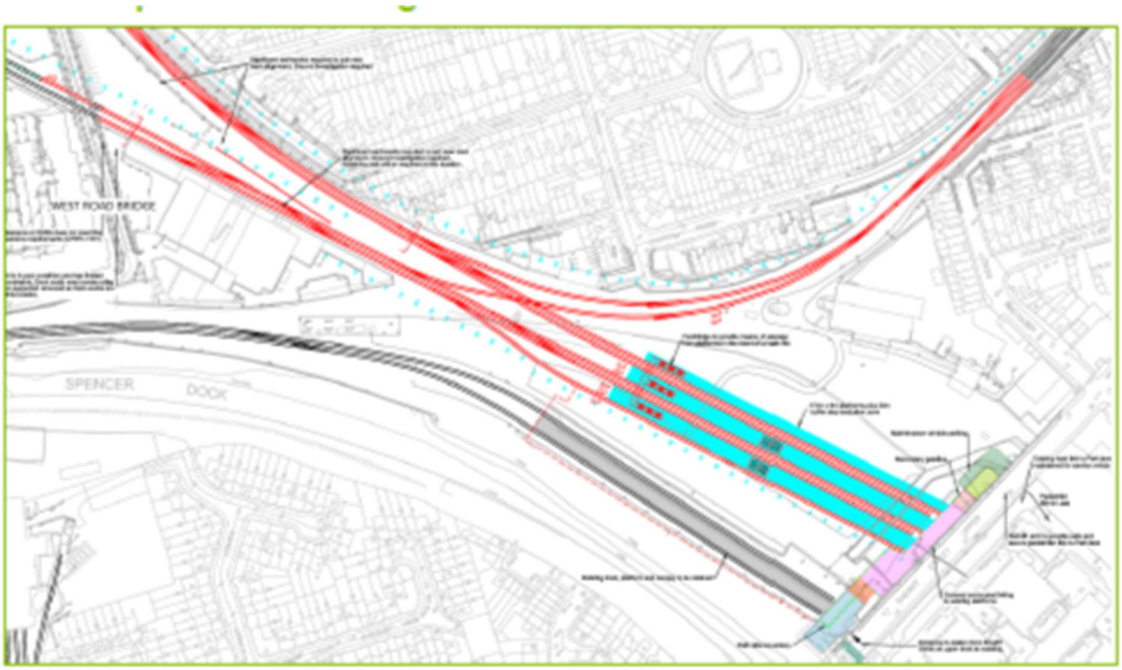


Figure 3: Extract from Option A General Layout

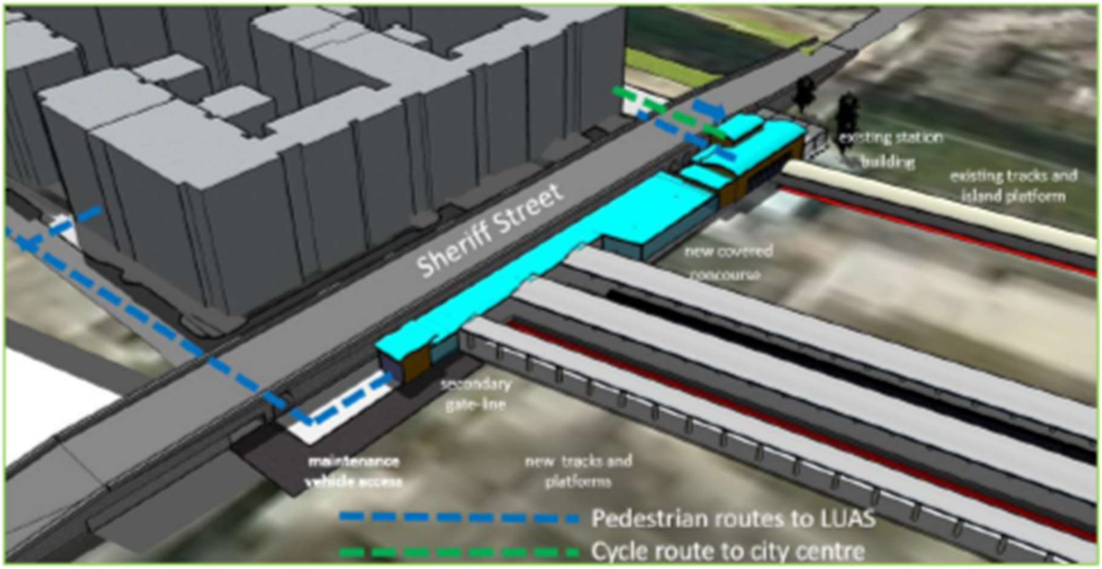


Figure 4 Option A Design Model

Option A proposal is to replace or augment the existing station with platforms in the area bounded by Sheriff Street Upper to the south, the Royal Canal to the west, and the limit of railway land to the east. The station footprint would be mainly or fully on railway land. To the east of the existing station is a coach park, which is considered to be a temporary facility. The western edge of the site is within a Conservation Area but it is considered feasible to avoid any works on this section.

The track layout for this station is challenging, because of the limited space between the northern ends of the platforms, the divergence of the three rail routes at differing gradients and the need for freight connections across the passenger tracks. To facilitate the design for this option land take to the west of the existing railway at Church Road Junction is required.

The existing platforms and approach tracks are retained without modification and continue to serve the route via Newcomen Junction, with the new platforms and canopies broadly replicating the existing. The existing station building is assumed to be modified with eastward extension to access the new platforms

The DART Underground portal would be in the same area, and if constructed may make this site inaccessible to and from the Northern route.

Like the existing station, the passenger entrance to this site would be on Sheriff Street Upper, at the edge of the Docklands development. It currently feels remote from the centre of activity and the nearest Luas stops are about 5min walk away on Mayor Street Upper.

3.2 Option B

Option B occupies a site south east of the existing Dockland Station, adjacent to the Spencer Dock Luas station.

Figure 5: Extract from Option B General Layout

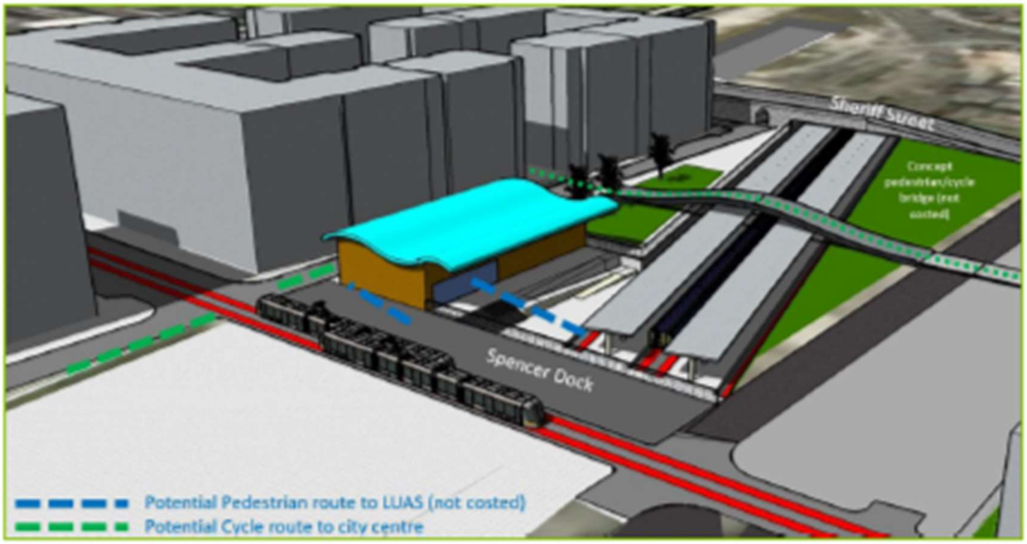


Figure 6 Option B Design Model

The entrance/exit is located adjacent the Spencer Dock Luas stop and close to the centre of the north bank Docklands area. The platforms extend below Sheriff Street Upper into the railway land beyond. The station entrance is on the northern platform of the Luas stop, level with the top of the Luas platform, with a ramp and stairs provided down to railway platform level.

A concept design has been developed which can link to all three routes from the Northern, Maynooth and Phoenix Park Tunnel lines with four parallel approach tracks that gives access between any platform and any of the three rail routes, as well as freight access via North Strand and East Wall junctions. The concept design highlights some engineering constraints and associated additional costs. The bridge where Sheriff Street Upper passes over the platform area would need replacement to lengthen the span. As a worst case, it has been assumed that providing clearance for electrification under the bridge necessitates lowering the track bed approximately 1m below grade and below the water table. This creates a need for “tanking” to prevent water ingress.

Furthermore, the previously approved Spencer Dock DART Underground station and the cut & cover sections of tunnel on approach occupies the same footprint as Site B and therefore the future construction of the underground station would impact the operation of the Option B station.

4 MULTI-CRITERIA ANALYSIS

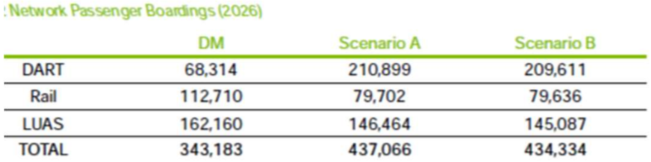
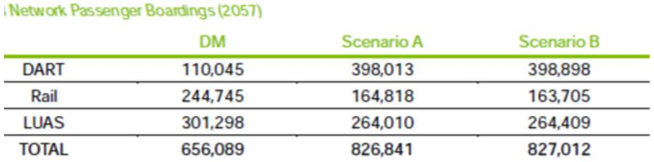
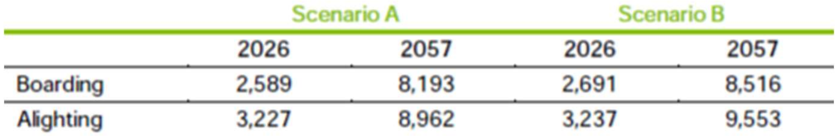
Following completion of Sift 1, the four emerging options were assessed in Sift 2 through Multi Criteria Analysis (MCA). The aim of the detailed qualitative and quantitative assessment in Sift 2 was to identify an Emerging Preferred Option. The output from the MCA for Option A and B is summarised in Table 1 below.

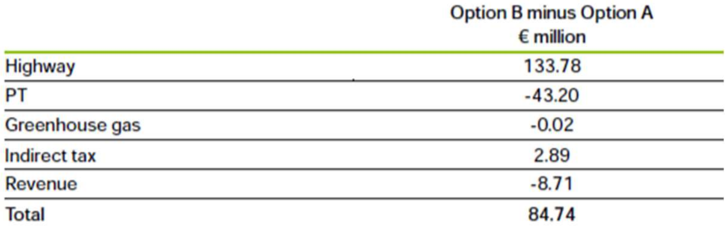
LEGEND

🟩 5	OPTION HAS SOME ADVANTAGES OVER OTHER OPTION
🟥 6	OPTION HAS SOME DISADVANTAGES OVER OTHER OPTION
🟨 7	BOTH OPTIONS COMPARABLE

Criteria	Approach	Discussion	Opt A	Opt B
ECONOMY				
Capital Cost	Order of magnitude capital cost estimates were prepared for indicative scheme infrastructure works.	Capital cost: Option A v Option B €91m v €138m All aspects of the design have not been finalised at this stage of development and as such final detailed costings were not possible. However, the cost estimates were developed to quantify the additional costs and risk associated with option B and these items are considered in the cost build up. Option B has allowed a greater allowance for the development of the station building that option A (€1.5m vs €300k) and a larger allowance for underground drainage (€2.6m vs €1.9m). Option B has also allowed for a greater contingency/risk allowance than option A (40% vs 30%) due to the greater number of unknowns associated with this option.	🟩	🟥
Operating Cost	The operational implications of options are considered, to assess their relative operating costs and any extra capital cost that might be incurred to improve operational flexibility. The assessment takes into account station capacity, operational	The performance of Option A and B was considered comparable in terms of capacity and journey time and freight access, however, the lack of space in Option A to hold trains between the station and Newcomen Junction is likely to be a severe operational restriction if significant numbers of trains access both Docklands and Connolly via this route. This is particularly relevant given that the overall DART+ Programme series of projects is to support a planned future service requirement of up to 44 trains per direction per hour (tpdph) travelling into the Connolly/Docklands area, from the Northern, Maynooth and Phoenix Park Tunnel lines. Because option A is effectively three separate stations side by side, the lack of connections between the platforms serving the three routes limits operational flexibility; for example there is no scope to interwork trains between routes except by use of the Glasnevin connections. Another disadvantage of Option A is the lack of space to hold trains between the station and Newcomen Junction.	🟥	🟩

Criteria	Approach	Discussion	Opt A	Opt B
	flexibility, and journey time and freight access.	Option B has considerable operational flexibility with access between all three routes and all platforms. For this reason Option B is considered to offer some advantages over Option A in regards to Operations.	🟥	🟩
Demand	A quantitative assessment was undertaken of the workplaces/ employment figures within an approximate 5 minute walking and 10 minute cycling catchment	Option B performs strongly on this assessment, given its closer proximity to higher density employment zones on the south and western side of the study area. This is considered in more detail using detailed accessibility/catchment mapping and by performing a network analyst service area assessment of the two locations, the output of which is included in the appendix. The findings from this analysis shows that whilst there is little difference in population figures between the two options, there is a significance difference in the employment figures, particularly within the 5min walking zone (Option B's catchment is 22% greater than Option A).	🟥	🟩
	Transport modelling using the NTAs Eastern Regional Model (ERM) was carried out	Network Passenger Boarding The results show that the additional rail services lead to an overall increase in rail based public transport of around 27% in both 2026 and 2057 compared to the Do Minimum services, with a 300% - 400% increase in DART use, coupled with some reduction in demand on Rail and LUAS. Marginal difference between Option A and B which is reflective of the scale of the NTA ERM compared to the scale of the station intervention being tested.	🟥	🟩

<table>
<tr><th>Criteria</th><th>Approach</th><th>Discussion</th><th>Opt A</th><th>Opt B</th></tr>
<tr><td></td><td></td><td>

Network Passenger Boardings (2026)
<table>
<tr><th></th><th>DM</th><th>Scenario A</th><th>Scenario B</th></tr>
<tr><td>DART</td><td>68,314</td><td>210,899</td><td>209,611</td></tr>
<tr><td>Rail</td><td>112,710</td><td>79,702</td><td>79,636</td></tr>
<tr><td>LUAS</td><td>162,160</td><td>146,464</td><td>145,087</td></tr>
<tr><td>TOTAL</td><td>343,183</td><td>437,066</td><td>434,334</td></tr>
</table>

Network Passenger Boardings (2057)
<table>
<tr><th></th><th>DM</th><th>Scenario A</th><th>Scenario B</th></tr>
<tr><td>DART</td><td>110,045</td><td>398,013</td><td>398,898</td></tr>
<tr><td>Rail</td><td>244,745</td><td>164,818</td><td>163,705</td></tr>
<tr><td>LUAS</td><td>301,298</td><td>264,010</td><td>264,409</td></tr>
<tr><td>TOTAL</td><td>656,089</td><td>826,841</td><td>827,012</td></tr>
</table>
Station Boarding and Alighting
The numbers of passengers boarding and alighting at the station in the two scenarios during an average 12-hour weekday is shown in table below. The results show that Option B attracts around more passengers than Option A both in 2026 and in 2057.

<table>
<tr><th></th><th colspan="2">Scenario A</th><th colspan="2">Scenario B</th></tr>
<tr><th></th><th>2026</th><th>2057</th><th>2026</th><th>2057</th></tr>
<tr><td>Boarding</td><td>2,589</td><td>8,193</td><td>2,691</td><td>8,516</td></tr>
<tr><td>Alighting</td><td>3,227</td><td>8,962</td><td>3,237</td><td>9,553</td></tr>
</table>
</td><td>🟥</td><td>🟩</td></tr>
<tr><td>Transport User Benefits</td><td>This TUBA appraisal allows for the quantification of benefits accruing from each option (within the context of the wider DART+ Programme) to</td><td>This exercise has been carried out to compare the two potential locations for the station. Both scenarios tested include very large scale changes to the public transport networks, the one difference between the two was the location of the station. These changes bring about a large-scale change in the public transport demand, significant increases in overall public transport usage and benefits to public transport users as demonstrated by the TUBA output.</td><td>🟥</td><td>🟩</td></tr>
</table>

<table>
<tr><th>Criteria</th><th>Approach</th><th>Discussion</th><th>Opt A</th><th>Opt B</th></tr>
<tr><td></td><td>be compared against the incremental cost differences between the two options.</td><td>Notwithstanding that both options perform well and generate additional benefits resulting from the changes to rail services, Option B does provide over €84.7 million more in terms of transport user benefits.

<table><tr><th></th><th>Option B minus Option A
€ million</th></tr><tr><td>Highway</td><td>133.78</td></tr><tr><td>PT</td><td>-43.20</td></tr><tr><td>Greenhouse gas</td><td>-0.02</td></tr><tr><td>Indirect tax</td><td>2.89</td></tr><tr><td>Revenue</td><td>-8.71</td></tr><tr><td>Total</td><td>84.74</td></tr></table></td><td>🟥</td><td>🟩</td></tr>
<tr><td colspan="5">INTEGRATION</td></tr>
<tr><td>Land Use Policy/ Plan Integration</td><td>A qualitative assessment was undertaken on the compatibility of each option against the Dublin City Council Development Plan 2016 - 2022 in the context of the National Development Plan.</td><td>Option A is located on the site of the existing Docklands Station. The location falls within a site zoned as Z1 (residential zoning) and is located outside of both the Strategic Development Zones (SDZ) and the Strategic Development and Regeneration Areas (SDRA).
Options B is located within both the North Lotts and Grand Canal Dock SDZ and SDRA 6. The site is predominantly zoned as Z14 (regeneration areas). The Z14 zoning objective is “to seek the social, economic and physical development and/or rejuvenation of an area with mixed us of which residential and “Z6” would be predominant uses”. It is a key objective of the Dublin City Development Plan 2016 –2022 for development proposals on Z14 lands within SDRA 6 to:
Support sustainable transport initiatives which facilitate pleasant, accessible and easy movement to, from and within the Docklands area;
Develop an integrated transport strategy for the entire Docklands area and to pro-actively promote sustainable smarter travel.
Option B best serves the needs of the Docklands area in meeting the key objectives of the Dublin City Development Plan in the context of the National Development Plan.</td><td>🟥</td><td>🟩</td></tr>
</table>

<table>
<tr><th>Criteria</th><th>Approach</th><th>Discussion</th><th>Opt A</th><th>Opt B</th></tr>
<tr><td>Public Transport Integration</td><td>Walking interchange time was used to assess integration with Luas and the Core Bus Corridor network.</td><td>Walking to public transport
<table><tr><th>Option</th><th>Nearest Luas stop</th><th>Walking distance (m)</th><th>Nearest bus Stop</th><th>Walking distance (m)</th></tr><tr><td>A</td><td>Spencer Dock</td><td>250</td><td>Convention centre</td><td>450</td></tr><tr><td>B</td><td>Spencer Dock</td><td>30</td><td>Irish Rail Building North Wall</td><td>280</td></tr></table>To maximise interchange potential with Luas, siting the station (Option B) 30m away from the Luas Stop is clearly advantageous. Options B has an entrance with direct access to the Luas Red Line (eastbound) platform at Spencer Dock providing accessible and easy movements to Connolly Station, Busáras and the City Centre. It is also located only a short walk from bus stops serving a range of destinations within the Core Bus Network along the North Quays.
In contrast to the above, Option A is 250 m away from Luas stop and hence does not have direct access to Luas nor to the current/proposed core bus network post-Bus Connects.</td><td>🟥</td><td>🟩</td></tr>
<tr><td>Walking/ Cycling Integration</td><td>A qualitative assessment was undertaken, and commentary provided on the relative potential for each option to integrate with the pedestrian and cycle network in the area</td><td>Option A is served by designated cycling routes. Options B have their entrance on Mayor Street, which carries some vehicular traffic in addition to the Luas lines.</td><td>🟩</td><td>🟥</td></tr>
<tr><td colspan="3">ENVIRONMENT</td><td colspan="2"></td></tr>
<tr><td>Cultural Heritage</td><td>A qualitative assessment has been undertaken, with reference to Recorded Protected Structures, Architectural Conservation Areas and National Inventory of Architectural Heritage</td><td>An area of approximately 70m on the western side of Option A falls within a designated Conservation Area associated with the Royal Canal and the River Liffey. This area includes the existing platforms and tracks forming the existing approach into Docklands station which would remain unchanged in this option.
Options B has no known archaeological features identified within any of the site footprints however there are a number of protected structures and NIAH sites located outside of this site option.
Both options are broadly comparable.</td><td>🟨</td><td>🟨</td></tr>
</table>

Criteria	Approach	Discussion	Opt A	Opt B
	Structures impacted by each option		🟧	🟧
Noise and Vibration	A qualitative assessment has been undertaken in relation to the proximity of each option to sensitive receptors.	Options A and B are surrounded by existing and potential future residential and mixed use properties. The implementation of appropriate mitigation measures will be required to minimise potential negative impacts to these sensitive receptors. Both options are broadly comparable.	🟧	🟧
Landscape and Visual	A qualitative assessment has been undertaken in relation to the impact on areas of specific character and visual sensitivity identified within Dublin City Development Plan 2016 - 2022.	The location of Option A at the northern fringe of the docklands redevelopment zone would isolate the proposed station from existing and future urban and commercial developments as well as from the existing Luas network and undermine its integration in the emerging urban townscape character. Option B is located adjacent to an existing high density residential apartment block with sensitive receptors. The location of the proposed station would provide a close link to the existing Luas network along Mayor Street Upper and is better from a public transport integration perspective as noted above. The proposal is located outside the Conservation Area and other landscape constraints but is confined to the road corridor along Park Lane immediately adjacent to residential quarters.	🟥	🟩

Table 1 – Multi Criteria Analysis

7.1 Summary

Criteria	Opt A	Opt B
Economy		
Capital Cost	🟩	🟥
Operating Cost	🟥	🟩
Demand	🟥	🟩
Transport User Benefits	🟥	🟩
Integration		
Land Use Policy/ Plan Integration	🟥	🟩
Public Transport Integration	🟥	🟩
Walking/ Cycling Integration	🟩	🟥
Environment		
Cultural Heritage	🟨	🟨
Noise and Vibration	🟨	🟨
Landscape and Visual	🟥	🟩

8 CONCLUSION

From the transport modelling of the two Emerging Preferred Options, Option A and Option B, using the NTAs Eastern Regional Model (ERM) and TUBA appraisal software, it is important to note that the output from the TUBA does support strongly the case for a new DART Station in the Docklands Area with the required minimum train capacity and connectivity to accommodate the planned future service requirement and that both interventions proposed deliver on this with Option B providing over €84.7 million more in terms of transport user benefits. This more than offsets the additional upfront capital investment cost of €47 million associated with Option B. Furthermore, to better serve the Docklands Area, siting the station closer to the higher density employment zones, increases accessibility and maximizes the potential to serve more people. Option B performs strongly on this assessment, given its closer proximity to higher density employment zones on the south and western side of the study area and its location within both the North Lotts and Grand Canal Dock SDZ and SDRA 6. This assessment also has been validated from the network analysis work carried out. From this analysis, it can be seen that there is a significance difference in the employment figures, particularly within the 5min walking zone (Option B's catchment is 22% greater than Option A).

Similarly, to maximise the interchange potential with Luas, siting the station (Option B) 30m away from the Luas Stop is clearly advantageous. Option A is 250 m away from Luas stop and hence does not have direct access to Luas nor to the current/proposed core bus network post-Bus Connects. This is further supported when considering the time saving benefits for Option B (associated with the walk time reduction between the station and the high density employment zones on the south quay). This was calculated for a range of travel time reductions and showed that walk time reductions of only approximately 96 seconds were required to generate time saving benefits equivalent to the additional investment required to deliver Option B. Even with investment in pedestrian links between Option A and the south quays, it is not considered feasible to achieve the same connectivity. Conversely, additional investment in the area (such as planned Liffey pedestrian bridges) would reduce the travel time between the station and the south quay even more and increase benefits further.

Lastly, in terms of operational flexibility, Option B has advantage over Option A with access between all three routes and all platforms. Option A's lack of space to hold trains between the station and Newcomen Junction is likely to be a severe operational restriction given significant numbers of trains will need access to both Docklands and Connolly by this route. This is particularly relevant given that the overall DART+ Programme series of projects is to support a planned future service requirement of up to 44 trains per direction per hour (tpdph) travelling into the Connolly/Docklands area, from the Northern, Maynooth and Phoenix Park Tunnel lines.

It is therefore concluded that Option B provides a positive return on the additional investment costs and is better aligned with long term planning and transport policy for the region. On this basis, the relocation of Docklands Station to a location at Spencer Dock (i.e. Option B) represents the preferred option. Furthermore, it is recommended that a staged approach in the development of Option B that is aligned with the DART+ Programme future needs is considered.

APPENDIX A DOCKLANDS STATION OPTIONS STUDY OPTIONS SIFT 1 REPORT

Docklands Station Options Study
Options Sift 1 Report

National Transport Authority

January 2019

Quality information

Prepared by	Checked by	Verified by	Approved by

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	03 Dec 2018	Initial issue			
2	20 Dec 2018	Issue 2			
3	31 Jan 2019	Issue 3			

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Executive Summary

An assessment of options for Docklands Station is in progress to identify the optimal solution for a DART station in the Docklands/North Lotts area. The process of assessment is divided into distinct stages consisting of:

- Sift 1 assessment
- Sift 2 assessment
- Identification of a preferred solution

This report outlines the approach and findings of the Sift 1 stage of the assessment. The objective of the Sift 1 process is to generate a short list of options from an initial long list generated by AECOM and supplemented and agreed by a joint workshop on 8th of November consisting of AECOM, the National Transport Authority and Irish Rail. The long list of options consisted of twelve options for consideration as part of Sift 1.

These long list site options were then assessed by a team of subject matter experts and engineering professionals to determine the suitability of each option. Options were subjected to a high level pass/fail assessment which considered technical, environmental and planning constraints.

Options which failed this assessment we discarded and not taken forward for further analysis. Options which passed this assessment have been recommended to be taken forward for further analysis within Sift 2.

Based on this assessment approach four of the twelve options identified on the long list of site options are recommended to be taken forward for further assessment as part of Sift 2.

Site	Verdict
A: Existing Docklands station site	Pass
B: East of Spencer Dock, north of Mayor Street Upper	Pass
C: East Wall Yard	Pass
F: Ferry Terminal	Fail
G: Elevated over Spencer Dock Luas	Fail
H: North Wall Quay over Liffey	Fail
J: Royal Canal south of Sheriff Street Upper	Fail
K: Samuel Beckett Bridge	Fail
L: West of Spencer Dock, north of Mayor Street Upper	Fail
M: New Wapping Street	Pass
N: Mayor Street Upper and Castleforbes Road	Fail
P: Combination of A and J	Fail

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Figures

Tables

1. Introduction

1.1 Study Wider Context

The National Transport Authority (NTA) has appointed AECOM to undertake a Docklands Station Options Study to determine the optimal location and layout of Docklands DART Station.

This study is one of a number of elements of the DART Expansion programme. DART Expansion falls within the period of the National Development Plan 2018–2027. It includes investment in new trains, new stations, electrification, and other infrastructure enhancements, in addition to major station capacity enhancements at Connolly Station. This series of projects is to support a planned future service requirement of up to 44 trains per direction per hour (tpdph) travelling into the Connolly/Docklands area, from the Northern, Maynooth and Phoenix Park Tunnel lines. Figure 1 shows the location of the existing Docklands station in relation to the various routes feeding into the area. The existing Docklands station does not have the connectivity or the capacity to accommodate the planned future service requirement. The station is not linked to the Northern or Phoenix Park lines and has only 2 platforms.

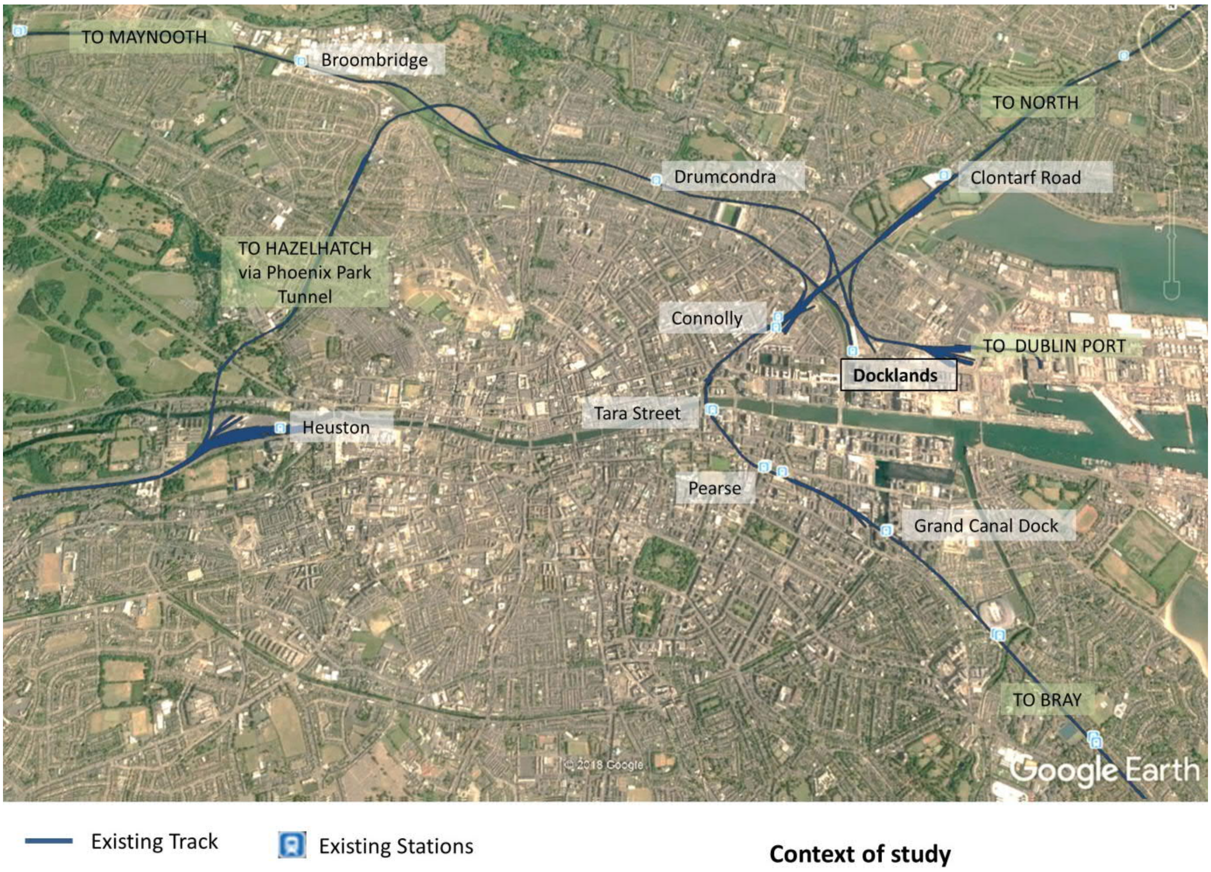

Figure 1: Existing Docklands station in the context of the Dublin rail network

1.2 Docklands Station Options Study Objectives

The overriding objectives of the Docklands Station Options Study stated within the client's brief[1] are:

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[1] Tender and Schedule for The Provision of Engineering Consultancy Services for Docklands Station Options Study

- To identify the optimal location and layout of Docklands Station with to the aim of achieving the minimum train capacity requirement, which would best serve the needs of the Docklands area and maximise interchange potential with the Luas; and
- To carry out a comprehensive study for the Docklands Station and how it is accessed, including all connecting rail alignments from the DART radial routes bounded by and including Newcomen, North Strand and East Wall Junctions and freight traffic from East Wall Yard. This study will take cognisance of the station's interface with a potential future DART Underground Station and alignment.

2. Sift 1 Methodology

This Sift 1 report covers the initial stages in the establishment of the emerging preferred option for Docklands Station. The stages followed during this Sift 1 assessment are illustrated in Figure 2 below.

The final Docklands Station Options Report will cover the whole study process.

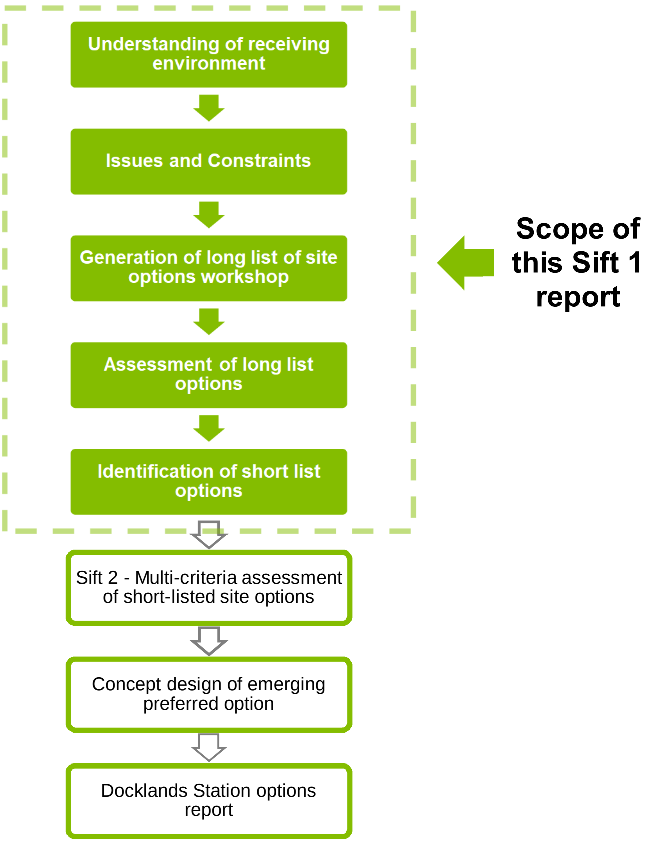

Figure 2: Study Process

This report describes:

- The issues and constraints within the receiving environment, which have been considered during the Sift 1 process;
- The work undertaken to generate a long list of station options which potentially satisfy the study objectives,
- The high-level assessment carried out on each of the long list options,
- The factors considered in determining whether each option 'passes' assessment (and is bought forward into Sift 2) or 'fails' assessment (and is discarded at this point); and

- The short list of options recommended to be taken forward for more detailed assessment during Sift 2.

3. Understanding the Receiving Environment

The AECOM project team of senior engineering, planning and rail operating professionals undertook an initial desktop identification of site options that could plausibly meet the project objectives; this included site options with space to provide several platforms of the required length. Following this review, the AECOM project team carried out a site visit of the Docklands and North Lotts area on 7th of November 2018.

4. Issues and Constraints

The issues and constraints associated with the receiving environment were reviewed. Those which had an impact on the assessment of station options are outlined below, these include planning and environmental issues, design constraints and other issues such as land ownership and constraints associated with the River Liffey navigational rights. While the impact on potential plans for Dart Underground is not used a determining factor for station option assessment, this impact is also discussed. The analysis of these issues and constraints was an ongoing activity initiated from the beginning of project and informs the generation of short list options.

4.1 Planning and Environmental

This section sets out the relevant planning and environmental issues considered during the assessment of options. This section includes excerpts from the land use zoning maps for the study area. A more detailed review will be carried out for the sites taken forward to Sift 2.

The main issues within the study area from a planning perspective are summarised below.

- Zoning;
- Conservation areas;
- Protected structures; and
- Zones of archaeological interest.

A high-level desktop review indicates there are no Special Areas of Conservation, Special Protection Areas or Natural Heritage Areas within the study area, therefore biodiversity is not considered a determining factor for the assessment of station sites. Similarly, the impact on air quality, flora and fauna and soil and geology is expected to be similar across all sites therefore these factors are not considered further during this study. While noise and vibration and hydrology may be differentiating factors, these factors will be considered during the Sift 2 process.

4.1.1 Zoning

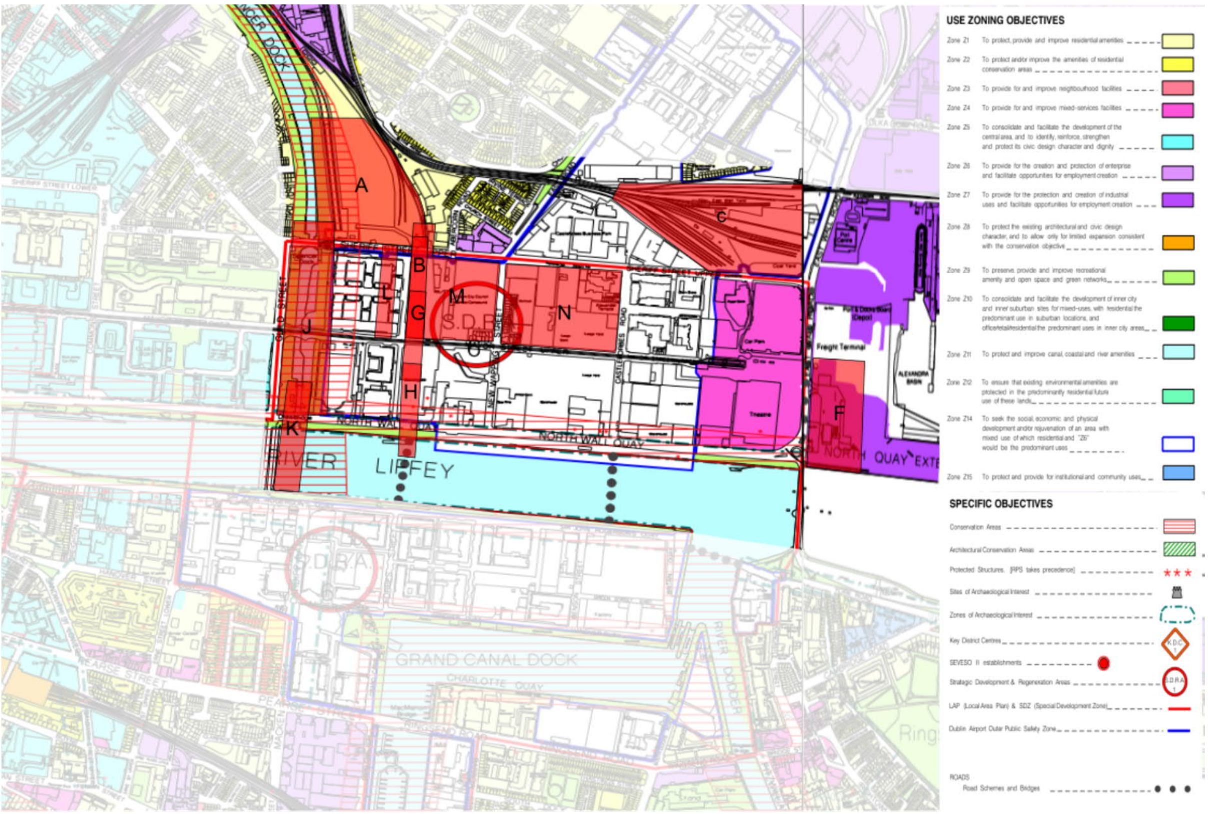

Figure 3: Study Area Zoning Map[2]

The relevant development plan for the study area is the Dublin City Development Plan 2016-2022. The existing Docklands Station site and the lands to its immediate east are zoned as Z1 (residential) and the zoning objective is:

"To protect, provide and improve residential amenities".

The adjoining lands to the west of Docklands Station are zoned as Z9 (green network) and Z11 (to protect and improve the Canal). The lands adjoining the station to the west and its immediate south are also located within a Conservation Area.

The remainder of the study area is predominantly located within Strategic Development and Regeneration Area (SDRA) 6 and is zoned as Z14. SDRAs are key sites, identified in the Dublin City Development Plan 2016 – 2022 as sites capable of accommodating significant housing and employment within the city.

The zoning objective for Z14 zoned lands is:

"To seek the social, economic and physical development and/or rejuvenation of an area with mixed use of which residential and 'Z6' would be the predominant uses"

A large portion of the study area is also located within the North Lotts and Grand Canal Dock (Docklands) Strategic Development Zone (SDZ). SDZs are sites that are deemed to be of economic or social importance to the State, designated so at Ministerial level. The Docklands SDZ was approved by An Bord Pleanála in 2014 and has the potential to facilitate:

- 2,600 residential units;
- 15,000 – 20,000m^2 of commercial retail;

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[2] Source: Dublin City Development Plan 2016 – 2022 Map Set E

- 305,000 – 360,000m^2 commercial/office;
- 13,000m^2 of new parks.

Any potential relocation of Docklands Station will need to comply with the land use zoning and site specific objectives of the preferred site and assist with delivering the aims of the SDZ and SDRA designations for sites within the boundaries of same.

4.1.2 Conservation Areas

Conservation Areas have been designated by Dublin City Council in recognition of their special interest or unique historic and architectural character and important contribution to Dublin's heritage. Policy CHC4 of the Dublin City Development Plan 2016 – 2022 aims to:

Protect the special interest and character of all Dublin's Conservation Areas. Development within or affecting a conservation area must contribute positively to its character and distinctiveness.

Development will not:

- *Harm buildings, spaces, original street patterns or other features;*
- *Involve the loss of traditional, historic or important building forms, features, and detailing including roofscapes, shop-fronts, doors, windows and other decorative detail;*
- *Introduce design details and materials, such as uPVC, aluminium and inappropriately designed or dimensioned timber windows and doors;*
- *Harm the setting of a Conservation Area; or*
- *Constitute visually obtrusive or dominant forms.*

Design proposals being put forward within Conservation Areas will need to be cognisant of this policy and the relevant design guidelines set out in the Dublin City Development Plan 2016 – 2022. Designs that compromise the character of Conservation Areas are unlikely to be approved by Dublin City Council.

4.1.3 Built Heritage

There are at least ten protected structures within the study area (demarcated by a red asterisk (*) in Figure 4). Proposals that will have a negative impact or cause physical harm to a protected structure will not be permitted by Dublin City Council.

Dublin City Council's record of protected structures (RPS) will be checked again at Sift 2 to determine if there have been any recent additions to the list that have not yet been shown on the zoning map or online list.

4.1.4 Archaeology

There is a zone of archaeological potential along Dublin's quays (highlighted by the dark green dashed line in Figure 4). Sites that encroach on this area will be reviewed by a qualified archaeologist and may require additional archaeological surveys.

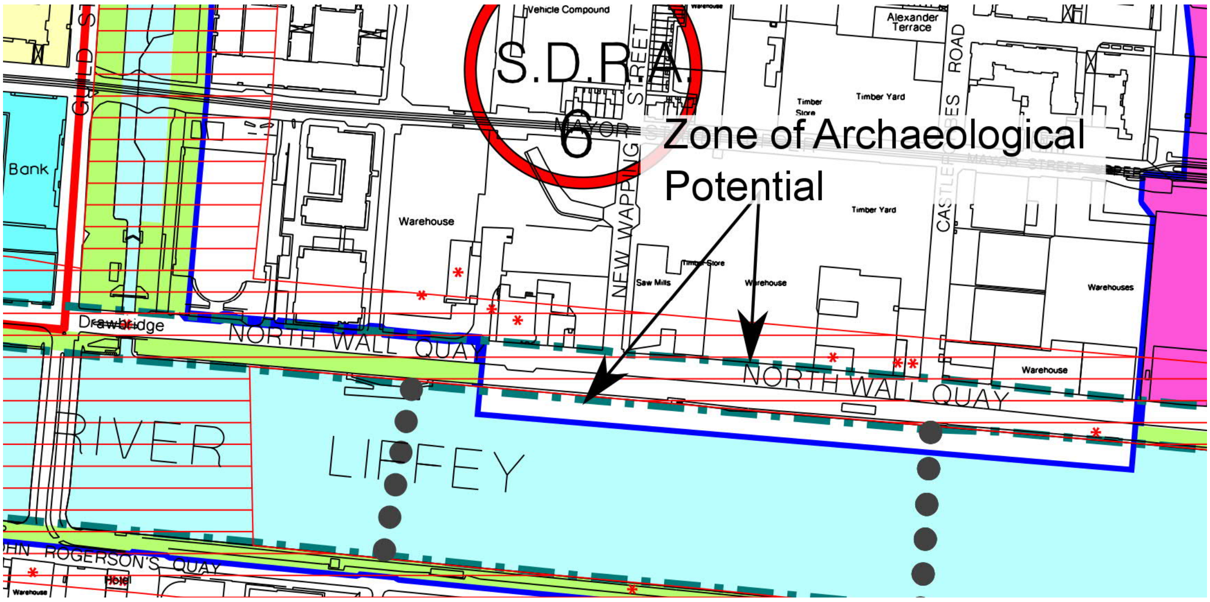

Figure 4: Zone of Archaeological Potential

4.2 Other Issues

4.2.1 Design

The existing lines in the study area are currently open for freight services and some for passenger services. As noted above, freight trains will continue to access the East Wall Yard and therefore the track alignment will need to be designed to accommodate freight trains. Freight trains generally travel at slower speed and are heavier than passenger trains, so the maximum gradients used on freight lines are typically shallower than those experienced on passenger-only lines. Therefore, the following maximum gradients are recommended:

- Freight / Mixed traffic lines: 1% maximum gradient.
- Passenger only lines: 2.5% maximum gradient, with 3.5% allowed over short distances.

The vertical alignment of the platforms will be limited to a maximum gradient of 0.2%[3]. This minimises the risk of stationary vehicles in the platform rolling away.

These gradient requirements will influence the length of the alignment required in order to provide vertical clearance over features such as highways and watercourses.

The horizontal alignment of the platforms should ideally be straight, to minimise the gaps between train and platform. New platforms may be constructed on radii up to 500m, but this is unlikely to be acceptable and should be avoided where possible[4]. The increased stepping distance at a curved platform is a consideration for a busy city station.

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[3] Standard I-PWY-1141, Section 2.1.1
[4] Standard I-PWY-1141, Section 2.1.2

4.2.2 Land Ownership

The approximate CIÉ land ownership boundary is shown in Figure 5. Proposed development outside of CIÉ owned lands is not a reason to discard an option, but will require the landowner's consent or a compulsory purchase order (CPO) of the lands. It should be noted that much of the land in this zone is currently vacant. A coach parking facility is currently occupying the lands immediately to the east of Docklands station.

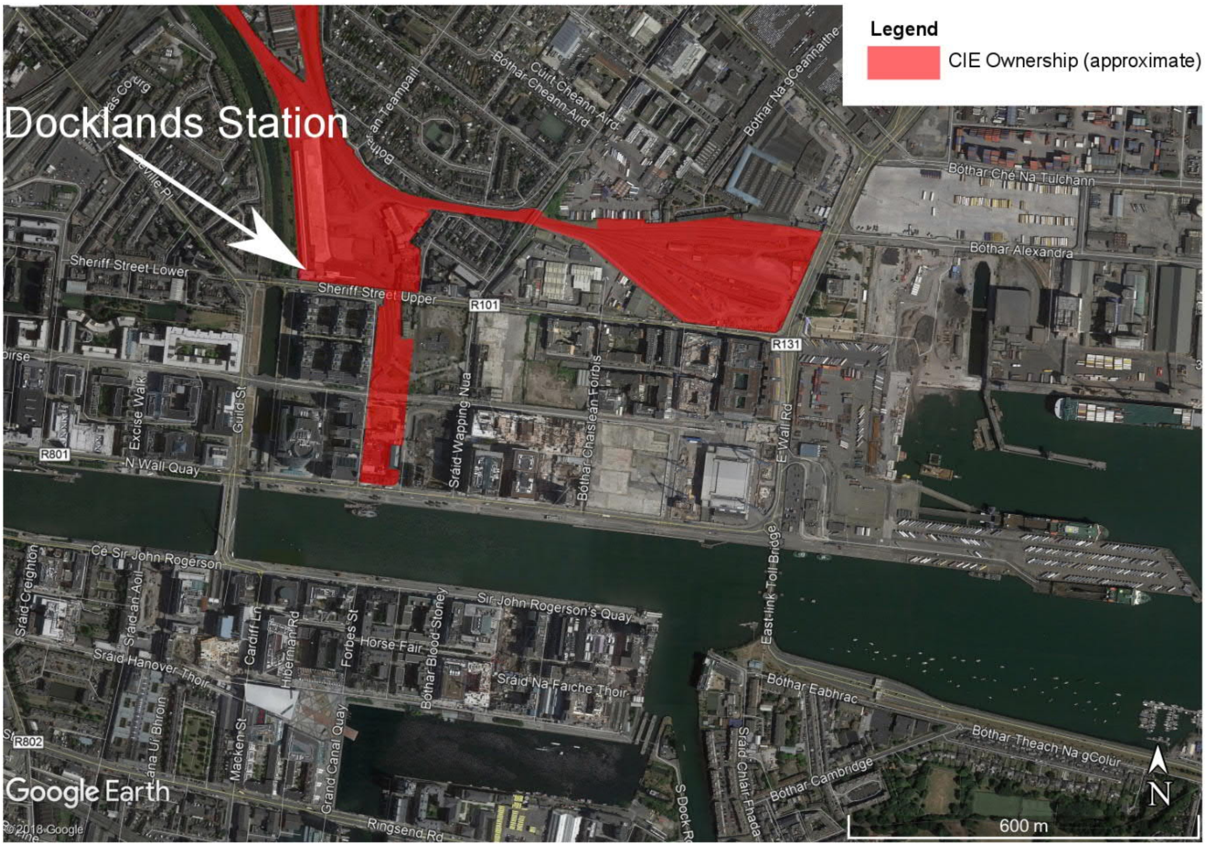

Figure 5: Approximate CIÉ Land Ownership Boundary

4.2.3 Liffey Crossings

The following issues apply to any structure spanning the Liffey in the Docklands area:

- Moveable structure required, imposing no restriction on vessel height over a channel of at least 32m.
- When closed the structure should provide clearance of at least 3.84m AOD.

4.2.4 DART Underground

The DART Underground project[5] has designed a tunnel ramp approximately following the line of the curve from the Northern line at East Wall Junction down to a portal just north of Church Road Junction. Tracks are proposed to continue in cut-and-cover across the vacant land north of Sheriff Street Upper to a sub-surface station in land east of Spencer Dock. This project has a Railway Order but is not currently going forward. The remit for the Docklands study requires consideration of compatibility with DART Underground but it is agreed this issue should not be a reason to discard options for the Docklands station.

Several of the options described below fall within the footprint of the DART Underground station and/or the portal area. It is expected that the purpose and required functionality of Docklands Station would be superseded if DART Underground went ahead. However, if it

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[5] DART Underground Railway Order alignment drawings, DU-RO 106 A-B and DU-RO 106 B-C.

was necessary to keep Docklands Station open during the construction of DART Underground, then some of the Underground works might have to be constructed with the station. Further discussion under specific options considers how this issue affects each option.

Additionally, the Railway Order portal design only leaves space for one track each side of the portal in the narrowest part of the railway land. This would significantly constrain capacity for trains between the Northern and Phoenix Park lines and any Docklands station site. This constraint applies to all Docklands options, so is not discussed specifically under each option. While it may be possible to mitigate this issue if the portal was to be moved slightly westward or northward, with some land take to the west, the Docklands study does not consider the issue further.

5. Generation of long list options

A collaborative workshop took place on the 8th of November with members of the NTA client team and Irish Rail contributing their considerable experience in transport option generation, and their detailed knowledge of the previous engineering and planning studies in the area. This discussion led to some modification of the initial long list proposed by AECOM and the addition of further site options. This resulted in a long list of twelve site options to be included in the Sift 1 assessment.

Figure 6: Long list of Site Options identified at workshop

Figure 6 shows the general location of the long list of sites identified during the options identification workshop.

Site C originally generated three separate site options (to include D and E). These were merged during the options generation workshop into a single site option at this stage, on the basis that the assessment of each of the three would be the same at this level of detail. Similarly, variants could exist within the broad area identified within other site options.

The labels I and O were omitted to avoid confusion with potential future numerical sub-options.

6. Assessment of Long List options

6.1 Site A: Existing Docklands station site

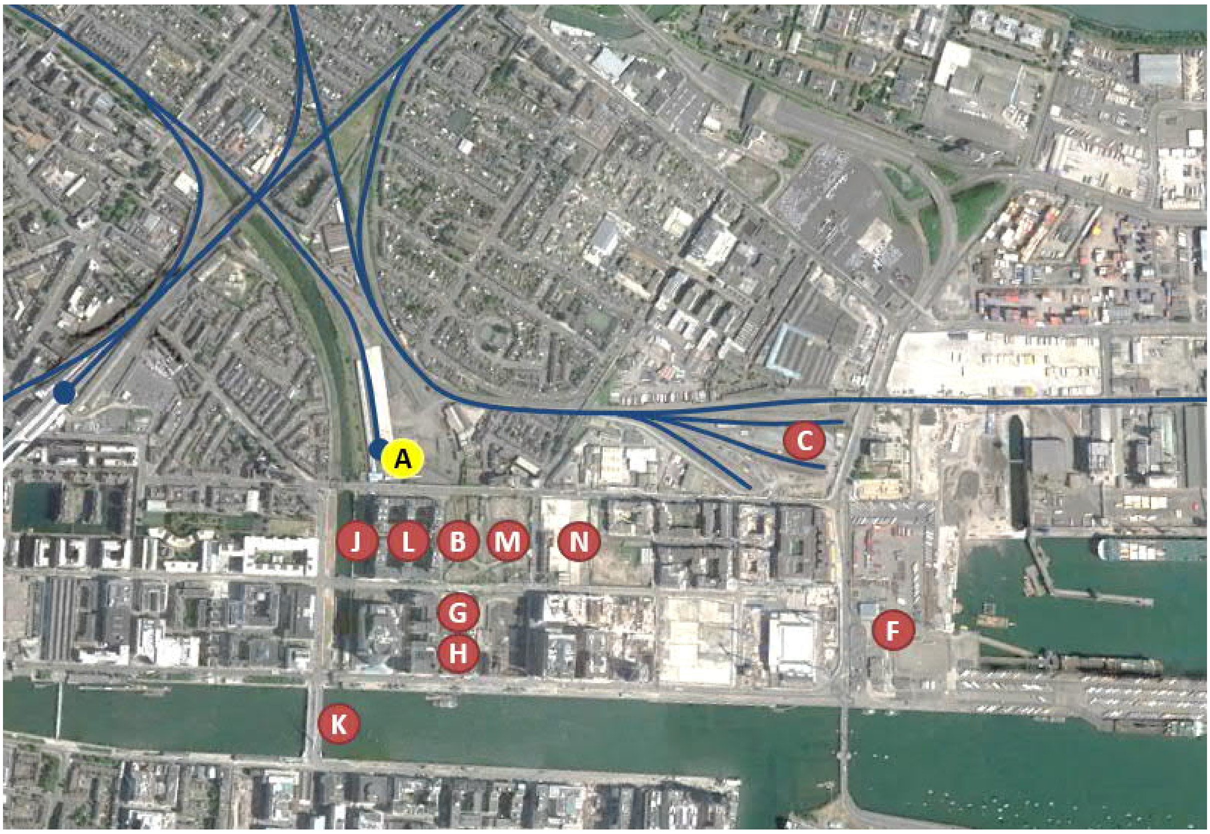

Figure 7: Site A

6.1.1 Commentary

The existing station would be replaced or augmented by platforms in the area bounded by Sheriff Street Upper to the south, the Royal Canal to the west, and the limit of railway land to the east. The station footprint would be mainly or fully on railway land. To the east of the existing station is a coach park, which is considered to be a temporary facility. The western edge of the site is within a Conservation Area but it is considered feasible to avoid any works on this section.

While the track layout for this station is challenging, because of the limited space between the northern end of the platforms and the divergence of the three rail routes at differing gradients, and the need for freight connections across the passenger tracks, Initial development has identified a feasible design. This does however require land take to the west of the existing railway at Church Road Junction. Design refinement is proposed during Sift 2 to establish definitively whether an at-grade solution is possible, or whether a split-level solution can be refined with less land take and simpler structures. In any event freight to and from the Phoenix Park line would almost certainly have to access via Drumcondra and the link at Glasnevin.

The DART Underground portal would be in the same area, and if constructed may make this site inaccessible to and from the Northern route.

Like the existing station, the passenger entrance to this site would be on Sheriff Street Upper, at the edge of the Docklands development. It currently feels remote from the centre of activity and the nearest Luas stops are about 5min walk away on Mayor Street Upper. However the transition from a station with a few peak-time trains to a busier all-day station would naturally increase footfall and activity. Improved access routes might include covered walkways, moving walkways or relocation of the Luas stop slightly nearer, and the development of the surrounding area.

While there are technical challenges with the development of a solution for option A which require further development, there are no issues identified which would prevent the development of an option at this location. Additionally, this option could potentially make use of some of the existing infrastructure and station buildings. As such it is proposed to take this option forward to Sift 2.

Verdict: Pass

6.2 Site B: East of Spencer Dock, north of Mayor Street Upper

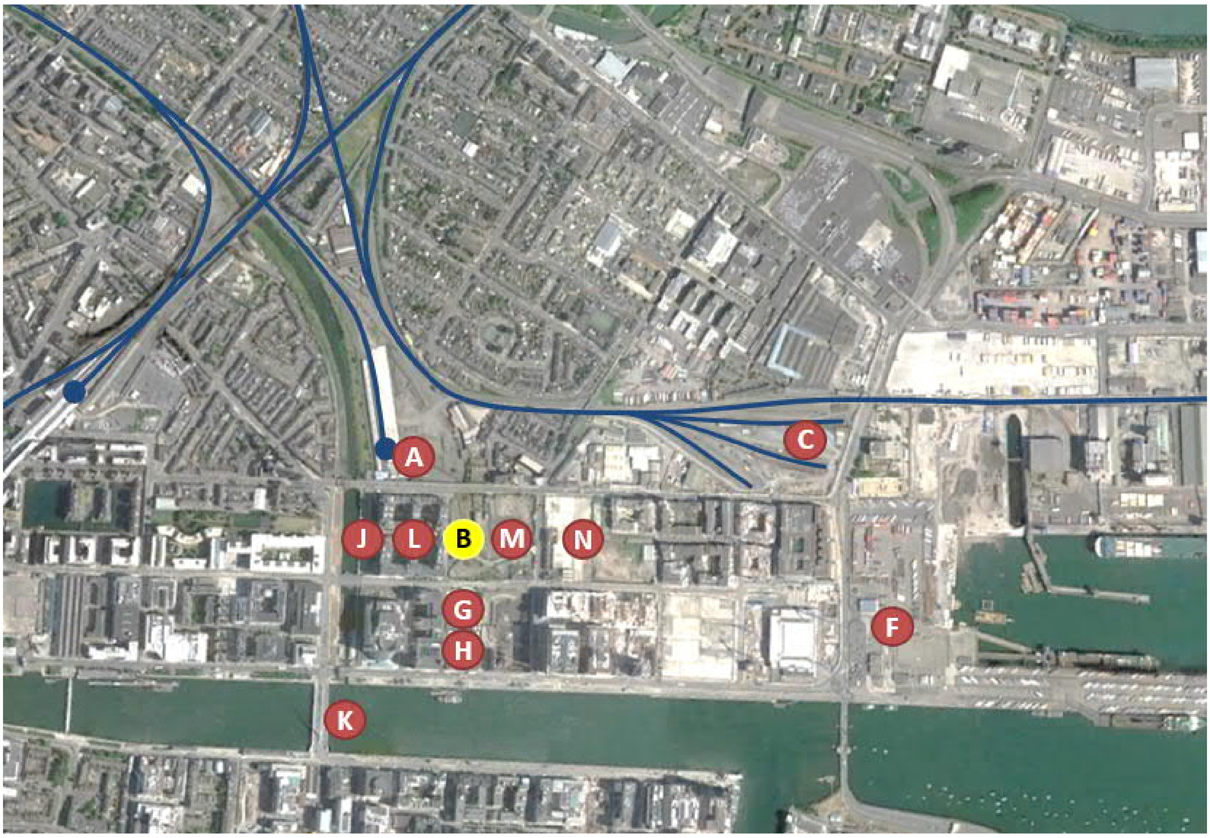

Figure 8: Site B

6.2.1 Commentary

This site is similar to one developed in an earlier study[6] for a terminus parallel to and east of Spencer Dock, with the buffer stops north of Mayor Street Upper. The likely entrance/exit would be located immediately alongside the Spencer Dock Luas stop and close to the centre of the north bank Docklands area. The platforms would extend below Sheriff Street Upper into the railway land beyond.

The previous study developed a broadly viable concept which could link to all three routes and provide the necessary freight connections. It did however identify some engineering constraints and note the high cost of this solution. The bridge where Sheriff Street Upper passes over the platform area would need replacement to lengthen the span and providing electrification clearances here necessitates lowering the track bed below the water table. This creates a need for "tanking" to prevent water ingress, for a split-level station building, and for possible level changes at Church Road Junction. The previous study also considered only three platform faces where the current study seeks to provide four if possible. As designed the outer end of the platforms would have a radius of 400m, below the absolute minimum of 500m.

Furthermore, the Spencer Dock DART Underground station and its cut-and-cover approaches – if built – would occupy the same footprint as Site B. If it was desired to keep a Site B station open during construction of the Underground, then much of the Underground structure might have to be built with the surface station.

Although the previous design is not acceptable as it stands, particularly in respect of the curved platforms, it is considered that some further engineering development at Sift 2 might

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[6] Spencer Dock Terminal Station Feasibility Study, Final Report, Irish Rail, February 2004

produce a viable option. Site M also presents the scope for reducing the curvature at the cost of increased land take on a site where development is planned.

There are no issues identified which would prevent the development of an option at this location. As such it is proposed to take this option forward to Sift 2.

Verdict: Pass

6.3 Site C: East Wall Yard

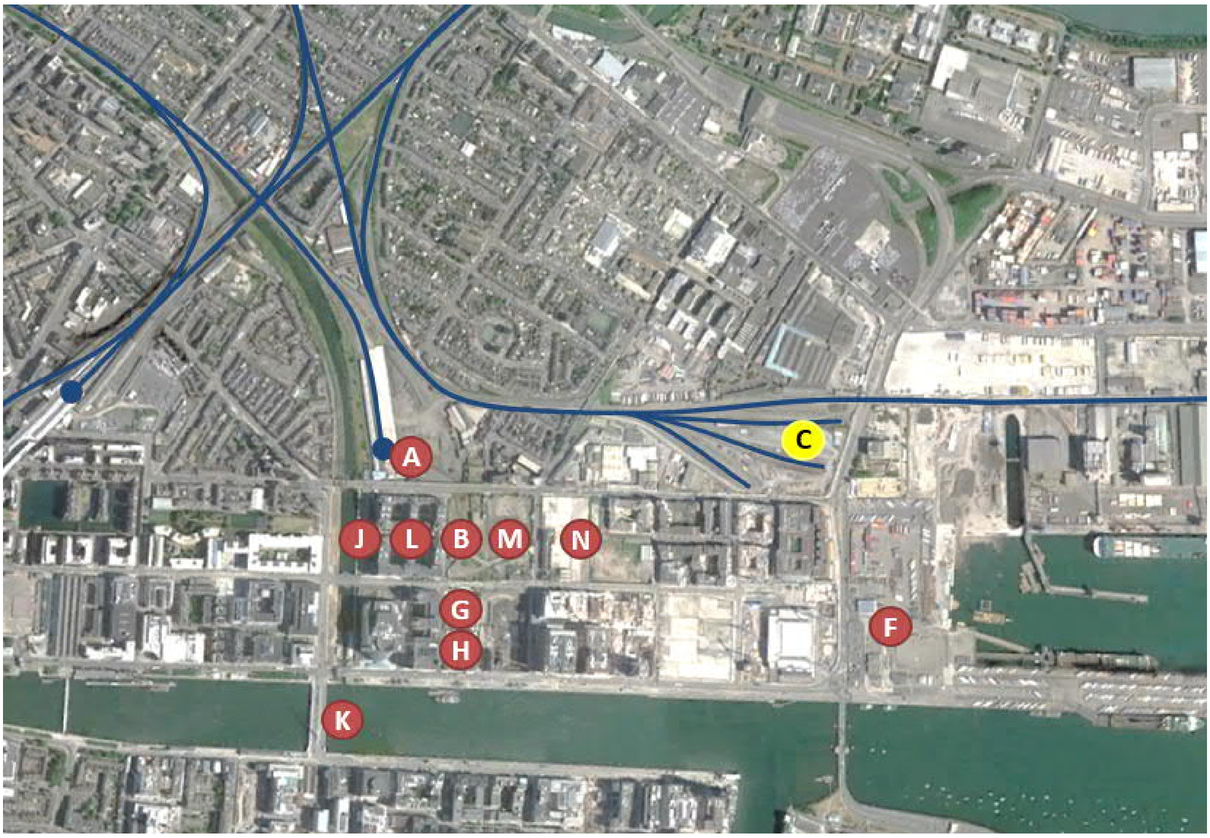

Figure 9: Site C

6.3.1 Commentary

As noted previously, with Option C any or all the existing railway activity in East Wall Yard could be relocated, with the exception of a freight route along the northern boundary of the site to access Alexandra Road. This relocation would free up enough railway land for a Docklands station. Rail access would be found along the existing trackbed to Church Road Junction, where there is width for two passenger and two freight tracks if necessary. East Road overbridge might have to be replaced by a structure with no central pier.

At Church Road a new track layout would be needed to link the passenger and freight tracks to the three routes onwards, but this area is considered to be less challenging than other sites where the platforms would be closer to the junction. However, some of the DART Underground cut-and-cover section might have to be constructed at the same time as the new junction, if it was envisaged that the Option C station would remain in service during or after construction of DART Underground.

Passenger access would be near the east end of Sheriff Street Upper or on East Wall Road itself. It is however rather remote from the western parts of Docklands. The south bank is accessible via Tom Clarke Bridge and the site is well placed should development extend eastwards into what is currently the port area. In terms of connectivity, the walk from the Point Luas stop is not currently attractive to potential passengers but there is scope for improvement if this site becomes the access to a major station. A short extension of the Luas tramline into the site is likely to be feasible, though it would conflict with the intention to extend the Luas across the river instead.

There are no issues identified which would prevent the development of an option at this location. As such it is proposed to take this option forward to Sift 2.

Verdict: Pass

6.4 Site F: Ferry Terminal

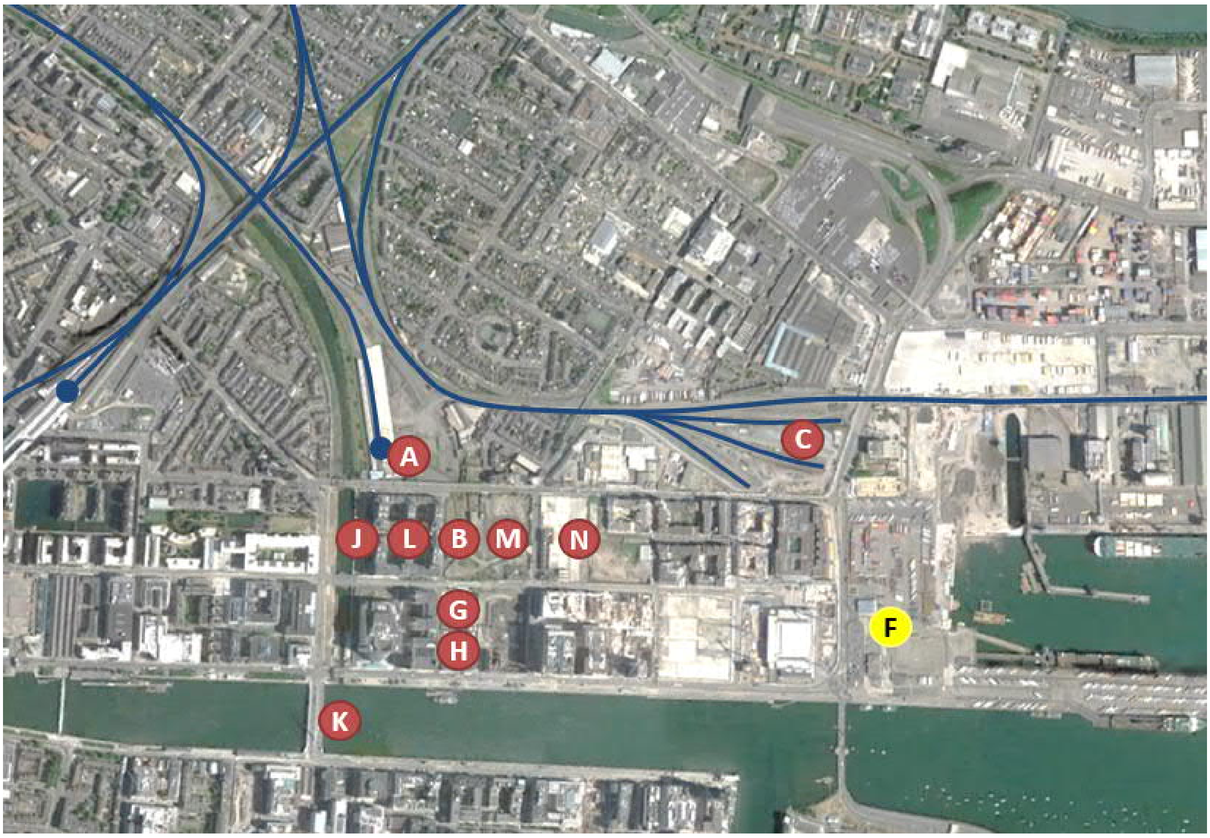

Figure 10: Site F

6.4.1 Commentary

The area east of East Wall Road includes a large, level site currently in use for port activities. In principle, a passenger railway could ramp up in East Wall Yard over East Wall Road. Alternatively the road might be elevated over both the new line and the freight tracks, but interfaces to other roads and buildings make this difficult to achieve. Either existing port activity would have to be relocated, or the station might need to be elevated and a waiting area for road vehicles provided below the station. The site also overlaps the zone of archaeological potential.

To minimise walking distance to the Point Luas stop, the station throat would have to be tightly curved to bring it into a closer north-south alignment east of the Point. This curve and the elevated structure would introduce significant engineering complexity and cost, probably requiring all platform tracks to continue around the curve and over East Wall Road with point work in East Wall Yard. The bridge would be long and forbidding for those walking underneath it. Works at Church Road Junction would be the same as Site C, including the potential conflict with DART Underground.

In engineering terms, the site is feasible but inferior to Site C due to the additional complexity of crossing East Wall Road. Passenger access is also inferior to Site C, being on the wrong side of the busy East Wall Road and further from Luas and all existing developments. It would also require land purchase, reducing the scope for either port or future residential/commercial development while still taking up a significant part of East Wall Yard.

Due to these considerations and the presence of a better alternative location adjacent to the site at C, it is proposed to discard Option F at this point.

Verdict: Fail

6.5 Site G: Elevated over Spencer Dock Luas

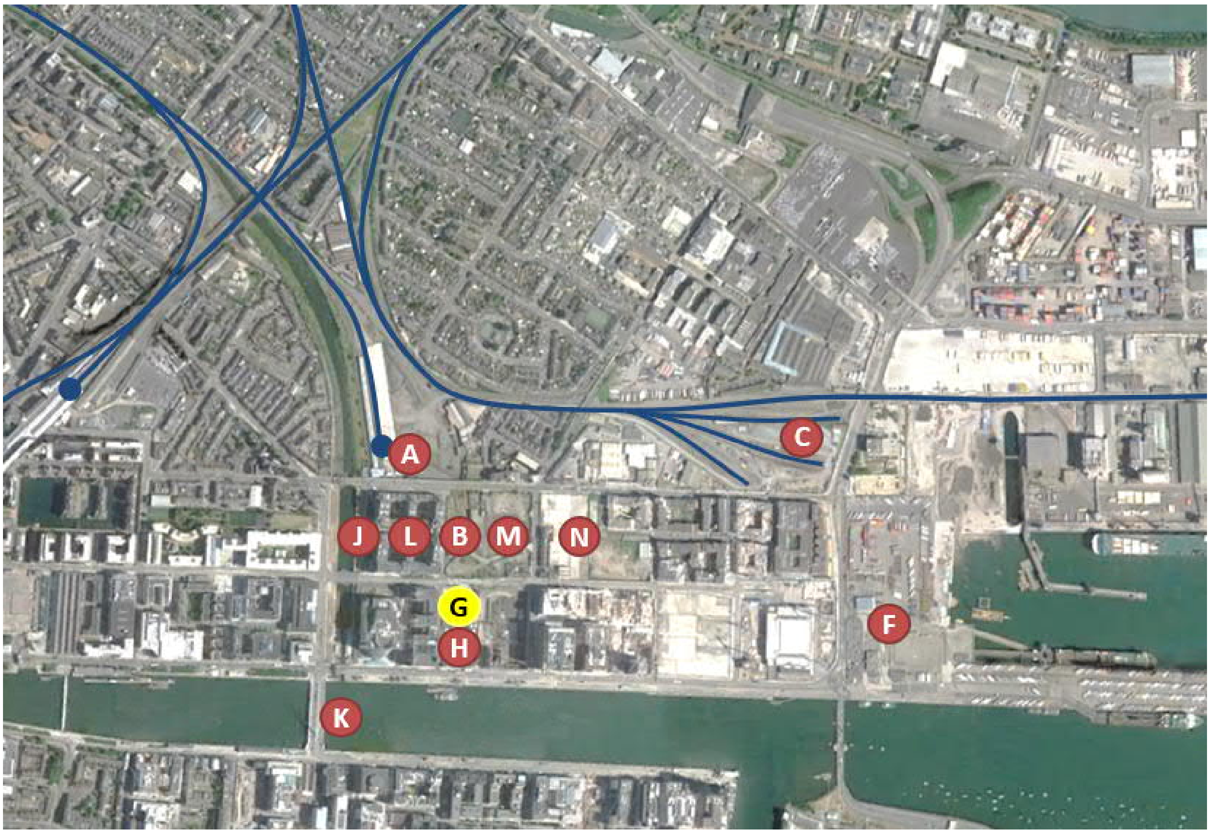

Figure 11: Site G

6.5.1 Commentary

If located here the station would be alongside and to the east of Spencer Dock like Site B, but further south and grade separated to pass over Mayor Street Upper and the Luas stop. This creates the opportunity for a southern entrance/exit at the LMS building where a pedestrian bridge to the south bank is also proposed, as well as a central/northern access to interchange with Luas and serve the northern part of the Docklands. However, as with Site B, it would be necessary to include part of the DART Underground station box and approaches when building the Site G station, if it was to remain open during any future construction of DART Underground.

The gradient necessary to pass over Mayor Street from the existing elevation of Church Road Junction is at least 3.9%, which is steeper than the 3.5% permitted by Irish Rail standards and therefore not technically feasible. This conclusion is based on the following worst case assumptions:

- Buffer stops are at the northern side of the protected LMS station building, the further south possible.
- Platforms are at the maximum permitted platform gradient of 0.2% at Mayor Street.
- Vertical curves are the minimum permitted radius of 1000m[7].
- Vertical curves run right up to the platform ends and to the southernmost likely switches and crossings at Church Road Junction.

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[7] Standard CCE-TMS-341

The gradient could be eased by raising the track level at Church Road Junction, but this would steepen the gradient between Church Road and East Wall Yard where shunting takes place. Gradient in this area is already more than 0.2%.

As described this option includes non-compliant track gradients which make this option not viable. As such it is proposed to discard Option G at this point.

While an underground sub-option might also be considered, the gradients needed would also be excessive albeit in the opposite sense.

Verdict: Fail

6.6 Site H: North Wall Quay over Liffey

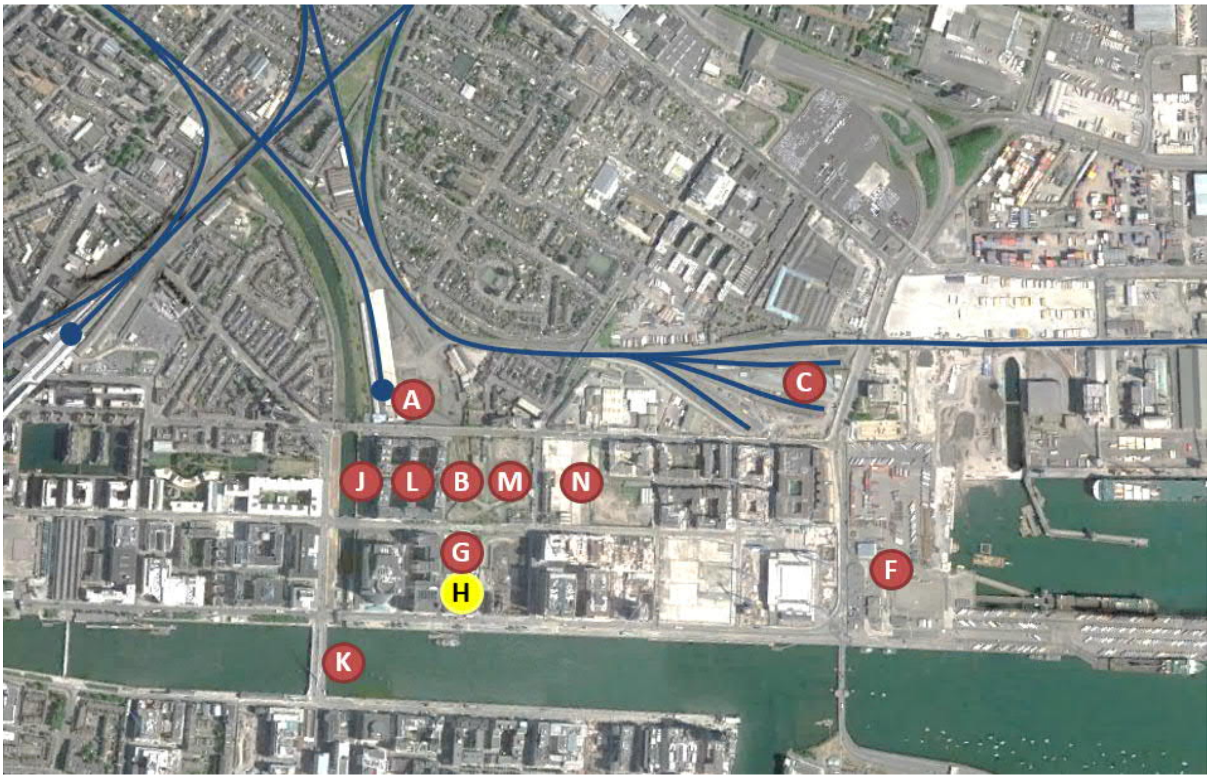

Figure 12: Site H

6.6.1 Commentary

An elevated station extending the whole way across the river was originally considered to give optimum accessibility to the high density employment on the south bank of the Liffey. However to maintain the navigational access and unlimited head clearance required on the Liffey an elevated station in Site H would therefore have to protrude part way across the river, with a moveable pedestrian bridge connecting it to the south banks. This would be in place of the footbridge currently proposed for this location.

It is also located within a Conservation Area and Zone of Archaeological Potential and would severely impact the setting of the former LMS station, a protected structure.

These environmental and planning issues would severely restrict the development of a station at this location and the requirement to maintain navigational access on the Liffey would render the option technically not viable. As such it is proposed to discard Option H at this point.

Verdict: Fail

6.7 Site J: Royal Canal south of Sheriff Street Upper

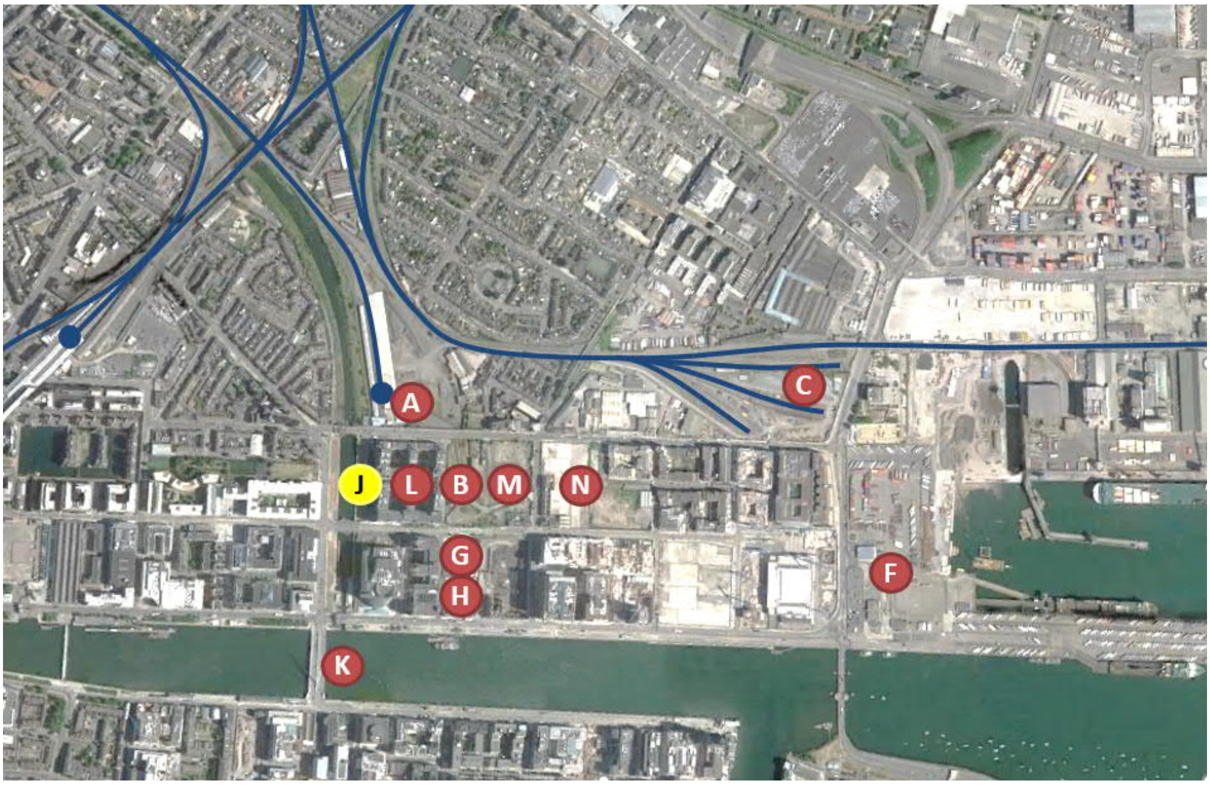

Figure 13: Site J

6.7.1 Commentary

This site straddles the Royal Canal, possibly with two platforms each side. The main entrance would be from Mayor Street Upper, close to the Spencer Dock Luas stop (which could be moved further west) and the north bank Docklands area. Therefore, access to the surrounding area is good, including the south bank via the existing Samuel Beckett Bridge.

There are considerable engineering and environmental challenges associated with this site. Tracks serving any platforms to the west of the canal would have to cross the site to reach any of the three rail routes, possibly requiring a moveable bridge or a “drop lock” solution that lowers the water level locally. Tracks from at least the Northern and Phoenix Park lines would have to pass over or through the existing station, requiring its demolition or major modification and a reduced service during the transition period. This would probably also require demolition of some of the mixed use Spencer Dock buildings. To pass beneath Sheriff Street Upper the station would have to be below the water table or the street elevated further. If the station extended across Mayor Street as well, the vertical constraints would be more severe.

The environmental impact of this site on the canal in terms of harming the setting of a Conservation Area and constituting a visually obtrusive or dominant form would be significant and considered unlikely to be mitigated through design. It would most likely also require the loss of a historic feature – the bridge where Sheriff Street Upper passes over the canal. A location for the station at the southern extremity of the site would be within a Zone of Archaeological Potential. On this basis it is proposed to discard Option J at this point.

Verdict: Fail

6.8 Site K: Samuel Beckett Bridge

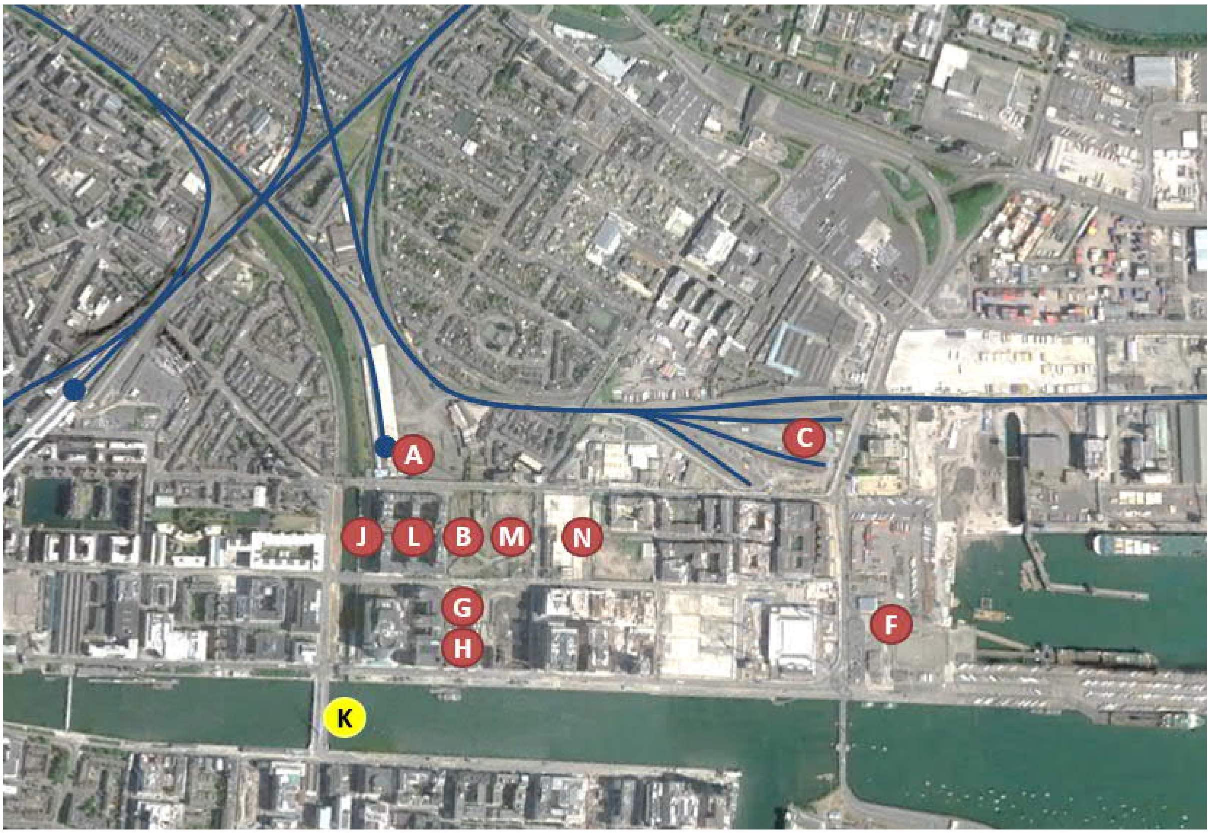

Figure 14: Site K

6.8.1 Commentary

Site K is on a similar alignment to Site J along the Royal Canal but located further south, so it straddles the river just east of the Samuel Beckett Bridge. Therefore, like Site J, the environmental impact on the canal in terms of harming the setting of a Conservation Area and constituting a visually obtrusive or dominant form would be significant and considered unlikely to be mitigated through design. It would also impact the lifting bridge where North Wall Quay crosses the canal, a protected structure. Like option H the navigational access along the Liffey would need to be maintained, requiring the station to pivot to allow access in a similar fashion to the existing Samuel Beckett Bridge. With major doubts regarding the technical feasibility of such a design and giving due consideration of the planning and environmental constraints referenced, it is proposed to discard option K at this point.

Verdict: Fail

6.9 Site L: West of Spencer Dock, north of Mayor Street Upper

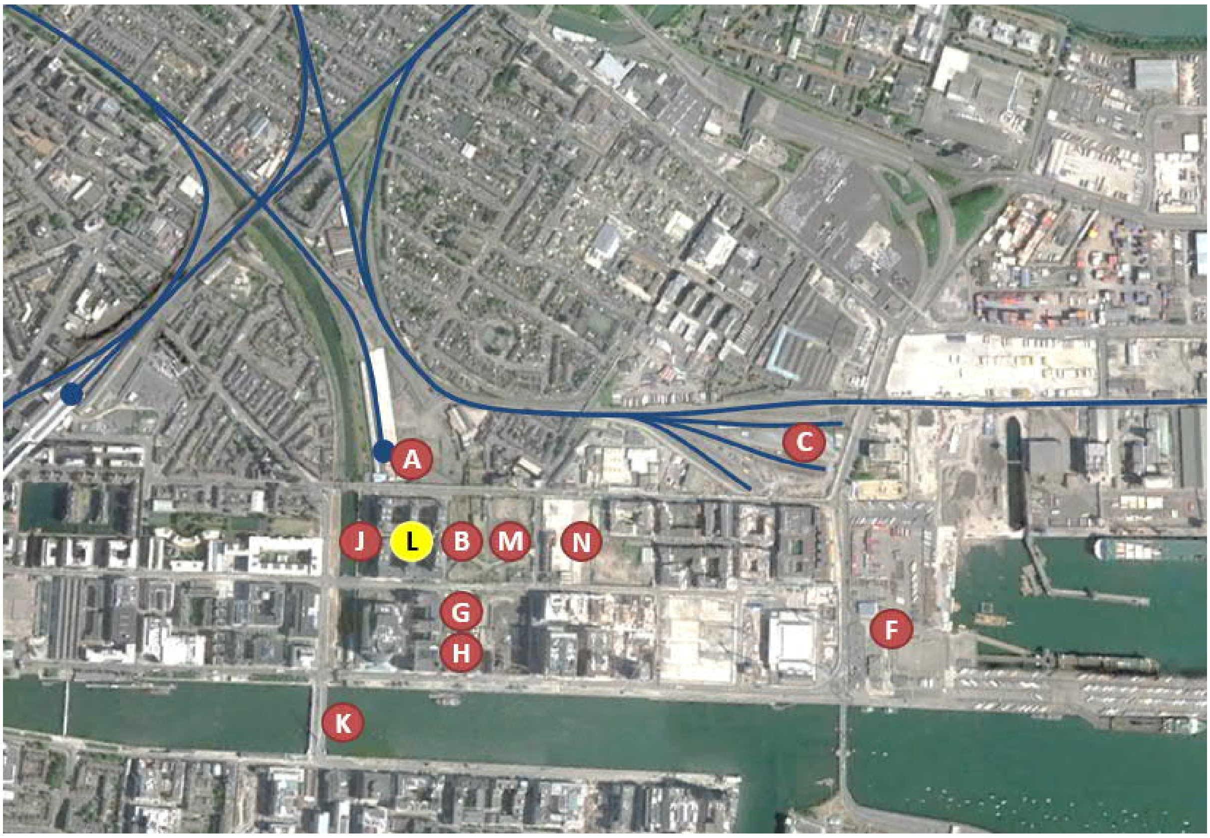

Figure 15: Site L

6.9.1 Commentary

Site L occupies part of the Spencer Dock mixed use buildings, and the demolition of many of these buildings is the principal downside of the site. In engineering terms, it is easier to connect to the three rail routes than option A further north or option B further east, but the need to pass beneath Sheriff Street Upper suggests that like option B the station would be below the water table.

With the principal entrance likely to be on Mayor Street Upper, this site offers good access to the Luas and to the north bank of the Docklands. However, it appears no better than Site M, which has similar engineering and accessibility features, but which is not occupied by a completed development.

Therefore site L is no better than site M and the issues associated with the demolition of the existing apartment complex on the site render the option not feasible. It is proposed to discard option L at this point.

Verdict: Fail

6.10 Site M: New Wapping Street

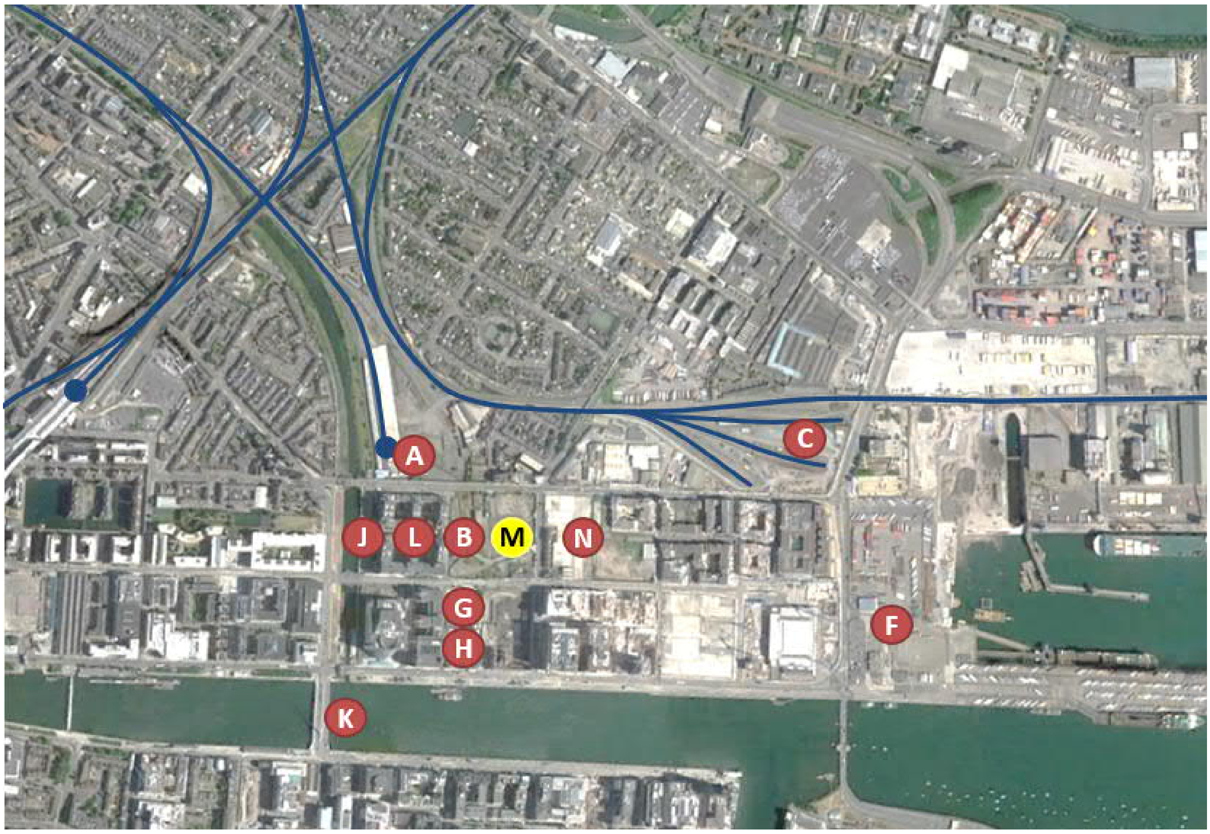

Figure 16: Site M

6.10.1 Commentary

At Site M, the station would lie diagonally across the block south of Sheriff Street Upper and west of New Wapping Street. Site M differs from Site B, as it extends into the eastern part of this block, which is largely vacant though has planning permission for commercial/residential development[8]. There is a terrace of houses in the south-east corner and a pumping station towards the northern edge. If built here the station would also impinge on the potential site of the DART Underground station, probably requiring part of the Underground box to be built if the station was to remain in use during construction of any Underground route.

In engineering terms this site is similar to Site B, as they share the likely need to go below the water table in order to pass under Sheriff Street Upper. However, the curve on approach to Site M would be less than Site B, making it likely that the platforms would be straight or at least straighter.

The property impact of Site M is significantly greater than for Site B. Local access for Site M would be good, as the likely entrance on Mayor Street Upper is close to the centre of the north bank Docklands and a future bridge over the Liffey. The site is further from the Luas than options B or G but is still easily accessible.

At this point the are advantages with Site M over other options located nearby and the development of a station at this location is achievable. As such it is proposed to take this option forward to Sift 2.

Verdict: Pass

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[8] http://www.dublincity.ie/swiftlg/apas/run/WPHAPPDETAIL.DisplayUrl?theApnID=DSDZ2896/18&theTabNo=2

http://www.dublincity.ie/swiftlg/apas/run/WPHAPPDETAIL.DisplayUrl?theApnID=DSDZ2387/18&theTabNo=2

6.11 Site N: Mayor Street Upper and Castleforbes Road

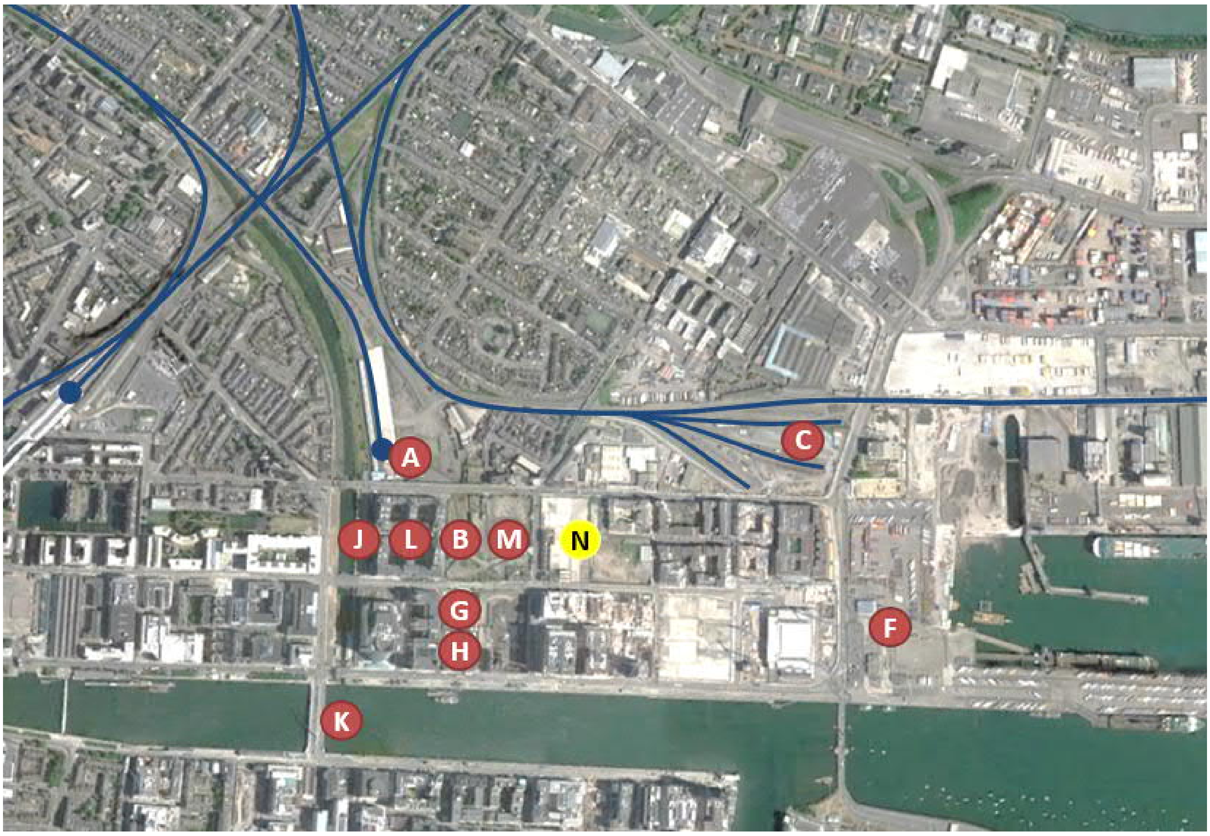

Figure 17: Site N

6.11.1 Commentary

For this site the approach tracks would curve eastwards through the block south of Sheriff Street Upper and west of New Wapping Street, and terminate approximately alongside and parallel to Mayor Street Upper between New Wapping Street and Castleforbes Road. Both blocks have planning permission for a commercial development[9], making Site N worse in this respect than Site M which only affects one block. With Site N there is some conflict with DART Underground if built, and the route would probably have to be elevated to avoid severing of New Wapping Street.

In accessibility terms the likely entrance onto Mayor Street Upper is convenient for most of northern Docklands. A Luas stop is a short walk away but could be relocated or an extra stop added. However, accessibility to Site N is overall slightly worse than for Site B, G or M, as it is slightly further from the centre of northern Docklands and less well placed for river crossings to the south banks.

There are no advantages of site N over other locations B and M nearby and as such it is proposed to discard this option at this point.

Verdict: Fail

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[9] http://www.dublincity.ie/swiftlg/apas/run/WPHAPPDETAIL.DisplayUrl?theApnID=DSDZ2135/18&theTabNo=2

6.12 Site P: Combination of A and J

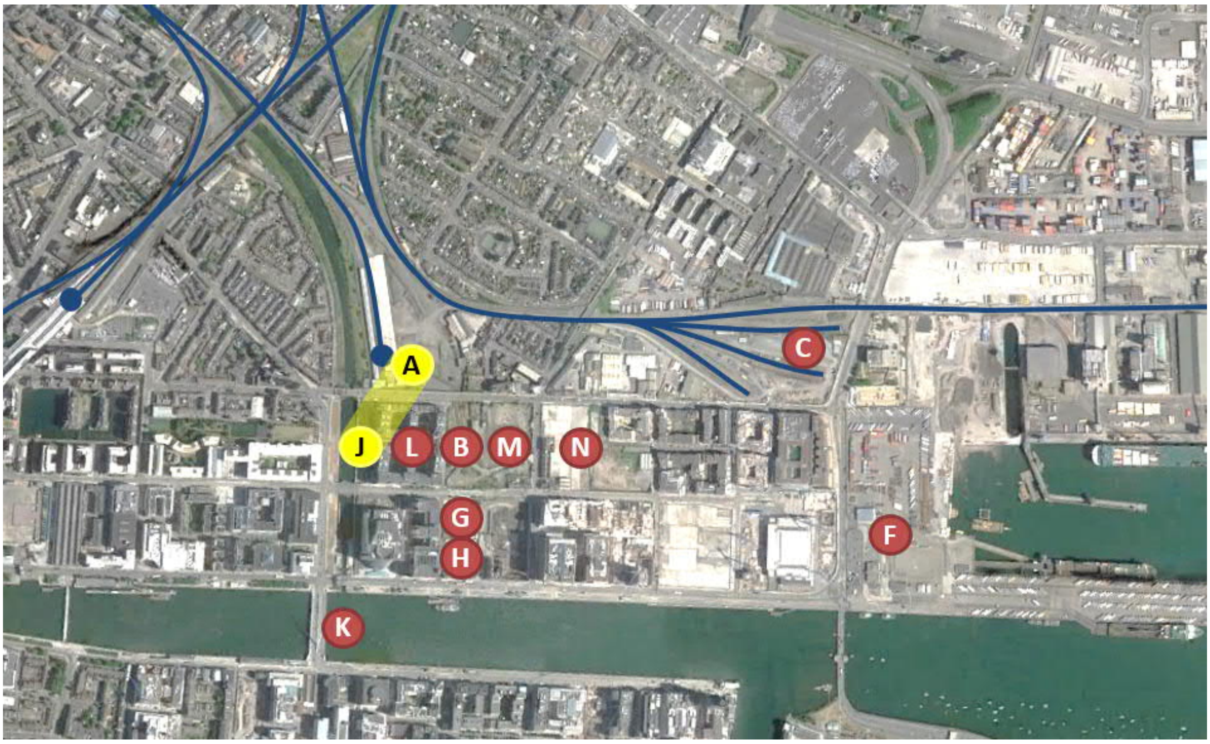

Figure 18: Site P

6.12.1 Commentary

Site P would have some platforms on the existing (A) site north of Sheriff Street Upper, and some alongside the Royal Canal Site J south of Sheriff Street Upper. The station would be integrated by some form of concourse passing under or over Sheriff Street. The south end of the southern platforms would be close to Mayor Street Upper giving good Luas access, but passengers to or from the northern platforms would have a longer walk possibly along the southern platforms. This station layout could be confusing to passengers, although probably no more so than the access to certain platforms at Connolly or Heuston stations.

However, like Site J, Site P is considered to have unacceptable planning/environmental downsides in relation to impact on the conservation area and the setting of the canal. As such, it is proposed to discard option P at this point.

Verdict: Fail

7. Sift 1 Conclusions and Recommendations

The table below summarises the outcome of the assessment carried out on each of the twelve long list options identified.

Options which have passed this assessment are those where it is feasible to develop a station option at the site and where no constraints have been identified which would make development impossible. These options will be included on the short list of options to be assessed as part of the subsequent Sift 2 process.

Options which have failed this assessment are to be discarded at this point and will not be developed further.

Table 1. Summary of Sift 1 conclusions and recommendations

Site	Verdict
A: Existing Docklands station site	Pass
B: East of Spencer Dock, north of Mayor Street Upper	Pass
C: East Wall Yard	Pass
F: Ferry Terminal	Fail
G: Elevated over Spencer Dock Luas	Fail
H: North Wall Quay over Liffey	Fail
J: Royal Canal south of Sheriff Street Upper	Fail
K: Samuel Beckett Bridge	Fail
L: West of Spencer Dock, north of Mayor Street Upper	Fail
M: New Wapping Street	Pass
N: Mayor Street Upper and Castleforbes Road	Fail
P: Combination of A and J	Fail

8. Next Steps

With the issuing of this Sift 1 report the project team seek approval of the short-listed options summarised in section 7.

Following the agreement of this short list between AECOM, the NTA and Irish Rail the short-listed options will be taken forward for further assessment within the Sift 2 process. This assessment will include a Multi Criteria Analysis, the content of which is to be proposed by AECOM in the coming weeks.

The preferred option identified by the Sift 2 process will then be further developed within the final report.

APPENDIX B DOCKLANDS STATION OPTIONS STUDY SIFT 2 REPORT,

Docklands Station Options Study

Sift 2 Report

14th of February 2019

Údarás Náisiúnta Iompair
National Transport Authority

AECOM Imagine it. Delivered.

Quality information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
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Executive Summary

An assessment is in progress to identify the preferred solution for a DART station in the Docklands/North Lotts area. The objectives of this study are to:

- Identify the preferred location and layout of Docklands Station with the aim of achieving the minimum train capacity requirement, which would best serve the needs of the Docklands area and maximise interchange potential with the Luas; and
- Carry out a comprehensive study for the Docklands Station and how it is accessed, including all connecting rail alignments from the DART radial routes bounded by and including Newcomen, North Strand and East Wall Junctions and freight traffic from East Wall Yard. This study will take consideration of the station's interface with a potential DART Underground Station and alignment.

Identification of the preferred solution is being undertaken in several stages. Following a high level initial assessment (Sift 1) four options were short listed for further development and assessment in Sift 2. The aim of this Sift 2 process is to identify an Emerging Preferred Option for further concept design, development and costing.

The four short-listed options taken forward from Sift 1 are shown below:

Study Options

These options have undergone engineering development and an initial multi-criteria assessment by a panel of experienced subject experts within AECOM. Feedback on the initial assessment from the NTA and Irish Rail project team has resulted in further engineering development and the operational assessment of each option as detailed within this report.

Options have been assessed against criterion which were agreed in advance with the NTA and which consist of three main criterion, economy, integration and environment and several sub criterions. The performance of each option was then ranked against this criterion. It is acknowledged that there is a degree of subjectivity within the multi-criteria assessment process which involves qualitative and some quantitative elements.

The impact of a new Docklands station on a possible future DART Underground station in the area is discussed but not included in the relative options assessment, as agreed.

The table below gives the results of the multi-criteria assessment for each option, with the following colour coding:

🟩	Significant advantages over other options
🟢	Some advantages over other options
🟨	Comparable to other options
🟠	Some disadvantages over other options
🟧	Significant disadvantages over other options

Main Criterion	Sub-Criterion	Option A	Option B	Option C	Option M
Economy	Capital Cost	🟩	🟢	🟢	🟧
	Operating Cost	🟨	🟨	🟠	🟨
	Demand	🟢	🟩	🟧	🟢
	Overall assessment	🟢	🟢	🟠	🟠

Main Criterion	Sub-Criterion	Option A	Option B	Option C	Option M
Integration	Land Use Policy/Plan Integration	🟨	🟨	🟨	🟠
	Public Transport Integration	🟠	🟨	🟨	🟨
	Walking/Cycling Integration	🟢	🟨	🟨	🟨
	Overall assessment	🟨	🟨	🟨	🟠

Main Criterion	Sub-Criterion	Option A	Option B	Option C	Option M
Environment	Cultural Heritage	🟨	🟨	🟨	🟨
	Noise and Vibration	🟨	🟨	🟢	🟨
	Landscape and Visual	🟨	🟨	🟠	🟨
	Overall assessment	🟨	🟨	🟨	🟨

Main Criterion	Sub-Criterion	Option A	Option B	Option C	Option M
Economy	Overall assessment	🟢	🟢	🟠	🟠
Integration	Overall assessment	🟨	🟨	🟨	🟠
Environment	Overall assessment	🟨	🟨	🟨	🟨
	Combined overall assessment	🟢	🟢	🟠	🟠

Overall, Options A and B both have some advantages over the other options.

While Option A benefits from the lower level of investment required to develop the site, the adjacent dedicated cycle routes and the presence of attractive walking routes along the canal, Option B performs strongly given its closer proximity to higher density employment zones on the south and western side of the study area.

Option C has some disadvantages, primarily driven by its location at the periphery of the higher density development area. Option M also has some disadvantages, primarily driven by the development currently taking place on the third-party-owned site and the costs associated with the purchase of non CIÉ lands.

In summary, Option A would cost less to develop whereas Option B would serve more people.

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Tables

1. Introduction

1.1 Background

The National Transport Authority (NTA) has appointed AECOM to undertake a Docklands Station Options Study to determine the preferred location and layout of Docklands DART Station.

1.2 Docklands Station Options Study Objectives

The objectives stated within the client's brief[1] are:

- *To identify the optimal location and layout of Docklands Station with the aim of achieving the minimum train capacity requirement, which would best serve the needs of the Docklands area and maximise interchange potential with the Luas*; and
- *To carry out a comprehensive study for the Docklands Station and how it is accessed, including all connecting rail alignments from the DART radial routes bounded by and including Newcomen, North Strand and East Wall Junctions and freight traffic from East Wall Yard. This study also takes consideration of the station's interface and alignment with a potential future DART Underground Station and alignment.*

The capacity demands on the station include the ability to cater for a total of up to eighteen trains per hour, requiring a degree of flexibility to split capacity between the three rail routes accessing the Docklands area. The station requires the potential for operation of 8-car electric trains. The platforms and other facilities require designs to operate as a busy commuter station.

1.3 Sift 2 Report Context

This Sift 2 report details the process followed to identify the Emerging Preferred Option for Docklands Station. The final Docklands Station Options Report will cover the whole study process, as set out in Figure 1 Study Process.

This report is intended to be read as a follow-up to the Sift 1 report, so does not repeat much of the background information contained within that report. This Sift 2 report describes:

- The assessment methodology;
- An updated overview of rail operational issues applicable to all options;
- Revised descriptions of each option, taking into consideration further engineering feasibility since Sift 1;
- The Multi-Criteria Assessment carried out; and
- Broad conclusions regarding the performance of each short listed option.

The detailed drawings referenced within this document can be found in Appendix A. A detailed capital cost breakdown can be found in Appendix B, with detailed operational assessment in Appendix C.

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[1] Tender and Schedule for The Provision of Engineering Consultancy Services for Docklands Station Options Study

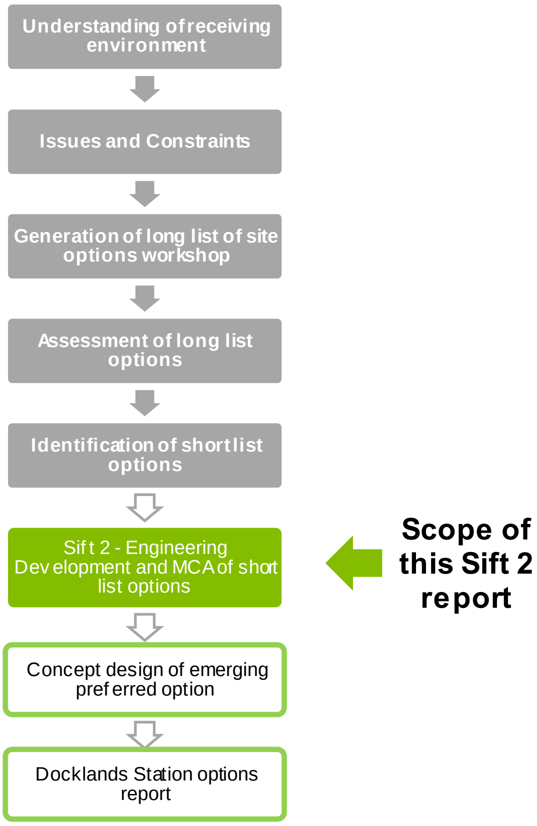

Figure 1 Study Process

2. Multi-Criteria Analysis Methodology

Following completion of Sift 1, the emerging options have been assessed in Sift 2 through Multi-Criteria Analysis (MCA). The results of the assessment are presented in Section 0. This stage comprises a more detailed qualitative and quantitative assessment than was carried out at Sift 1. The aim of the Sift 2 process is to identify an Emerging Preferred Option for further concept design development and costing.

The ‘Guidelines on a Common Appraisal Framework for Transport Projects and Programmes’ (CAF) published by the Department of Transport, Tourism and Sport (DTTAS), March 2016, requires schemes to undergo a ‘Multi-Criteria Analysis’ (MCA) under the following six criteria:

- Economy
- Integration
- Environment
- Accessibility and Social Inclusion
- Safety
- Physical Activity.

The CAF criteria informed by project specific considerations are used as the basis for this Sift 2 MCA.

The approach taken for each assessment criterion is described below. Where an assessment criterion (as identified by the CAF) has been deemed not to be applicable for inclusion within the analysis, the rationale for this determination is also described.

As agreed with the NTA, Sift 2 does not explicitly assess compatibility with any previous or potential future DART Underground scheme, but section 3 comments in broad terms on compatibility of options with an underground scheme.

2.1 Economy

2.1.1 Capital Cost

Order of magnitude capital cost estimates were prepared for indicative scheme infrastructure works. These included the costs of tracks, signalling, station construction and urban realm improvements.

The assessment does not include the potential costs and revenues of over-site development opportunities. Land acquisition costs are taken into consideration for options requiring third party land.

2.1.2 Operating Cost

Significant operating issues were compared between options, to assess their relative operating costs and any extra capital cost that might be incurred to improve operational flexibility. Complexity of station design is a proxy for variations in maintenance cost between options. Section 3.2 discusses operational aspects.

2.1.3 Demand

A qualitative assessment has been undertaken of the workplaces/employment figures within an approximate 5 and 10 minutes walking catchment using GIS-based analysis on data obtained from the 2035 Eastern Regional Model (ERM).

2.2 Integration

2.2.1 Land Use Integration

A qualitative assessment was undertaken, and commentary provided on the compatibility of each option against the Dublin City Council Development Plan 2016-22 in the context of the National Development Plan. Particular reference is made to the North Lotts and Grand Canal Dock Strategic Development Zone. As agreed with NTA, no specific consideration is made with respect to a possible future DART Underground station in the area.

2.2.2 Public Transport Integration

Walking interchange time (distance between station entrance and closest Luas platform/bus stop in each direction) was used to assess integration with Luas and the Core Bus Corridor network.

2.2.3 Walking/Cycling Integration

A qualitative assessment was undertaken, and commentary provided on the relative potential for each option to integrate with the pedestrian and cycle network in the area.

2.2.4 Impact on Road Network

This is not considered relevant for differentiating between options for this scheme because at the current level of design development it is assumed all options can maintain the existing road capacity.

2.2.5 Geographical Integration

Integration across geographic and judicial boundaries is not considered relevant for differentiating between options for this scheme as all lie within the same administrative boundaries.

2.2.6 Other Government Policy Integration

This is not considered relevant for differentiating between options for this scheme because all options will have the same level of fit with other Government policies.

2.3 Environment

2.3.1 Cultural Heritage

A qualitative assessment has been undertaken, and commentary provided with reference to Recorded Protected Structures, Architectural Conservation Areas and National Inventory of Architectural Heritage Structures impacted by each option.

2.3.2 Biodiversity

This was agreed with NTA as not relevant for differentiating between options for this scheme because there are no Special Areas of Conservation, Special Protection Areas and Natural Heritage sites affected by any of the shortlisted options.

2.3.3 Air Quality

This was agreed with NTA as not relevant for differentiating between options for this scheme as all short-listed options fall within the same measurement zone.

2.3.4 Noise and Vibration

A qualitative assessment has been undertaken, and commentary provided in relation to the proximity of each option to sensitive receptors, which have been determined during this stage of the study.

2.3.5 Landscape and Visual Quality

A qualitative assessment has been undertaken, and commentary provided in relation to the impact on areas of specific character and visual sensitivity including urban landmarks, land uses, spaces and streetscapes, identified within Dublin City Development Plan 2016-22.

2.3.6 Land Use

This criterion is defined within the CAF, however in the context of this study the 'Impact on value for intended use' is already covered under the Integration criterion – sub-criterion Land Use Integration. As agreed with NTA, it is not therefore assessed further.

2.3.7 Water Resources

As agreed with NTA, this criterion is not considered relevant for differentiating between options for this scheme as the presence of water features, designated flood zones and potential discharge impacts to groundwater is the same across all options.

Flood risk has been taken into consideration in the design and costing of each option, so is covered under the Economy criterion.

2.3.8 Accessibility and Social Inclusion

Under the broad meaning of 'accessibility' applied in the CAF (i.e. access to jobs for Deprived Geographic Areas), this criterion is not considered relevant for differentiating between options for this scheme as the origins of services bringing passengers into Docklands station will be the same for all options. Accessibility to jobs more generally (as a proxy for demand) is picked up under the Economy criterion.

2.4 Safety

As agreed with NTA, this criterion is not considered relevant for differentiating between options for this scheme as all options would be designed in accordance with applicable safety standards.

2.5 Physical Activity

As agreed with NTA, this criterion is not considered relevant for differentiating between options for this scheme because all schemes would be expected to have a broadly similar impact on physical activity.

2.6 Assessment

The table below lists the selection criteria used for the assessment.

Table 1. Summary of Selection Criteria

Criterion	Sub-Criterion
Economy	Capital Cost
	Operating Cost
	Demand
Integration	Land Use Policy/Plan Integration
	Public Transport Integration
	Walking/Cycling Integration
Environment	Cultural Heritage
	Noise and Vibration
	Landscape and Visual

Each criterion was initially assessed by one or more of AECOM's individual subject matter experts and verified/challenged through an internal workshop by a wider panel of team members. Feedback from NTA and Irish Rail was incorporated into the further assessment presented here.

Each sub-criterion was assessed against the five-point scale outlined below. The performance of each option against these sub-criterions determined the options performance against the main criterion and in turn the overall assessment of each option.

Table 2. Assessment Scale

Significant advantages over other options
Some advantages over other options
Comparable to other options*
Some disadvantages over other options
Significant disadvantages over other options

**only applied in instances where 3 or more options are comparable against a given criteria*

3. Development of Short Listed Options

Figure 2: Shortlist of Site Options

Station options have been developed for each of the four sites brought forward from Sift 1. The engineering assessment concentrated particularly on those issues that differentiate the sites, so are most relevant to selection of a preferred option. Hence the buildings and platforms have a similar form under all options and provide equivalent facilities, subject to variations to suit the particular site constraints.

Appendix A contains the drawings of the options.

3.1 Requirements

The following principal operational and design requirements are considered to be applicable to all options.

3.1.1 General

A maximum of 1% gradient is generally recommended for freight or mixed traffic lines. However steeper gradients currently exist on routes used by freight in the Docklands area. For passenger-only lines a 2.5% maximum, with 3-3.5% allowed over short distances, is defined by standards.

Station platforms are to be a minimum of 174m long. The vertical alignment of the platforms will be limited to a maximum gradient of 0.2%[2]. This minimises the risk of stationary vehicles in the platform rolling away. A 20m exclusion zone is required behind buffer stops.

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[2] Standard I-PWY-1141, Section 2.1.1

The normal minimum horizontal radius is 200m with an exceptional minimum of 150m[3]. The horizontal alignment of the platforms should ideally be straight, to minimise the gaps between train and platform. The relevant standard[4] recommends platforms should be straight or, if unavoidable, curved on a radius not less than 1000m, but also mentions smaller radii down to 350m. The increased stepping distance at a curved platform is a particular consideration for a busy city station because it increases risk to passengers and train dwell time, so the study assumes the higher limit of 1000m.

All sites include parking for staff cars and for small vans used for maintenance. Cycle racks are provided. No public car parking is provided.

3.1.2 Capacity

The Appendix to the client's brief states:

> *The Docklands Station Study shall aim to achieve a target capacity of c.18 tphpd [trains per hour per direction] from the combined three radial routes Northern Line, Maynooth Line and Phoenix Park Tunnel Line… If beneficial, the … Consultant may look at combining the Western trains from Maynooth/Phoenix Park Tunnel onto the existing North Strand line [GSWR] – which in turn would have the effect of the combined Western trains accessing Docklands via the existing Newcomen Jnct Line [MGWR] – but any required development at Glasnevin is outside the scope of this study.*

This implies a flexible layout which can accommodate the 18 trains arriving and departing by various combinations of the three routes, over a 3 hour peak period. This requirement is assessed in more detail within the operational assessment sections of this report.

Several freight trains per day run to and from the facilities accessed via the tracks on Alexandra Road. The minimum provision for freight within the study area is:

- Single track access between Alexandra Road and the Maynooth, Phoenix Park and Northern routes (this could involve switching between routes at Glasnevin Junction);
- Double track section for the longest freight trains (450m) to refuge and pass each other between the East Wall Road crossing and any interface to passenger trains. This is assumed to be worked manually so it applies to a distance between fouling points, with provision for variation in stopping position but no allowance for signalling overlaps;
- Measures such as signals and trapping[5] are required to protect passenger trains from freight train movements;
- Construction of safe walkways is required for staff to access trains and hand-worked points.

3.1.3 Electrification

The costings included assume that the existing Northern Line electrification will be extended into the new station but do not include any costs for the possible electrification of the other two routes. However, the feasibility and design work within the study is based on passive provision for 25kV on passenger lines, so the proposed works will not make any future 25kV or 1500V electrification more difficult.

Specifically, vertical profiles are considered to be compatible with providing clearance for a 25kV overhead line at overbridges, but electrification of the Phoenix Park and Maynooth lines is likely to require significant works to those bridges. The infrastructure costs currently allow for replacement of the West Road overbridge, but further development of the preferred option may establish that this work is not necessary until electrification takes place and therefore remove it

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[3] Standard CCE-TMS-340, section 4.2.1.

[4] Standard I-PWY-1141, section 2.1.2 and 6.1.9.

[5] A device to intentionally derail unauthorised train movements from sidings or yards towards passenger lines.

from the final costings. As this applies equally to all Sift 2 options, it does not act as a differentiator and does not influence the choice of preferred option.

3.2 Operational Assessment

Operational assessments for the four options are presented below. Options A and B are examined in detail. Option C and M are commented on based on applying the results from the other options. Further information on the methodology, assumptions and detailed results for the operational assessment are found in Appendix C.

3.2.1 Passenger

Capacity assessments are based on calculations of the intervals between trains entering and leaving the station that are necessary to avoid trains being slowed by signals. This ensures that trains entering the station do not have to brake excessively and allows compliance with station speed restrictions. Train journey times are estimated for an 8-car unit with similar performance to DART, and assume each train is scheduled to spend a minimum of 8min turnaround time in the platform.

Throughput of each route approaching the station is considered in isolation, assuming that any shared platforms or other tracks are fully available to that route when needed. Comments are made where this is not possible, or where re-routeing at Glasnevin can result in greater capacity, and combinations of routes are then considered.

The throughputs are presented assuming no interaction with Connolly trains. To maximise the capacity available for Connolly trains, the assessment assumes trains are timetabled to run at intervals that are multiples of 3min, and that trains on the same route pass each other close to the junctions where Connolly and Docklands trains diverge.

3.2.2 Freight

All options provide facilities for freight to access Alexandra Road to and from all three routes, although all but option C requires access to and from the Maynooth line to be via North Strand and the connection at Glasnevin. The removal of the tracks where freight trains can wait to enter or leave these facilities will lead to some changes in freight working practices:

- Freight trains destined for East Wall Yard or Alexandra Road can currently be signalled up to a stop board where they can wait to continue eastward without blocking passenger services. This will no longer be possible, so the signaller will have to confirm that a train can be accepted into the yard area before it is sent towards Church Road.
- Freight trains leaving these facilities will have to wait between East Wall Yard and Church Road for a path over Church Road Junction and beyond. All options provide standage for a 450m train from Alexandra Dock, without blocking a train of similar length in the other direction.
- If East Wall Yard is retained, some shunting moves may have to go out onto passenger lines under the control of the signaller.
- Freight in either direction over Church Road Junction will be moving slowly as it is entering or leaving the yard where there are hand-worked points and staff may be on the track. If a longer freight train is brought to a halt in either direction between this junction and North Strand or East Wall junctions (and Newcomen Junction in option C) its tail will be blocking other movements. Thus the passenger timetable needs to allow a significant “time window” for freight movements at the off-peak times when they are likely to take place.

These freight constraints are not considered to be differentiators between options, as they are similar whichever option is selected.

The capacity assessment is based on peak passenger service when freight is assumed not to operate.

3.3 Option A: Existing Docklands station site

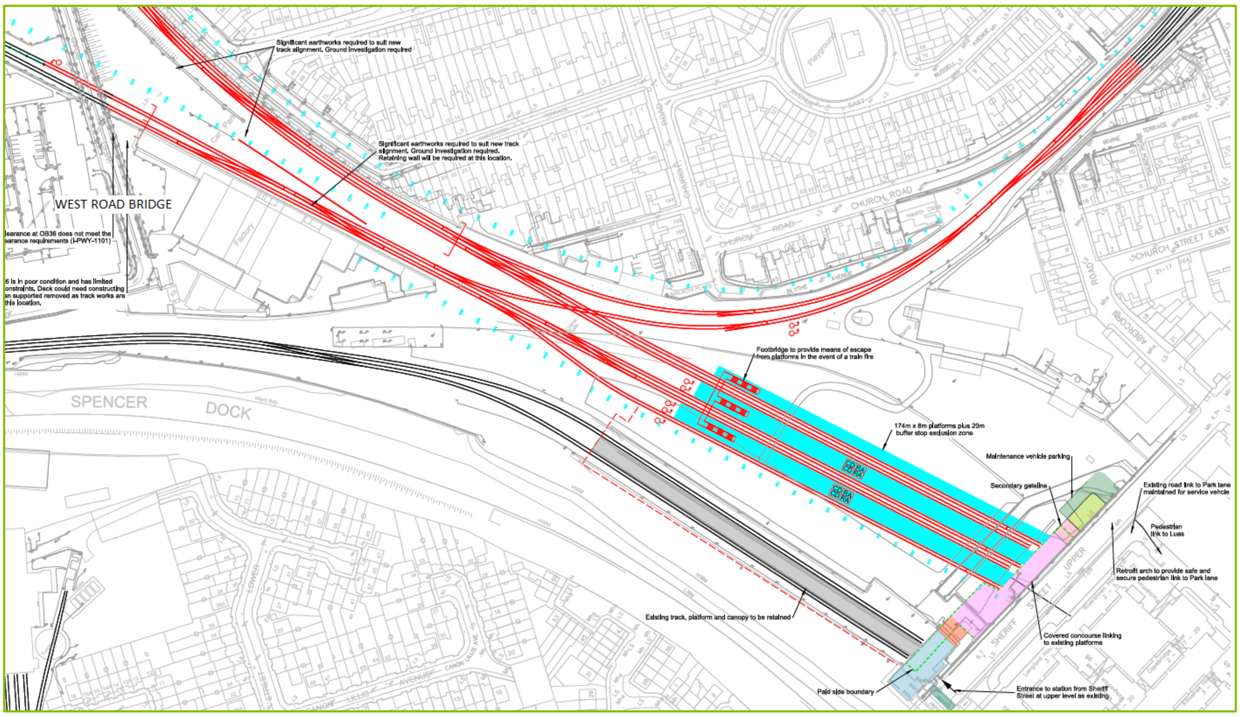


Figure 3: Extract from Option A General Layout

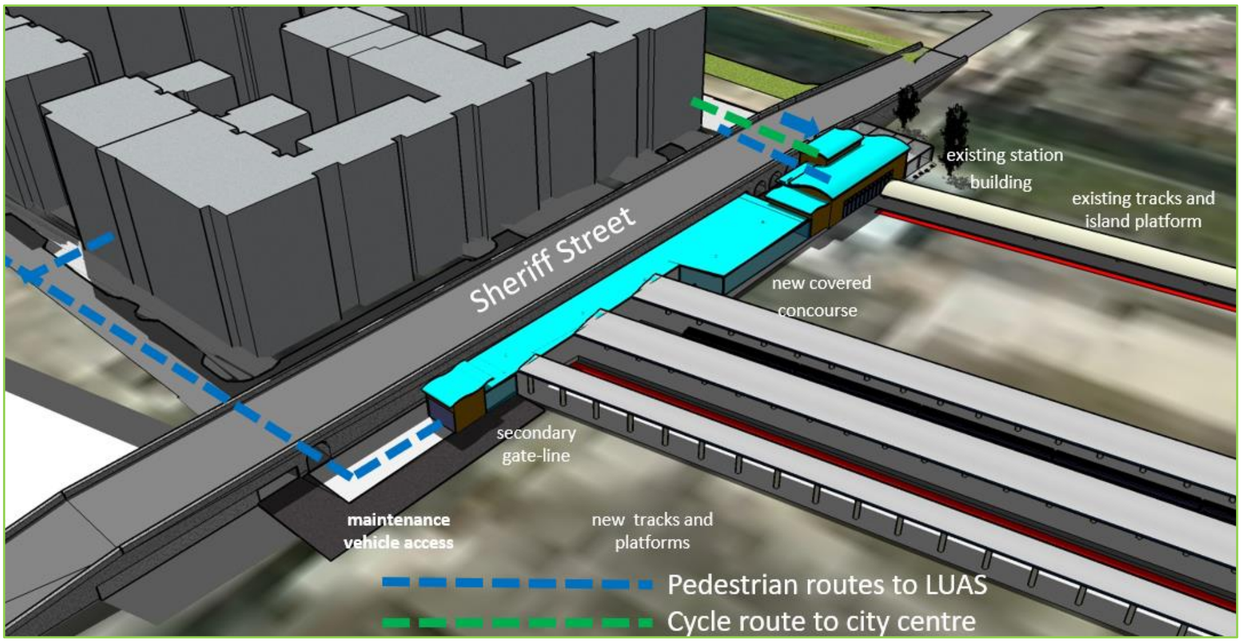


Figure 4 Option A Design Model

3.3.1 Engineering

The major constraint in development of this option is the short distance between the northern end of the platforms and the divergence of the three rail routes the station is to serve. This is exacerbated by the difference in gradient between the routes, since the necessary vertical curves cannot generally coincide with switches and crossings. The new layout requires two diamond crossings for the freight connection to and from North Strand to cross the tracks linking the platforms with East Wall Junction. 25km/h is possible on all routes on the layout.

It has been possible to develop an option where all tracks and platforms are approximately at grade. However, due to the space limitations, it has not been possible to provide any inter-connections between the routes, so each platform is accessible to and from only one route.

Furthermore the new platforms serving the Phoenix Park and Northern lines are located a short distance to the east of the existing platforms which are retained to serve the Maynooth line. To allow use of a standard angle on the diamond crossings the two platform tracks leading to the Northern line must be parallel with no island platform between them. Within these constraints it has been possible to provide an extra platform for operational flexibility, which is connected to the route via North Strand Junction, making a total of seven platforms. For these reasons the footprint of option A is larger than that of the other options.

As West Road bridge is assumed to be retained, the tracks must avoid the central pier. If the bridge was replaced for electrification or other reasons, the tracks could be made parallel and the nearby crossovers optimised with a small operational benefit from exchanging the positions of the facing and trailing crossovers.

The existing platforms and 30km/h approach tracks are retained without modification and continue to serve the route via Newcomen Junction, with the new platforms and canopies broadly replicating the existing. The existing station building is assumed to be modified with eastward extension to access the new platforms.

Passenger access to and from the new station would continue via the existing western at-grade entrance, leading to a walkway under the Sheriff Street Upper viaduct and along the canal bank to Mayor Street Upper. Additional access is provided onto Sheriff Street Upper via lifts and stairs, and by a new route from the east of the extended building through an existing span of the Sheriff Street Upper viaduct to reach the north end of Park Lane.

Provision is made for emergency egress in the event of a train fire by the introduction of a footbridge and stairs at the North end of the platforms, and safety refuges for those unable to use stairs.

Should DART Underground be built in line with previously-approved designs, the existing platforms serving the Maynooth line could continue to operate. However, the throat of the proposed eastern platforms clashes with the area of the Underground portal. It is likely that during and after the Underground construction, this part of the station could be no more than two platforms connected via Newcomen Junction and probably one or two more platforms with a single line connection via North Strand Junction.

3.3.2 Operations

The table below summarises the maximum service of Docklands trains on the three routes for three alternate routing options.

Table 3. Maximum route capacity (tphpd) for station Option A

Routeing option	Maynooth line	Phoenix Park line	Northern line
No diversion at Glasnevin	8	12	10
Routeing of 10tphpd Docklands Maynooth trains via existing Glasnevin connection and North Strand Junction	18	2	10
Routeing of 6tphpd Docklands Phoenix Park trains via potential new Glasnevin connection and Newcomen Junction	2	18	10

Capacity is limited to 10tphpd from the Northern line, but this is likely to be adequate as a significant proportion of the service on that line is always likely to continue to serve Connolly. Because option A is effectively three separate stations side by side, the above maximum services can operate simultaneously, subject to any constraints at Glasnevin. However the lack of connections between the platforms serving the three routes limits operational flexibility; for example there is no scope to interwork trains between routes except by use of the Glasnevin connections.

A third platform has been included in the design for Option A, serving the route via North Strand. However this only increases the capacity by that route from 10tphpd to 12tpd, and at the cost of extending turnaround times from 7.5min to 10.5min which would require an extra train in service.

A disadvantage of Option A is the lack of space to hold trains between the station and Newcomen Junction. This is likely to be a severe operational restriction if significant numbers of trains access both Docklands and Connolly by this route.

3.4 Option B: East of Spencer Dock, north of Mayor Street Upper

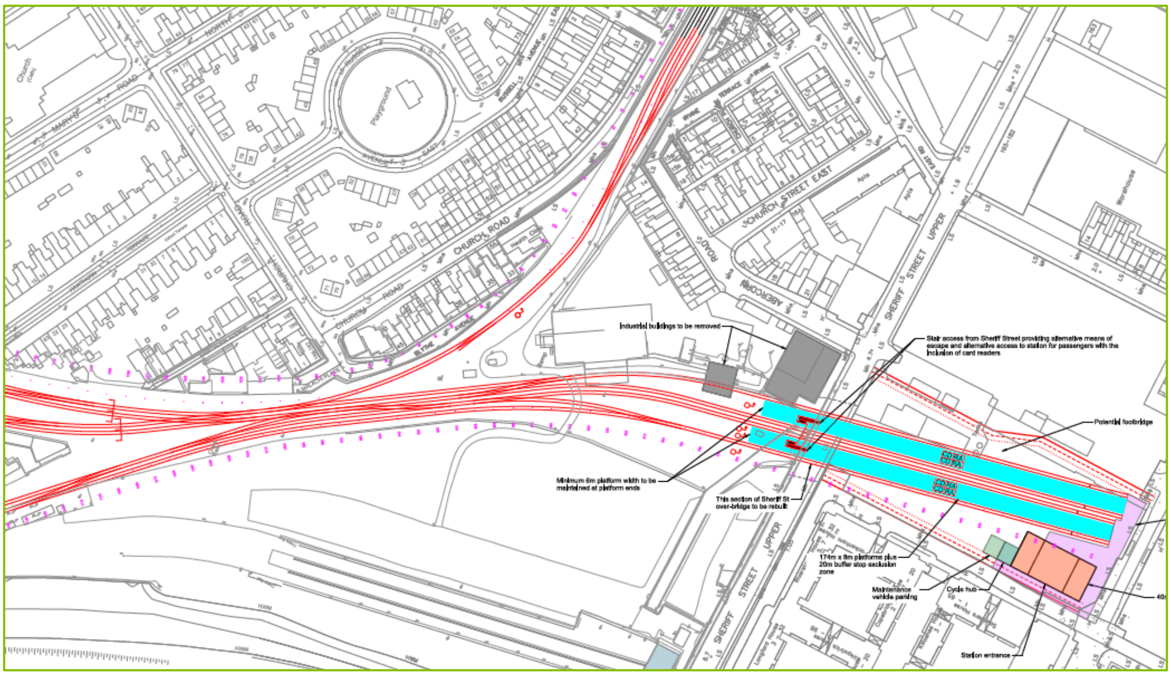


Figure 5: Extract from Option B General Layout

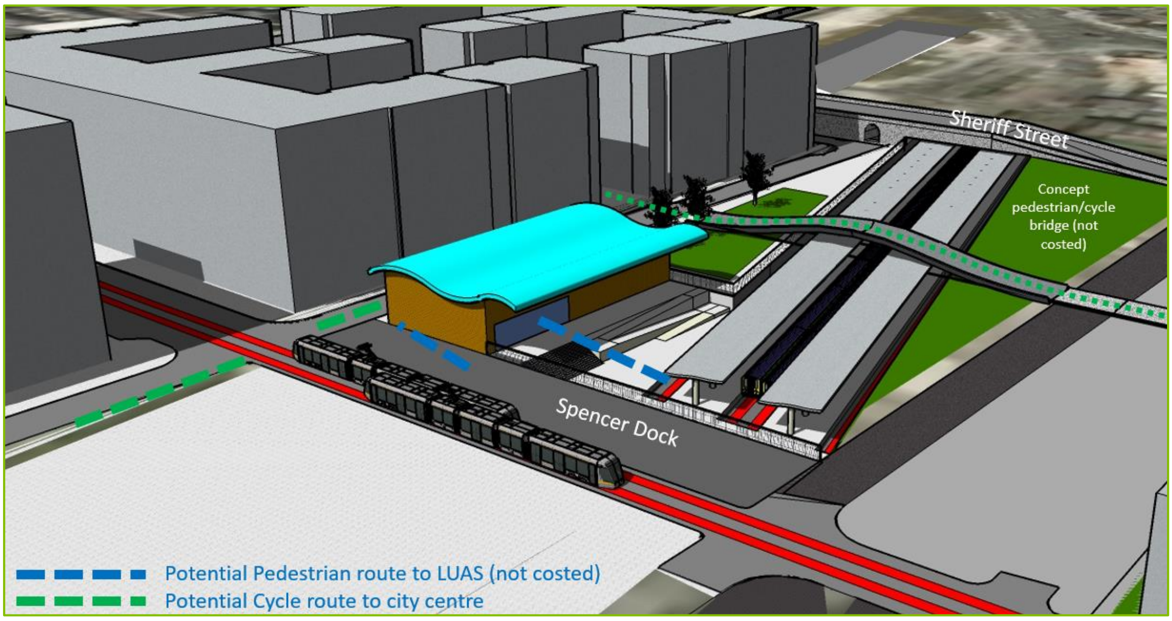


Figure 6 Option B Design Model

3.4.1 Engineering

To keep the platform straight and to limit curves outside the platform to a 200m radius, the platforms of option B have been angled relative to Park Lane. The southern end of the eastern platform track is now at the western boundary of the development now under construction between Mayor Street Upper, New Wapping Street and Sheriff Street Upper. The northern end of the western platform track is similarly as close as possible to Park Lane without blocking it, requiring re-configuration of the turning head in this area to run underneath Sheriff Street Upper. Use of a 1000m radius on the platform was also considered but does not significantly improve the geometry, so platforms are straight throughout their length and tracks continue straight for 20m beyond. This width constraint limits the station to four platforms, and the station blocks the access beneath Sheriff Street Upper to the current coach park.

Sheriff Street Upper spans the platforms, requiring replacement of the existing bridge. Even with minimisation of the depth of this structure, clearance for 25kV electrification requires the station area to be sunk so that top of rail is approximately 1m below grade. Because of the high water table, this in turn requires the station to sit in a concrete trough with pumped drainage.

Like Option A the centre pier of West Road overbridge affects the nearby crossovers. However the effect is less severe for option B, with re-building of the bridge allowing only minor re-alignment and standardisation of components with no operational benefit.

The station building is located west of the tracks, between the buffer stops and Park Lane (but still within CIÉ land) with a cross-walk separating the buffer stop exclusion zones from Mayor Street. The station entrance is on the northern platform of the Luas stop, level with the top of the Luas platform, with a ramp and stairs provided down to railway platform level. Emergency stairs are also incorporated from near the northern end of the platforms up to Sheriff Street Upper, with safety refuge for those unable to use stairs. An enhanced facility with lifts might be developed to provide a secondary entrance to the station but has not been included in the costings.

Option B has a greater distance between the platform ends and Church Road Junction than Option A. Hence it has been possible to develop a 25km/h throat layout with four parallel approach tracks and crossovers to give access between any platform and any of the three rail routes, as well as freight access via North Strand and East Wall junctions.

Most of the footprint of Option B clashes with that of the proposed DART Underground. It is unlikely that any part of the station would remain operable during or after any Underground construction. However the existing Docklands station platforms could be kept and re-connected to the rail network should the Underground cause demolition of Option B.

3.4.2 Operations

Table 4. Option B results

tphpd	Via Newcomen Jn	Via North Strand Jn	Via East Wall Jn
Sustained trains per hour (turnaround ≥8min, service interval multiple of 3min, no conflicting services on other routes)	12	12	12
Maximum simultaneous services (subject to some constraints on timetabling conflicting routes)	4	12 shared between the routes	
	8	8 shared between the routes	
	12	4 shared between the routes	

Table 5. Maximum route capacity (tphpd) for station Option B

Routeing option	Maynooth line	Phoenix Park line	Northern line
No diversion at Glasnevin	see Table 4	see Table 4	see Table 4
Routeing of up to 8tphpd Docklands Maynooth trains via existing Glasnevin connection and North Strand Junction	0	16	0
Routeing of up to 8tphpd Docklands Phoenix Park trains via potential new Glasnevin connection and Newcomen Junction	16	0	0

Train journey times for option B will be approximately 30s longer than for option A in each direction. Together with the longer minimum turnaround times for option B, some timetable options will require more trains to run the services.

Option B has considerable operational flexibility with access between all three routes and all platforms. However fewer platforms and the shared approach tracks mean that total capacity is lower than option A, particularly when connections at Glasnevin are considered. This simple analysis suggests that total capacity falls slightly short of the 18tphpd required by project objectives. However by reducing turnarounds to 7min via East Wall Junction and 6.5min on the other two routes, 10tphpd could be operated via Newcomen Junction and a total of 10tphpd via East Wall Junction and North Strand Junction, giving a total station capacity of 20tphpd. However these short turnaround times would require driver step-back or other measures to ensure operational robustness.

3.5 Option C: East Wall Yard

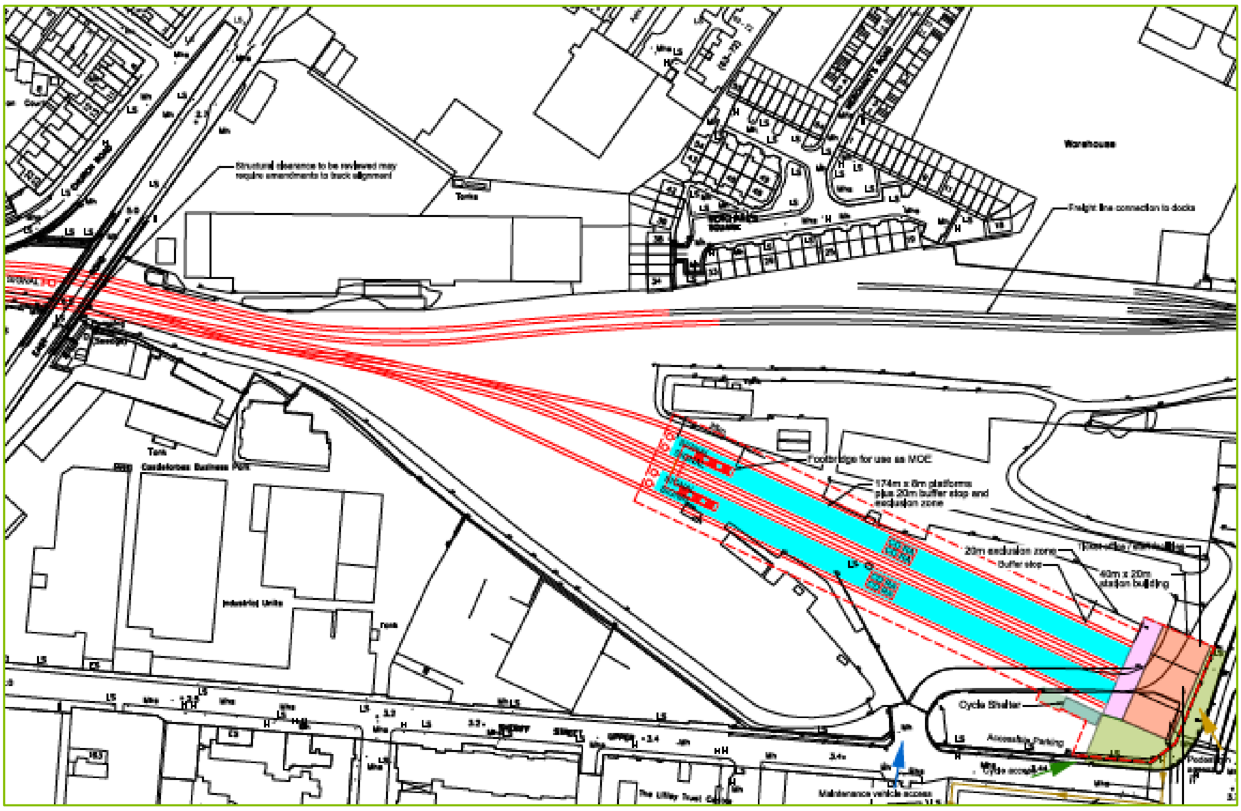


Figure 7: Extract from Option C General Layout

3.5.1 Engineering

A configuration with the station towards the south of the site was adopted. This minimises the walking distance to Luas and the destinations in the Docklands area, and also avoids conflict between passenger and freight operations.

Two double junctions at Church Road allow trains on all three routes to access the link to the current East Wall Yard. This link is increased to four tracks, the southern pair serving the passenger station and the northern pair connecting to Alexandra Road. We assume that East Road overbridge could be modified to provide electrification clearance, or the tracks lowered beneath it, but this would require confirmation should this option go forward.

25km/h is assumed for the layouts at Church Road and the station throat and would also apply to the short distance between them.

Except for the tracks to Alexandra Road, the facilities at East Wall Yard would have to move, to make room for the station. The costings assume provision of alternatives in the Dublin area, but this study does not include identification of suitable sites.

The station building is positioned behind the buffer stop exclusion zones with the entrance at the corner of East Wall Road and Sheriff Street Upper. A footbridge is provided at the western end of the platforms for emergency exit purposes, with safe refuges for those unable to use steps.

The DART Underground proposal clashes with Option C in the area of Church Road Junction. During or after any Underground construction, Option C could have double track connections to the Maynooth line but the connection to the Phoenix Park and Northern lines would probably be single. A significant period of closure of the Docklands station would be required to create a cut-and-cover trench, which would pass beneath the switches and crossings at Church Road. The existing Docklands station could be retained and re-connected to the railway if Underground works led to temporary or permanent closure of Option C

3.5.2 Operations

The Option C station is further from Church Road Junction than the other options, so there the opportunity to insert another signal between them. This would improve operational robustness to some degree by allowing trains to wait here for an onward path. However it does not improve capacity because the capacity analysis assumes trains would not be checked by signals. To avoid encountering adverse aspects requires a clear route through Church Road Junction to or from the platforms.

By analogy with Option B, Option C is expected to allow 12tphpd shared between the three routes, and in normal operation only three platforms would be necessary. To achieve this maximum, trains on the same routes must be scheduled to pass each other in the vicinity of the three existing junctions.

Journey times for Option C are expected to be approximately 90s longer than option B and 120s longer than option A in each direction. This will result in one extra train being required to operate the more intensive timetable scenarios. The capital or lease costs of any extra rolling stock are not included within the infrastructure costs provided in Appendix A but are taken into consideration in the relative operational criterion assessment between options.

3.6 Option M: New Wapping Street

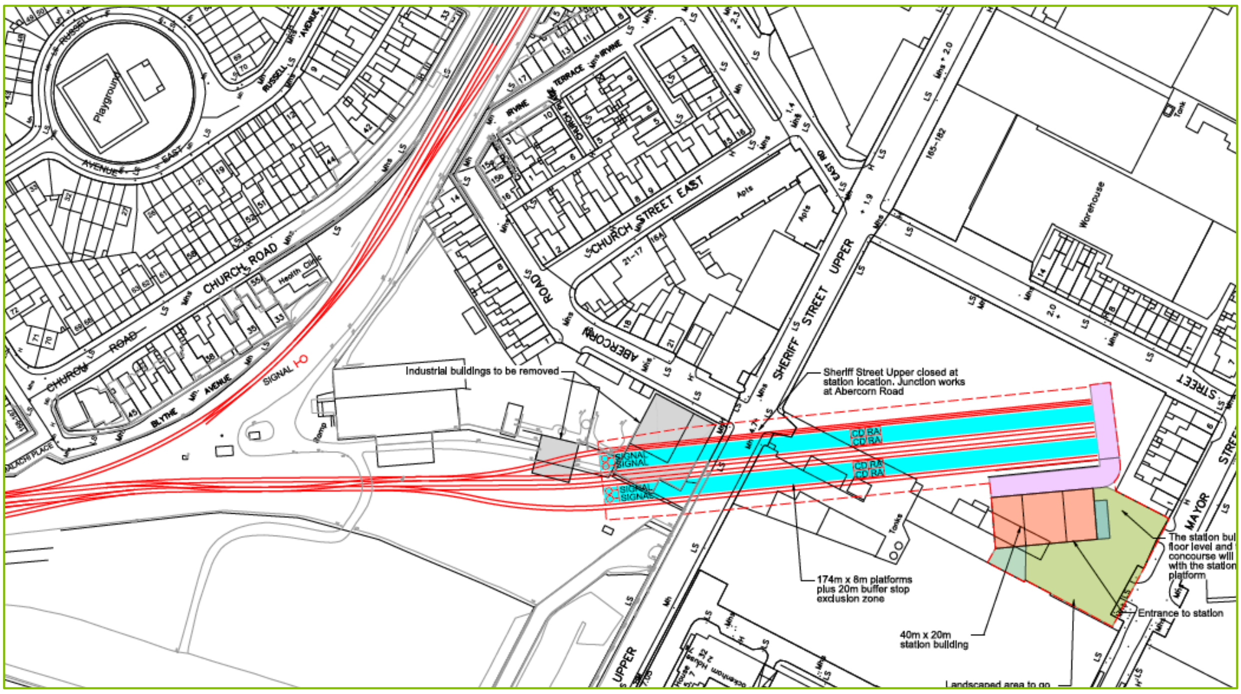
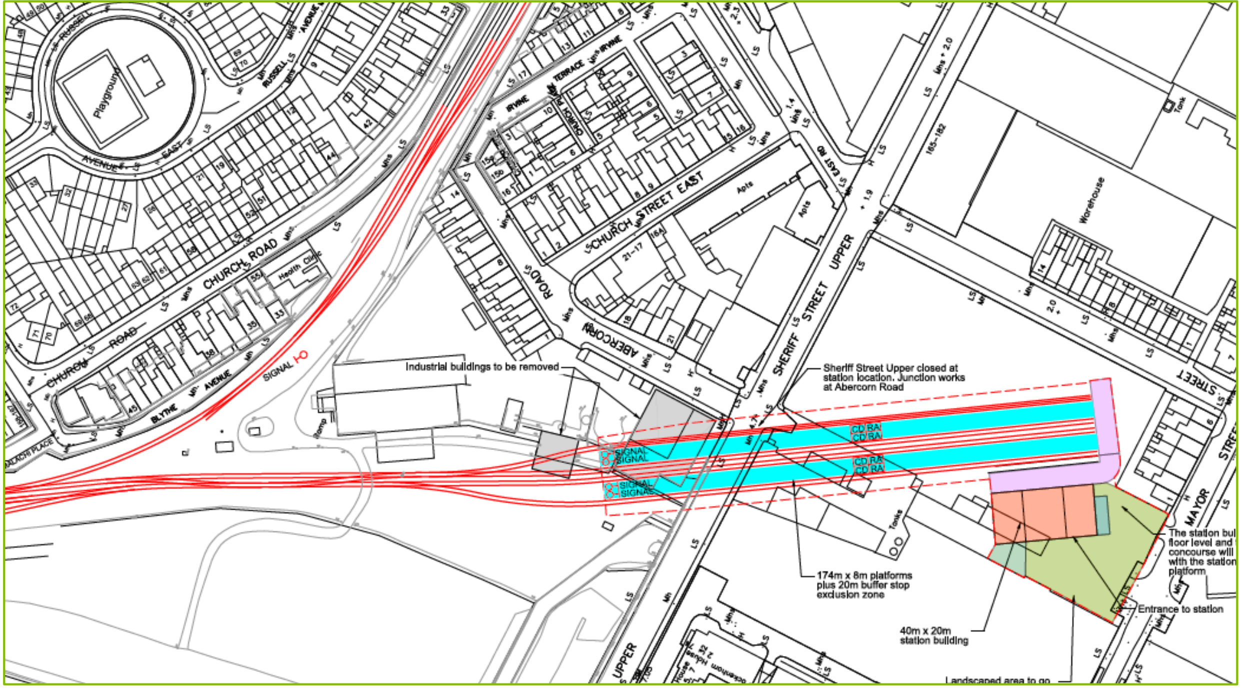


Figure 8: Extract from Option M General Layout

3.6.1 Engineering

Option M has similarities to option B, but was shortlisted in order to test an alternative that eliminates the tight curves required to route the line into the option B.

A number of sub-options of option M are possible within the block bounded by Sheriff Street Upper, Wapping Street, Mayor Street Upper and Spencer Dock. The one shown in Figure 8 avoids the existing housing, and the two-track throat shown could be enhanced to a four-track layout like option B. However all sub-options clash significantly with the development now under construction in the eastern part of this block.


Industrial buildings to be removed
Sheriff Street Upper closed at station location. Junction works at Abercorn Road
174m x 8m platforms plus 20m buffer stop exclusion zone
40m x 20m station building
Landscaped area to go
Entrance to station

The platforms must extend underneath Sheriff Street Upper. Like option B, option M has steps up to Sheriff Street Upper for emergency evacuation, and places of safety refuge for those unable to use steps, and these could be developed at significant extra cost into a secondary entrance.

Re-grading of Sheriff Street Upper to pass over option M would affect Abercorn Street and would be highly disruptive to nearby properties, so is assessed not to be feasible. As the streets are lower where they pass over the option M tracks than the option B tracks, option M has to be at a lower elevation than option B. Although sub-options of option M vary in detail, all would require a concrete trough and pumped drainage. They also take up much of the eastern part of the block, which is not CIÉ land and where planning permission has been granted for development. Thus they incur a large land purchase cost, included in Appendix B.

The station throat and part of the actual station for option M clash with the potential DART Underground portal and associated structures. Like Option B it is unlikely that any part of Option M could be retained during or after any DART Underground construction, but the existing Docklands platforms could be retained and re-connected in this eventuality.

3.6.2 Operations

With the same maximum number of platforms, scope for a similar station throat layout and similar distances and speeds achievable, Option M is deemed to be equivalent to Option B and can be assumed to have the same operational capabilities.

4. Multi-Criteria Assessment

4.1 Economy

4.1.1 Capital Costs

Order of magnitude infrastructure costs for each option, together with notes on assumptions and exclusions are presented in the Appendix B. It should be noted these include the cost of land acquisition outside CIÉ ownership for Option M, for which an independent estimate has been obtained and adds €73m to the construction costs for this option

Table 6. Capital Cost Assessment

Option	Relative Cost	Description
A	€91m	Significant advantages over other options
B	€138m	Some advantages over other options
C	€124m	Some advantages over other options
M	€222m	Significant disadvantages over other options

4.1.2 Operating Costs

Section 3 considers the operational implications of the four options. The assessment is derived from that discussion, taking account of the following factors:

- Station capacity, with or without diversion of trains at Glasnevin
- Operational flexibility, such as the ability to interwork trains on different routes
- Journey time, and whether this creates a need for extra trains to run the same service
- Freight access was also considered but is not assessed to be a significant differentiator.

Table 7. Operating Cost Assessment

Option	Description
A	Comparable to other options
B	Comparable to other options
C	Some disadvantages over other options
M	Comparable to other options

4.1.3 Demand

The area within a 500m and 1km walking distance was assessed for each option, with the assumption that four new pedestrian bridges crossing the Liffey would be in place. It should be noted that two of those bridges are not fully committed; therefore figures have also been estimated without those bridges in place.

An estimate of the relative employment catchment of each option was carried out using forecast 2035 data at Small Area zone level, taken from the Eastern Regional Model zones. Where the catchment area cuts across a zone boundary, a Tabulate Intersection tool in ArcGIS was applied to calculate the proportion of each zone within each option catchment. For example, if 5% of the area of a zone is within the catchment, 5% of the forecasted 2035 jobs are assumed to be within the catchment. It is acknowledged that this approach has some limitations as it assumes jobs are evenly distributed and does not account for areas containing water, where no jobs are located. This method was considered appropriate for relative assessment purposes at this stage of assessment.

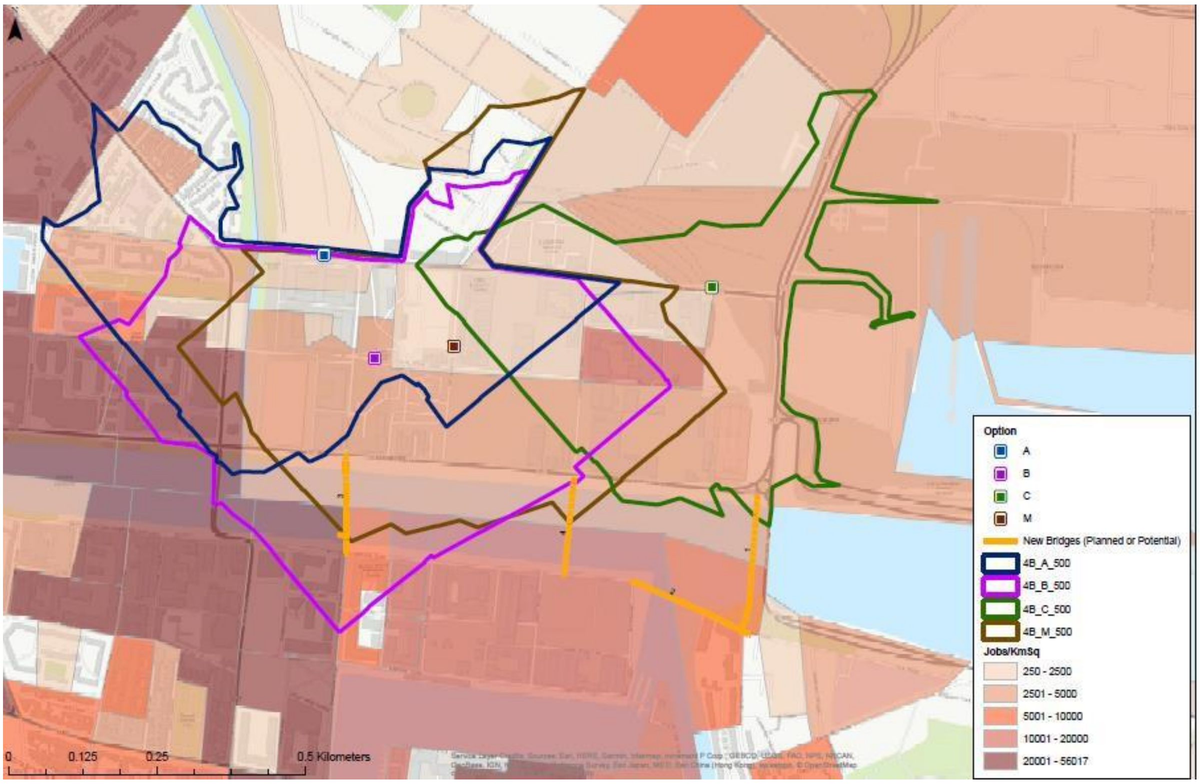


Figure 9: 2035 Employment 500m Catchment (assuming four bridges in situ)

Figure 9 above shows the 500m catchment for each option overlaid on the 2035 employment data, assuming all four bridges are in place. Similar maps have been prepared for 1km catchment and the scenario with only two bridges.

Table 8. Estimated Employment Catchment

Distance	Option	Four Bridges	Two Bridges
500m	A	1660	1606
	B	3451	2405
	C	974	950
	M	1489	1236
1km	A	17880	16511
	B	20163	16094
	C	4904	3691
	M	15198	10724

Option B performs strongly on this assessment, given its closer proximity to higher density employment zones on the south and western side of the study area. Option C performs worst. Option A similar to Option M on this criterion.

The overall assessment is given in Table 9.

Table 9. Demand Assessment

Option	Description
A	Some advantages over other options
B	Significant advantages over other options
C	Significant disadvantages over other options
M	Some advantages over other options

4.2 Integration

4.2.1 Land Use Integration

The following were taken into consideration in the option assessment:

- National Development Plan 2018-2027;
- Site zoning (Dublin City Development Plan 2016 – 2022); and
- Site specific objectives outlined in the above development plan.

The following National Strategic Outcomes of the Project Ireland 2040, National Development Plan 2018 – 2027 (the NDP) are of most relevance to the proposed station relocation:

- NSO 4: Sustainable Mobility; and
- NSO 8: Transition to a Low-Carbon and Climate-Resilient Society

NSO 4 states that a step change is required to put environmentally sustainable public transport systems in place which represent a decisive shift away from polluting and carbon-intensive propulsion systems. The NDP aims to deliver a public transport network that will provide high-quality passenger interchange points which facilitate convenient transfer between efficient and integrated public transport services. Key projects noted in the NDP are Metro Link (Dublin), BusConnects (Dublin, Cork and Galway) and priority elements of DART Expansion (such as the subject of this study), but not DART Underground.

NSO 8 notes that a comprehensive integrated public transport network for Ireland's cities connecting more people to more places is a key objective of the NDP.

As agreed, while commentary relating to the impact of station options on potential future Dart Underground plans is discussed it is not used as an assessment criterion within the MCA. It is also noted that reference to Dart Underground in local development plans pre-date the NDP and given the status of DART Underground within the NDP it is assumed that any planning permission sought by the NTA to develop a station (in an area identified in a local development plan, as requiring consideration) would not be considered a material contravention of said local development plan.

Table 10 below gives the definition of the relevant terms within the Dublin City 2016-2022 development plan used in this section.

Table 10. Planning definitions

Item	Definition
Strategic Development Zone (SDZ)	Sites that are deemed to be capable of delivering development that is of economic or social importance to the State. There is no third-party right to appeal for certain planning applications within SDZs which could result in a fast-tracked planning application process subject to certain criteria being met.
Strategic Development and Regeneration Area (SDRA)	Key sites identified in the Dublin City Development Plan 2016– 2022 as sites capable of delivering a significant number of homes and employment within the city.
Z1 Zoning	Residential zoning. The zoning objective is "to protect, provide and improve residential amenities".
Z14 Zoning	Regeneration Areas. The zoning objective is "to seek the social, economic and physical development and/or rejuvenation of an area with mixed us of which residential and "Z6" would be predominant uses". It is a key objective of the Dublin City Development Plan 2016 – 2022 for development proposals on Z14 lands within SDRA 6 to: • Support sustainable transport initiatives which facilitate pleasant, accessible and easy movement to, from and within the Docklands area; • Develop an integrated transport strategy for the entire Docklands area and to pro-actively promote sustainable smarter travel.

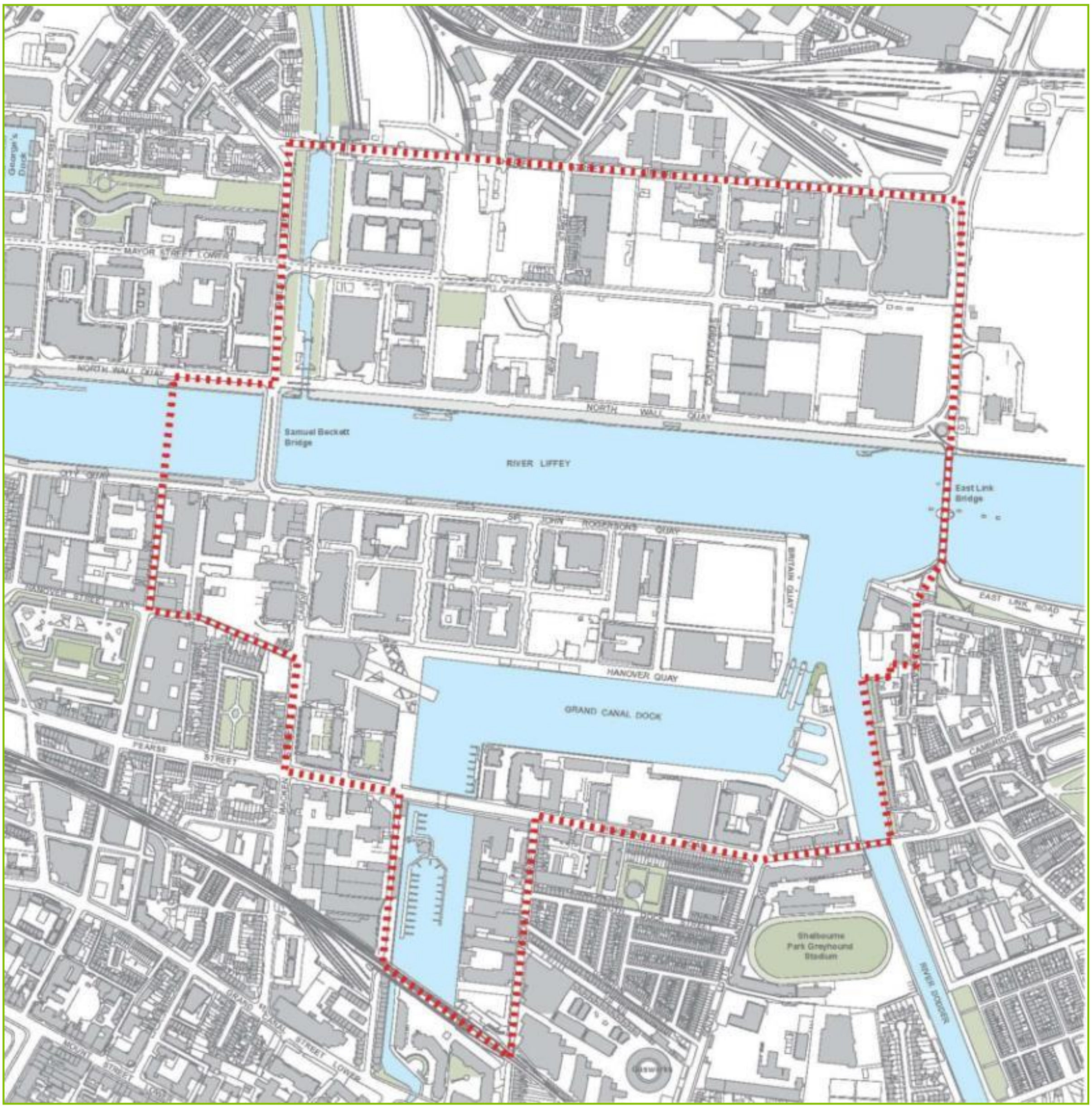


Figure 10: Docklands SDZ

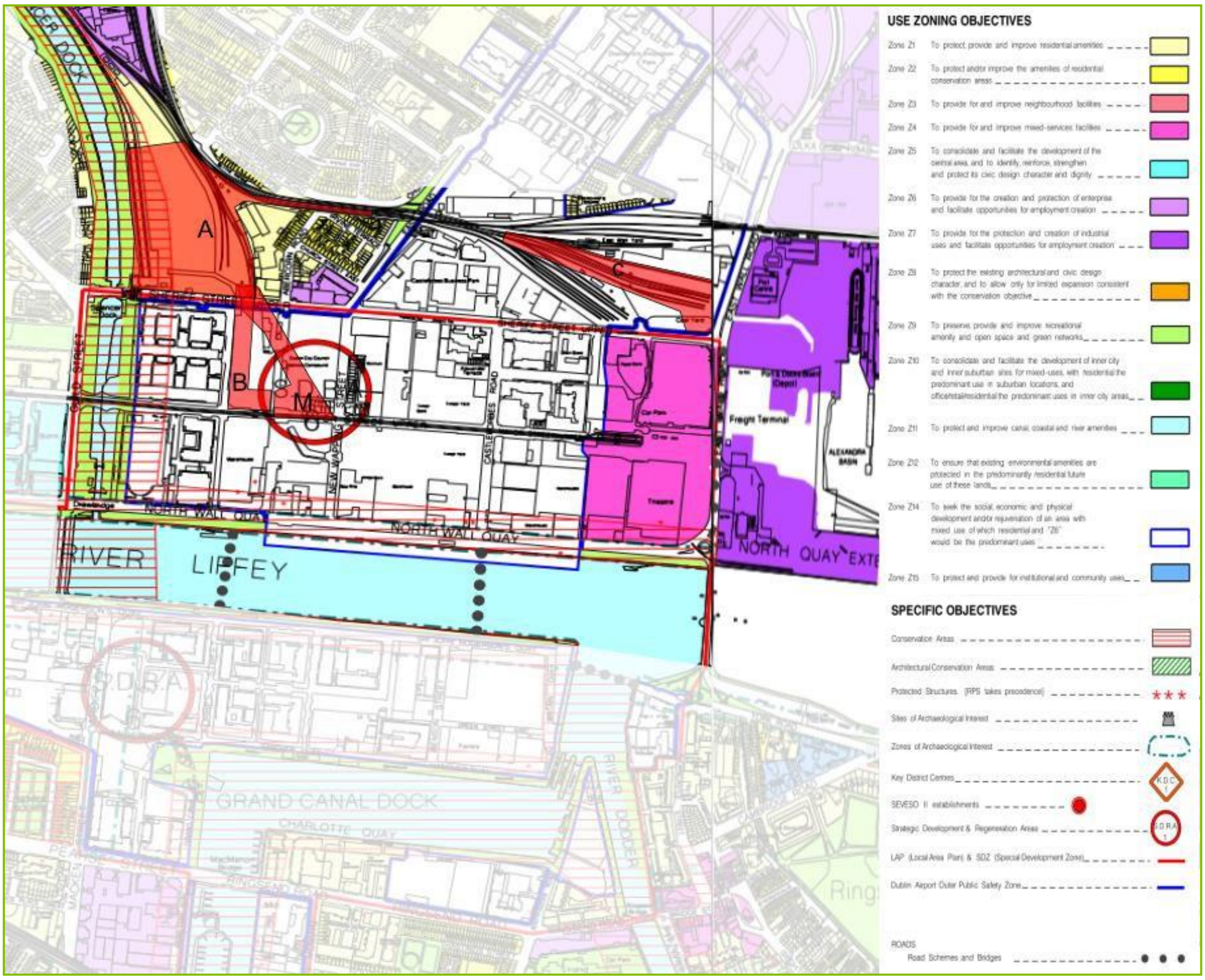


Figure 11: Planning considerations of site options

Figure 11 shows the general sites of each proposed option overlaid on the Dublin City Development Plan 2016 – 2022 zoning map.

Option A is located on the site of the existing Docklands Station. The location falls within a site zoned as Z1 (Sustainable Residential Neighbourhoods) and is located outside of both the SDZ and the SDRA. It may therefore not benefit from the fast-track routes to obtaining planning permission that would apply if the site was located within the SDZ. However this may not impede planning approval on this site because the station is already in this location, and there are no site-specific objectives in the Development Plan.

Options B and M are located within both the North Lotts and Grand Canal Dock SDZ and SDRA 6. The sites are predominantly zoned as Z14 (regeneration areas); however a small portion of both sites (the section to the north of Sheriff Street Upper) is located on lands which are zoned as Z1 (sustainable residential neighbourhoods). Part of the site of Option M has planning permission for residential development and is currently under construction.

Option C is site is wholly located within SDRA 6 on lands zoned as Z14 (regeneration area). It is not located within the North Lotts and Grand Canal Dock SDZ. The site would therefore not benefit from the fast-track routes to obtaining planning permission that would apply if it was located within the SDZ.

At this stage, options A, B and C are considered comparable, with M having disadvantages due to the granting of planning permission for a residential development, currently under construction.

Table 11. Land Use Integration Assessment

Option	Description
A	Comparable to other options
B	Comparable to other options
C	Comparable to other options
M	Some disadvantages over other options

4.2.2 Public Transport Integration

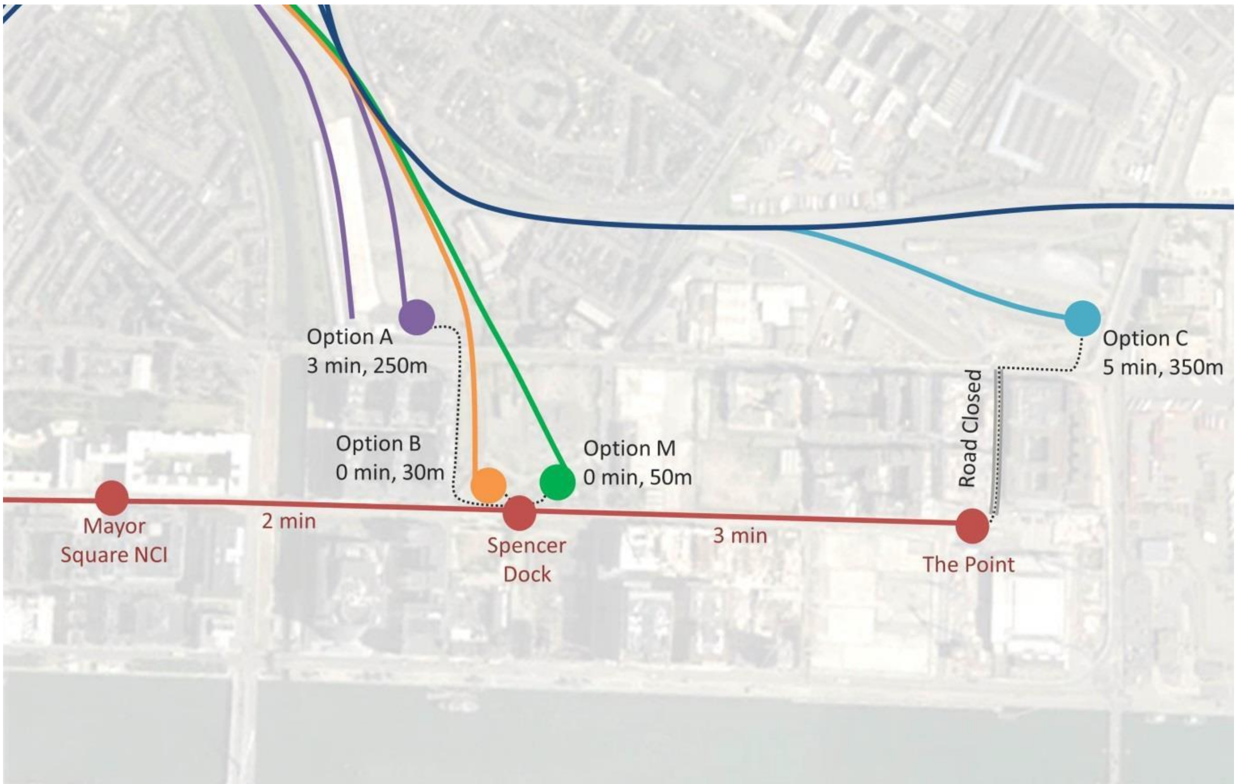


Figure 12: Luas integration

Table 12. Walking to Public Transport

Option	Nearest Luas stop	Walking distance (m)	Nearest bus Stop	Walking distance (m)
A	Spencer Dock	250	Convention centre	450
B	Spencer Dock	30	Irish Rail Building North Wall	280
C	The Point	350	East Wall Road	0
M	Spencer Dock	50	North Wall Quay (New Wapping Street)	220

Options B and M have entrances with direct access to the Luas Red Line (eastbound) platform at Spencer Dock and are located only a short walk from bus stops serving a range of destinations within the Core Bus Network along the North Quays. Option C provides access to a smaller range of bus services along East Wall Road but is a short walk away from the Luas between two high-rise buildings. Option A does not have direct access to Luas or to the current/proposed core bus network post-Bus Connects.

Table 13. Public Transport Integration Scores

Option	Description
A	Some disadvantages over other options
B	Comparable to other options
C	Comparable to other options
M	Comparable to other options

4.2.3 Walking/Cycling integration

The study area is served by a number of nationally recognised cycling routes and high quality walking and cycling provision is established. These lie primarily towards the west of the study area. Figure 13 below gives an indication of cycling provision in the area, although it is acknowledged this may not be reflect all routes regarded as cycle routes.

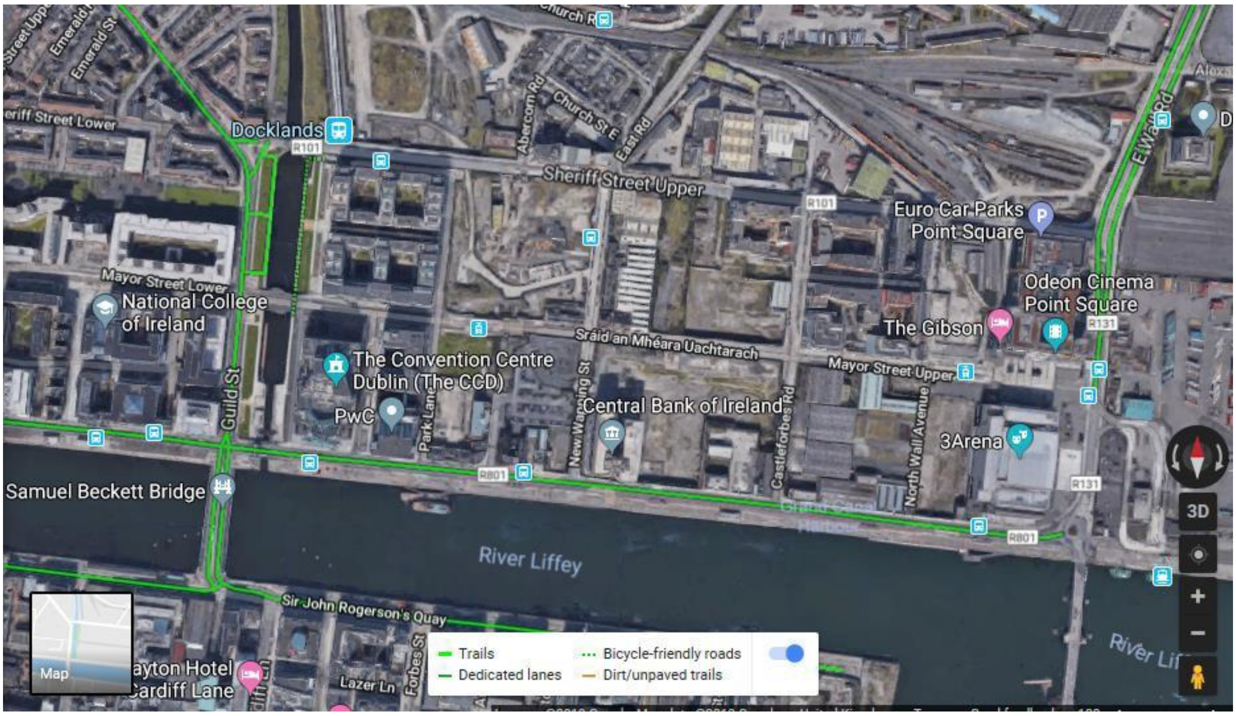


Figure 13: Cycling routes (source: Google Maps)

Option A is served by designated cycling routes, and the proposed station plans provide grade-separated pedestrian access towards Mayor Street and the wider Docklands area underneath Sherriff Street Upper, using the historic existing brick arches. The proposed Royal Canal Greenway on the western side of the Royal Canal would also link closely with Option A. Options B and M have their entrance on Mayor Street, which carries some vehicular traffic in addition to the Luas lines. There is some dedicated cycling provision along East Wall Road in addition to the Slí na Slaínte East Coast walking route, but the general environs of Option C are not currently well suited for walking and cycling. There is some potential for improvement given proposals for a new Liffey Crossing to the east of East Link (Tom Clarke) bridge.

Table 14. Walking/Cycling Integration Scores

Option	Description
A	Some advantages over other options
B	Comparable to other options
C	Comparable to other options
M	Comparable to other options

4.3 Environment

4.3.1 Cultural Heritage

A further desktop review was conducted in addition to that undertaken for Sift 1, to identify any potential archaeological and cultural heritage constraints within the study area. This included the following:

- Record of Monuments and Places (RMP sites) (including National Monuments under State care and Preservation Order);
- Record of Protected Structures (RPS);
- Buildings and historic landscapes / demesnes recorded on the National Inventory of Architectural Heritage (NIAH), which provides the basis for recommending the inclusion of particular structures in the RPS; and
- Architectural Conservation Areas (ACA) and Conservation Areas.

The majority of the data used for this section was obtained from the Dublin City Development Plan (2016-2022). Additional cultural heritage data was obtained from the National Monuments Service Historic Environment Viewer[6] and Dublin Bay Area Heritage Maps[7].

An area of approximately 70m on the western side of Option A falls within a designated Conservation Area associated with the Royal Canal and the River Liffey. This area includes the existing platforms and tracks forming the existing approach into Docklands station which would remain unchanged in this option.

Options B, C and M have no known archaeological features identified within any of the site footprints.

There are a number of protected structures and NIAH sites located outside of each site option, including:

- Sheriff Street Lifting Bridge (NIAH Reg No. 50010016) located to the south of Option A, and to the west of works required in Options B and M.
- Detached two-storey three bay house (NIAH Reg No. 50010196) located less than 50m to the southeast of Option M.

It is not anticipated that these NIAH structures will be significantly impacted by the potential new station and associated access tracks, though there is the potential that the settings of these structures and the Conservation Area could be impacted during the construction and operational phases.

Based on the above, all options are considered broadly comparable. As the surrounding area has a number of archaeological and cultural heritage sites, it is important to note that there is potential for previously unrecorded archaeological features to be discovered during the construction at any of the site options.

Table 15. Cultural Heritage Scores

Option	Description
A	Comparable to other options
B	Comparable to other options
C	Comparable to other options
M	Comparable to other options

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[6] Historic Environment View Accessed 13th December 2018
[7] Dublin Bay Heritage Maps Accessed 13th December 2018

4.3.2 Noise and Vibration

A Noise and Vibration assessment was carried out comparing the number of sensitive receptors that may be impacted from changes in noise conditions within 50m of each station option.

Table 16. Sensitive receptors within 50m of station entrance

	Option A	Option B	Option C	Option M
Properties within 50m of station entrance	>76	>100	>35	Circa 39

While some residential properties north and south of the existing freight-only line are impacted on the approach to the station, Option C would be preferable as it is located in an existing train yard and is surrounded by industrial properties. Options A, B and M are all surrounded by existing and potential future residential and mixed use properties.

The implementation of appropriate mitigation measures will be required to minimise potential negative impacts to these sensitive receptors.

Table 17. Noise and Vibration Scores

Option	Description
A	Comparable to other options
B	Comparable to other options
C	Some advantages over other
M	Comparable to other options

4.3.3 Landscape and Visual

Potential visual amenity and landscape effects were assessed for the four site options.

The townscape surrounding all four site options is characterised as predominantly urban / light industrial. The following option assessments are based on information available to date:

- Option A, which includes the existing Docklands Station, is located to the east of the Royal Canal. New elements of infrastructure within Option A are located on a brownfield site, to the east of (and just outside) the Royal Canal Proposed Natural Heritage Area (pNHA) and Conservation Area. The scale of new infrastructure is unlikely to impact on the proposed Royal Canal Greenway (planning permission pending) along the western banks of the Royal Canal north of the western end of Sheriff Street Upper, however this should be taken into consideration in the final design. The location of Option A at the northern fringe of the docklands redevelopment zone would isolate the proposed station from existing and future urban and commercial developments as well as from the existing Luas network and undermine its integration in the emerging urban townscape character.
- Option B is located adjacent to an existing high density residential apartment block with sensitive receptors. The existing townscape character is in the process of changing from a brownfield area to a new mixed use quarter with urban character. Equally the visual amenity is in the process of changing rapidly from a visually poor quality former warehouse district with derelict or cleared sites to contemporary urban residential and office district. The location of the proposed station would form a part of this transition process and provide a close link to the existing Luas network along Mayor Street Upper. The proposal is located outside the Conservation Area and other landscape constraints but is confined to the road corridor along Park Lane immediately adjacent to residential quarters.
- Option C is located at the existing terminus of freight trains at the edge of Dublin Port. This remote location is located at the north-eastern edge of the docklands redevelopment zone. There are no townscape and visual constraints other than the adjacent Slí na Slaínte - East Coast Route Dublin along East Wall Road. The development will be visible

along this section of the walking route. However, the proposed development would not alter the existing townscape character significantly considering its existing use by railway operations.

- Option M, similar to Option B, is located within the centre of the changing dockland development zone. The existing townscape character is in the process of changing from a brownfield area / warehouse district to a new mixed quarter with urban character. Equally the visual amenity is in the process of changing rapidly from a visually poor quality warehouse district with derelict or cleared sites to a contemporary urban residential and office district. The location of the proposed station would form a part of this transition process and provide an opportunity to provide a transport hub between rail and Luas, which would become integrated in the new urban townscape character and visually improve the area.

Based on the findings above, Options A, B and M are considered to be comparable in having greater potential than Option C to become a focal point in the developing urban townscape character and visual amenity.

Table 18. Landscape and Visual Scores

Option	Description
A	Comparable to other options
B	Comparable to other options
C	Some disadvantages over other options
M	Comparable to other options

4.4 Summary of Assessment

Based on the assessment criteria and the methodology applied, the Sift 2 process has resulted in the assessment provided in Table 19 below. For reference, the colour coding is as follows:

🟩	Significant advantages over other options
🟢	Some advantages over other options
🟨	Comparable to other options
🟧	Some disadvantages over other options
🟥	Significant disadvantages over other options

Table 19. Assessment

Criterion	Sub-Criterion	Option A	Option B	Option C	Option M
Economy	Capital Cost	🟩	🟢	🟢	🟥
	Operating Cost	🟨	🟨	🟧	🟨
	Demand	🟢	🟩	🟥	🟢
	Overall assessment	🟢	🟢	🟧	🟧

Criterion	Sub-Criterion	Option A	Option B	Option C	Option M
Integration	Land Use Policy/Plan Integration	🟨	🟨	🟨	🟧
	Public Transport Integration	🟧	🟨	🟨	🟨
	Walking/Cycling Integration	🟢	🟨	🟨	🟨
	Overall assessment	🟨	🟨	🟨	🟧

Criterion	Sub-Criterion	Option A	Option B	Option C	Option M
Environment	Cultural Heritage	🟨	🟨	🟨	🟨
	Noise and Vibration	🟨	🟨	🟢	🟨
	Landscape and Visual	🟨	🟨	🟧	🟨
	Overall assessment	🟨	🟨	🟨	🟨

Criterion	Sub-Criterion	Option A	Option B	Option C	Option M
Economy	Overall assessment	🟢	🟢	🟧	🟧
Integration	Overall assessment	🟨	🟨	🟨	🟧
Environment	Overall assessment	🟨	🟨	🟨	🟨
	Combined overall assessment	🟢	🟢	🟧	🟧

Overall, Options A and B both have some advantages over the other options.

While Option A benefits from the lower level of investment required to develop the site, the adjacent dedicated cycle routes and the presence of attractive walking routes along the canal, Option B performs strongly given its closer proximity to higher density employment zones on the south and western side of the study area.

Option C has some disadvantages due to is location at the periphery of the higher density development area. Option M also has some disadvantages, primarily driven by the development currently taking place on the third-party-owned site and the costs associated with the purchase of non CIÉ lands.

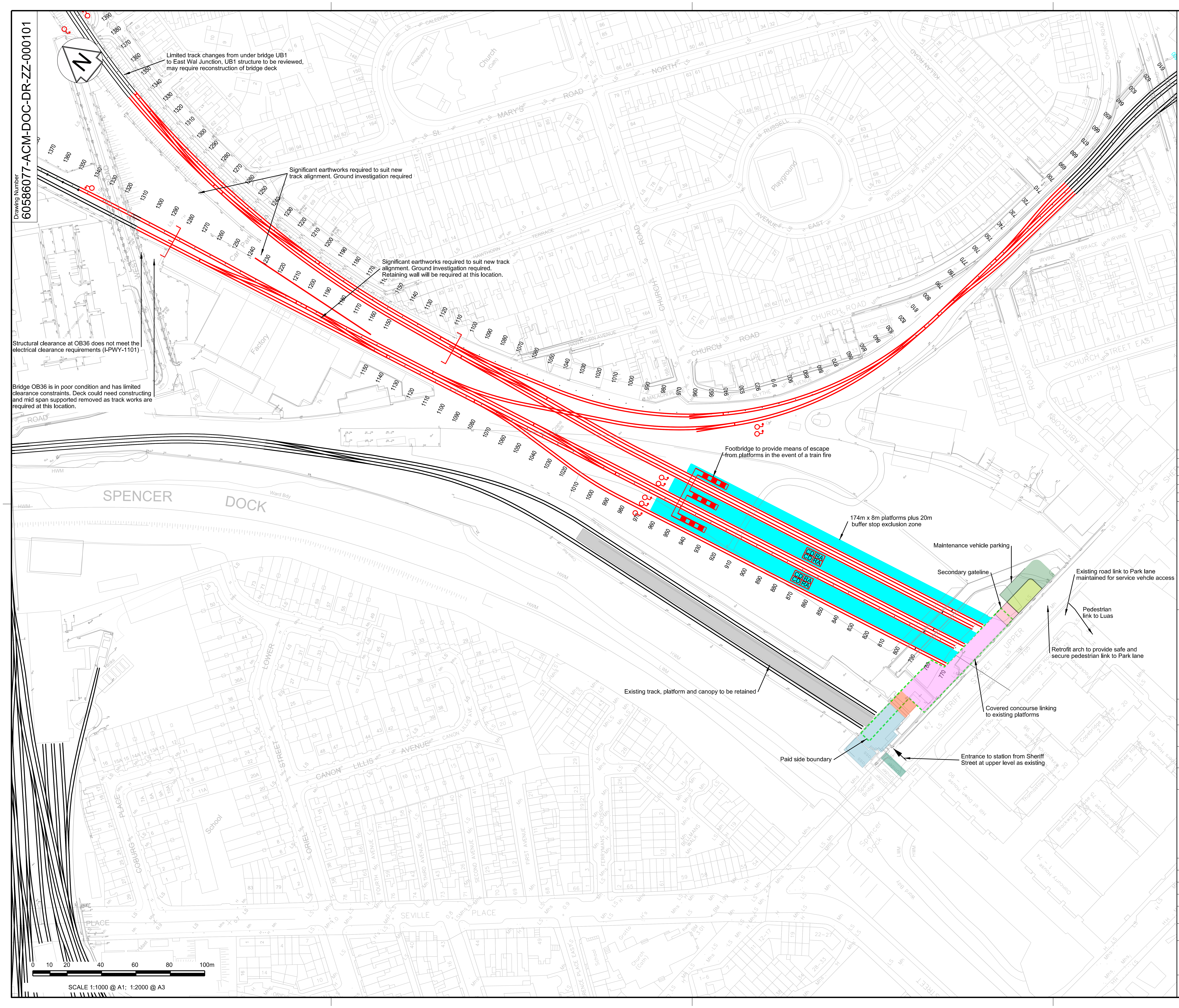
In summary, Option A would cost less to develop whereas Option B would serve more people.

Appendix A Drawings

The following drawings are reproduced below and also issued separately.

A.1 Document Register

Drawing Number	Description	Format	Revision
60586077-ACM-DOC-DR-RT-000100	OPTION A TRACK ALIGNMENT	PDF	P02
60586077-ACM-DOC-DR-ZZ-000101	OPTION A GENERAL LAYOUT	PDF	P02
60586077-ACM-DOC-DR-ZZ-000102	OPTION A STATION LAYOUT	PDF	P02
60586077-ACM-DOC-DR-RT-000110	OPTION B TRACK ALIGNMENT	PDF	P02
60586077-ACM-DOC-DR-ZZ-000111	OPTION B GENERAL LAYOUT	PDF	P02
60586077-ACM-DOC-DR-ZZ-000112	OPTION B STATION LAYOUT	PDF	P02
60586077-ACM-DOC-DR-RT-000120	OPTION C TRACK ALIGNMENT	PDF	P02
60586077-ACM-DOC-DR-ZZ-000121	OPTION C GENERAL LAYOUT	PDF	P02
60586077-ACM-DOC-DR-ZZ-000122	OPTION C STATION LAYOUT	PDF	P02
60586077-ACM-DOC-DR-RT-000130	OPTION M TRACK ALIGNMENT	PDF	P02
60586077-ACM-DOC-DR-ZZ-000131	OPTION M GENERAL LAYOUT	PDF	P02
60586077-ACM-DOC-DR-ZZ-000132	OPTION M STATION LAYOUT	PDF	P02



Legend/Notes

Signalling Impact Assessment

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Environmental Impact

Part of the paid side concourse extension is located within a Conservation Area. These Conservation Areas require special care in terms of development proposals and works by the private and public sector, which may affect structures both protected and non-protected in these areas.

The Royal Canal proposed Natural Heritage Area (pNHA) is located circa 50 m to the west of the site. It is important to note that although pNHA's in Ireland are not statutorily proposed or designated, they have been identified as being of significance for wildlife and habitats and are still afforded some level of protection. Appropriate mitigation measures will need to be implemented during the construction phase to minimise potential negative impacts.

An ecological site walk over would be required to determine the presence of protected species and any linkages between the Options and the closest European designated sites (i.e. SACs and SPAs).

The implementation of appropriate mitigation measures will be required to minimise potential negative impacts to a number of air quality and noise sensitive receptors.

—	Proposed Track Alignment
—	Existing track to be retained
🟦	Proposed platforms
🟧	Proposed station building
🟪	Proposed station concourse
🟩	Proposed maintenance vehicle access
🟦	Proposed cycle hub
🟩	Proposed station forecourt
→	Vehicle access
→	Cycle access
○	Junction Signal
⇠	Pedestrian Route
- - -	Revenue Protection
CD	Close Doors Indicator
RA	Right Away Indicator

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P02	08/02/19	Issued for SIFT 2 Option Review	DF	JD	BG
P01	18/01/19	Issued for SIFT 2 Option Review	DF	JD	BG

Status: FOR INFORMATION
Suitability: -

Client: -
Údarás Náisiúnta Iompair
National Transport Authority

Contractor(s)
AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

AECOM

Contract Title: Docklands Station Options Study

Contract No.: 60586077

Project: Engineering Consultancy Services

Grip Stage: FEASIBILITY

Drawing Title
DOCKLANDS STATION
OPTION A
GENERAL LAYOUT

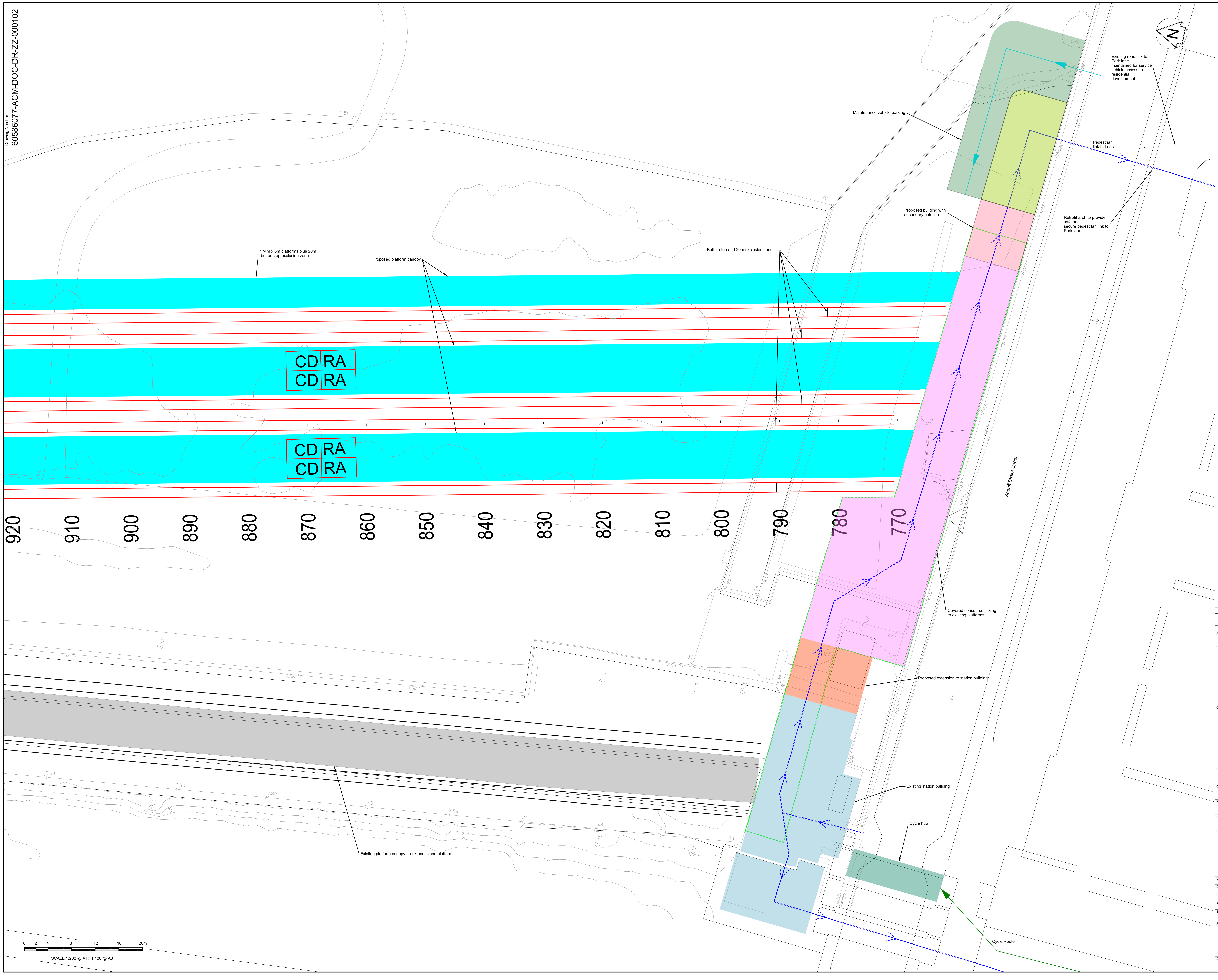
		Signed	Date
Designed	B. George		
Drawn	D. Franklin		
Checked	J. Donaghy		
Approved	B. George		

Scale(s): 1:1000 @ A1
ELR & Mileage: -

Alternative Reference: -
Sheet: 1 of 1

Drawing Number: 60586077-ACM-DOC-DR-ZZ-000101
Revision: P02

Sheet Size A1 594 x 841



Legend/Notes

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—	Existing track to be retained
🟦	Proposed platforms
🟧	Proposed station building
🟪	Proposed station concourse
🟩	Proposed maintenance vehicle parking
🟦	Proposed cycle hub
🟧	Proposed area for development
🟩	Proposed station forecourt
▶	Vehicle access
▶	Cycle access
○	Junction Signal
CD	Close Doors Indicator
RA	Right Away Indicator
- - ◀ -	Pedestrian Route
- - -	Revenue Protection

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P02	08/02/19	Issued for SIFT 2 Option Review	DF	JD	BG
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Status
FOR INFORMATION

Suitability
-

Client
Údarás Náisiúnta Iompair
National Transport Authority

Contractor(s)
AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

AECOM

Contract Title
Docklands Station Options Study

Contract No.
60586077

Project
Engineering Consultancy Services

Grip Stage
FEASIBILITY

Drawing Title
DOCKLANDS STATION
OPTION A
STATION LAYOUT

Designed	B. George	Signed		Date	
Drawn	D. Franklin	Signed		Date	
Checked	J. Donaghy	Signed		Date	
Approved	B. George	Signed		Date	

Scale(s)
1:200 @ A0

ELR & Mileage
-

Alternative Reference
-

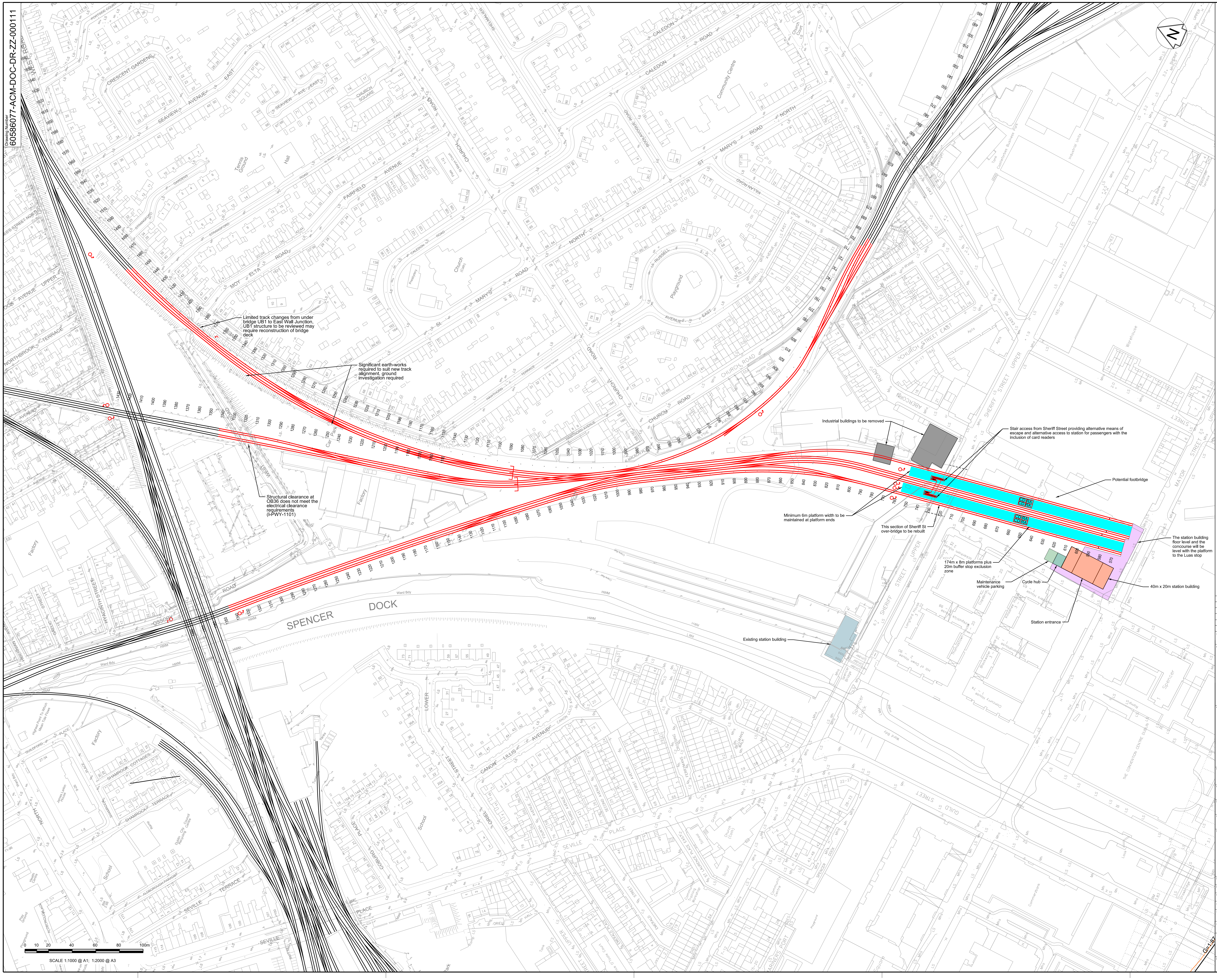
Signed

Sheet
1 of 1

Drawing Number
60586077-ACM-DOC-DR-ZZ-000102

Revision
P02

Sheet Size A0 841 x 1189



Limited track changes from under bridge UB1 to East Wall Junction, UB1 structure to be reviewed may require reconstruction of bridge deck

Significant earth-works required to suit new track alignment. ground investigation required

Structural clearance at OB36 does not meet the electrical clearance requirements (I-PWY-1101)

Industrial buildings to be removed

Stair access from Sheriff Street providing alternative means of escape and alternative access to station for passengers with the inclusion of card readers

Potential footbridge

Minimum 6m platform width to be maintained at platform ends

This section of Sheriff St over-bridge to be rebuilt

The station building floor level and the concourse will be level with the platform to the Luas stop

174m x 8m platforms plus 20m buffer stop exclusion zone

Maintenance vehicle parking

Cycle hub

40m x 20m station building

Station entrance

Existing station building

Legend/Notes

Signalling Impact Assessment

The new platforms will require starting signals and entry signals from the existing running lines. The is also the potential requirements for Train ready to start plungers and close doors/right away indicators on the platforms.

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Environmental Impact

The Royal Canal proposed Natural Heritage Area (pNHA) is located circa 165 m to the west of the site. It is important to note that although pNHA's in Ireland are not statutorily proposed or designated, they have been identified as being of significance for wildlife and habitats and are still afforded some level of protection. Appropriate mitigation measures will need to be implemented during the construction phase to minimise potential negative impacts.

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—	Existing track to be retained
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🟩	Proposed maintenance vehicle parking
🟩	Proposed cycle hub
🟧	Proposed area for development
🟨	Proposed station forecourt
➤	Vehicle access
➤	Cycle access
○	Junction Signal
CD	Close Doors Indicator
RA	Right Away Indicator
-·-▶	Pedestrian Route
- - -	Revenue Protection

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P02	08/02/19	Issued for SIFT 2 Option Review	DF	JD	BG
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Status
FOR INFORMATION

Suitability
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Client

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National Transport Authority

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Co. Dublin A96 T927
Ireland

AECOM

Contract Title
Docklands Station Options Study

Contract No.
60586077

Project
Engineering Consultancy Services

Grip Stage
FEASIBILITY

Drawing Title

DOCKLANDS STATION
OPTION B
GENERAL LAYOUT

Designed	B. George	Signed	Date
Drawn	D. Franklin	Signed	Date
Checked	J. Donaghy	Signed	Date
Approved	B. George	Signed	Date

Scale(s)
1:1000 @ A0

ELR & Mileage
-

Alternative Reference
-

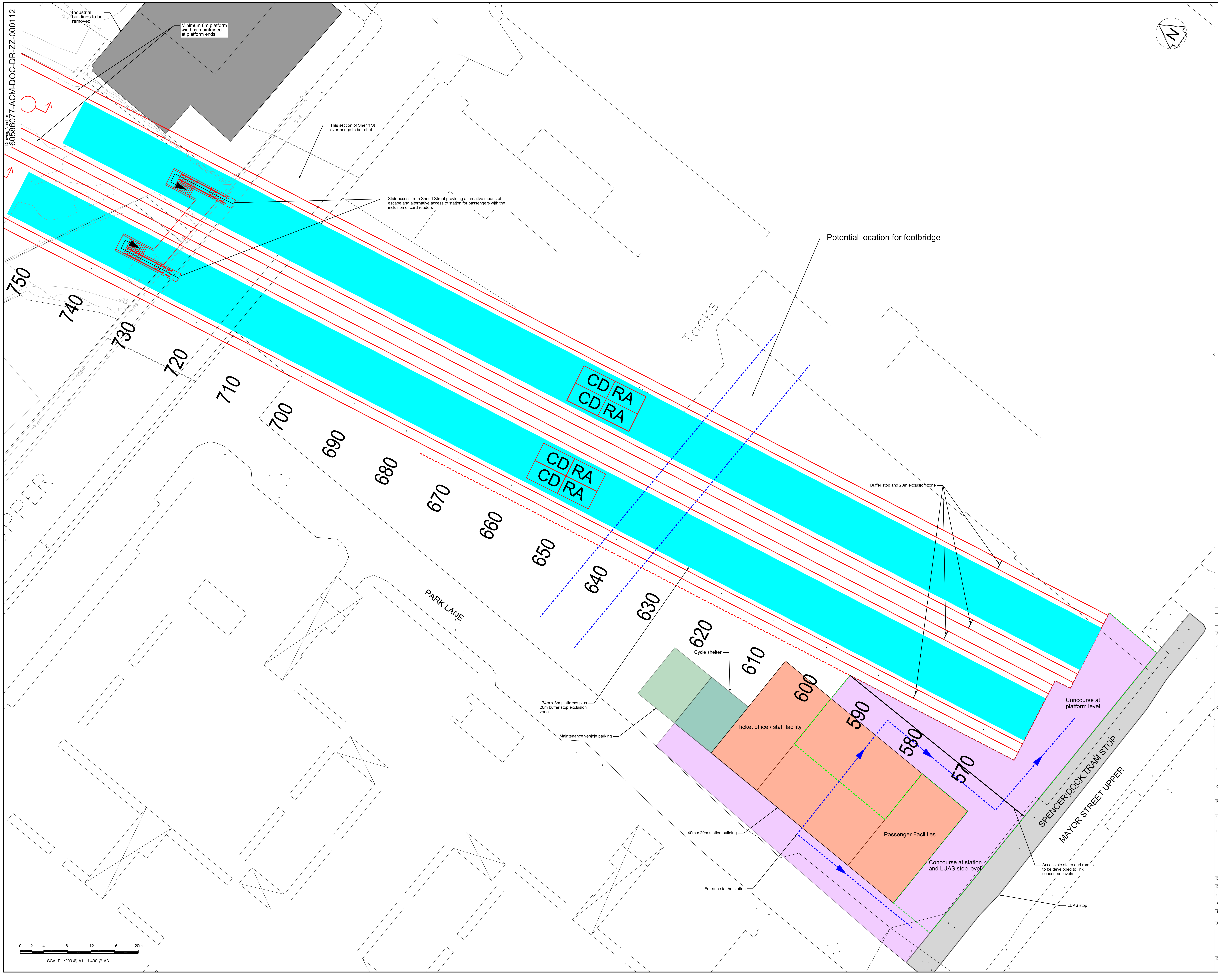
Signed

Sheet
1 of 1

Drawing Number
60586077-ACM-DOC-DR-ZZ-000111

Revision
P02

Sheet Size A0 841 x 1189



Legend/Notes

Signalling Impact Assessment

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—	Proposed Track Alignment
—	Existing track to be retained
■	Proposed platforms
■	Proposed station building
■	Proposed station concourse
■	Proposed maintenance vehicle parking
■	Proposed cycle hub
■	Proposed area for development
■	Proposed station forecourt
→	Vehicle access
→	Cycle access
○	Junction Signal
CD	Close Doors Indicator
RA	Right Away Indicator
- - →	Pedestrian Route
- - -	Revenue Protection

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P02	08/02/19	Issued for SIFT 2 Option Review	DF	JD	BG
P01	18/01/19	Issued for SIFT 2 Option Review	DF	JD	BG

Status: FOR INFORMATION
Suitability: -

Client

Údarás Náisiúnta Iompair
National Transport Authority

Contractor(s)

AECOM Ireland Limited
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Dun Laoghaire
Co. Dublin A96 T927
Ireland

AECOM

Contract Title: Docklands Station Options Study
Contract No.: 60586077
Project: Engineering Consultancy Services
Grip Stage: FEASIBILITY

Drawing Title

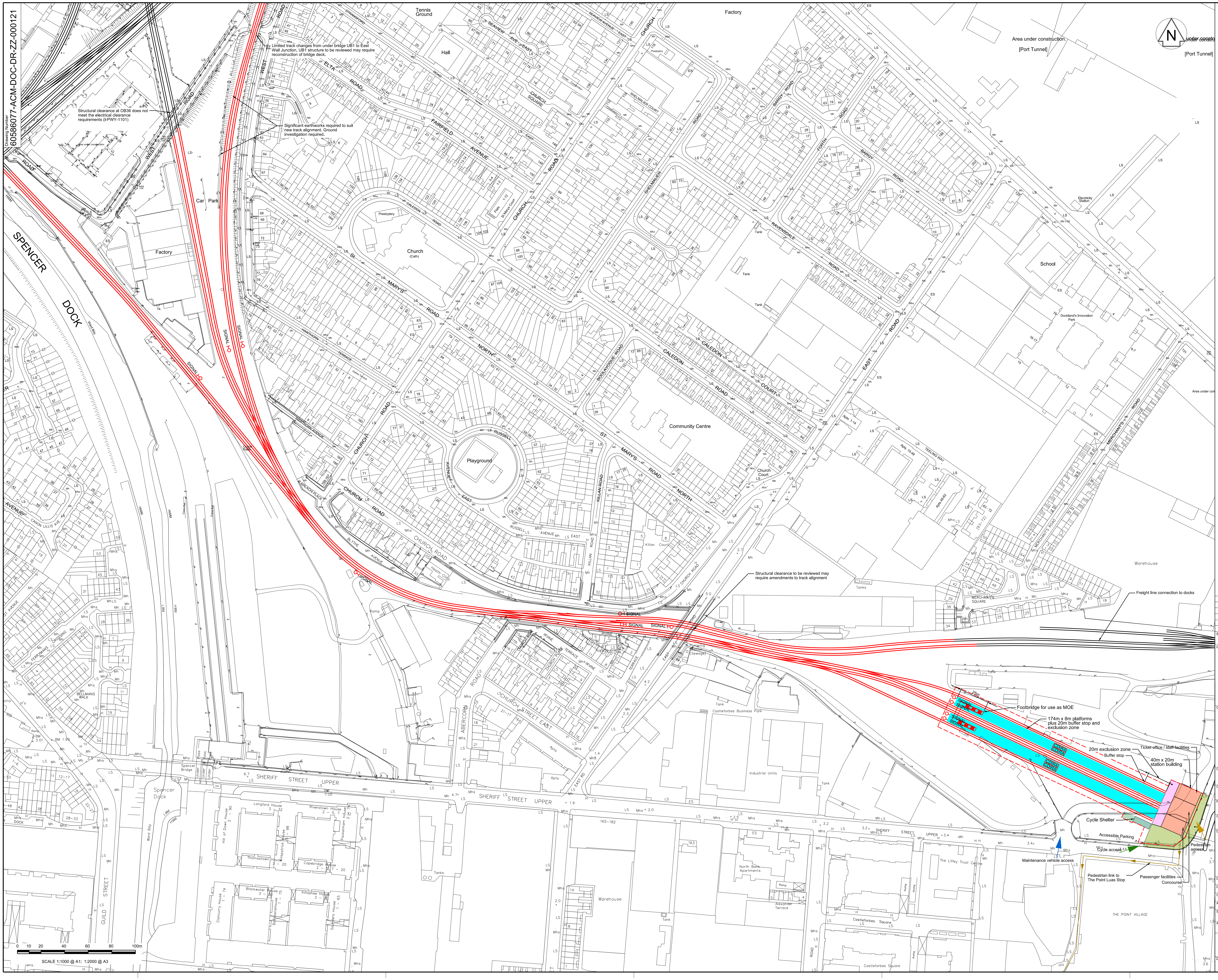
DOCKLANDS STATION
OPTION B
STATION LAYOUT

Designed	B. George	Signed	Date
Drawn	D. Franklin	Signed	Date
Checked	J. Donaghy	Signed	Date
Approved	B. George	Signed	Date
Scale(s)	1:200 @ A0	ELR & Mileage -	
Alternative Reference	-	Signed	Sheet 1 of 1

Drawing Number: 60586077-ACM-DOC-DR-ZZ-000112
Revision: P02

Sheet Size A0 841 x 1189

Drawing Number
60586077-ACM-DOC-DR-ZZ-000121



Legend/Notes

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- - - -	Land ownership boundary
—	Proposed Track Alignment
—	Existing track to be retained
🟦	Proposed platforms
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🟪	Proposed station concourse
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🟦	Proposed cycle hub
🟧	Proposed area for development
🟩	Proposed station forecourt
►	Vehicle access
►	Cycle access
►	Pedestrian access
O⊣	Junction Signal
CD	Close Doors Indicator
RA	Right Away Indicator

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P02	12/02/19	Issued for SIFT 2 Option Review	DF	JD	BG
P01	18/01/19	Issued for SIFT 2 Option Review	DF	JD	BG

Status
FOR INFORMATION

Suitability
-

Client
Údarás Náisiúnta Iompair
National Transport Authority

Contractor(s)
AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
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Co. Dublin A96 T927
Ireland

AECOM

Contract Title
Docklands Station Options Study

Contract No.
60586077

Project
Engineering Consultancy Services

Grip Stage
FEASIBILITY

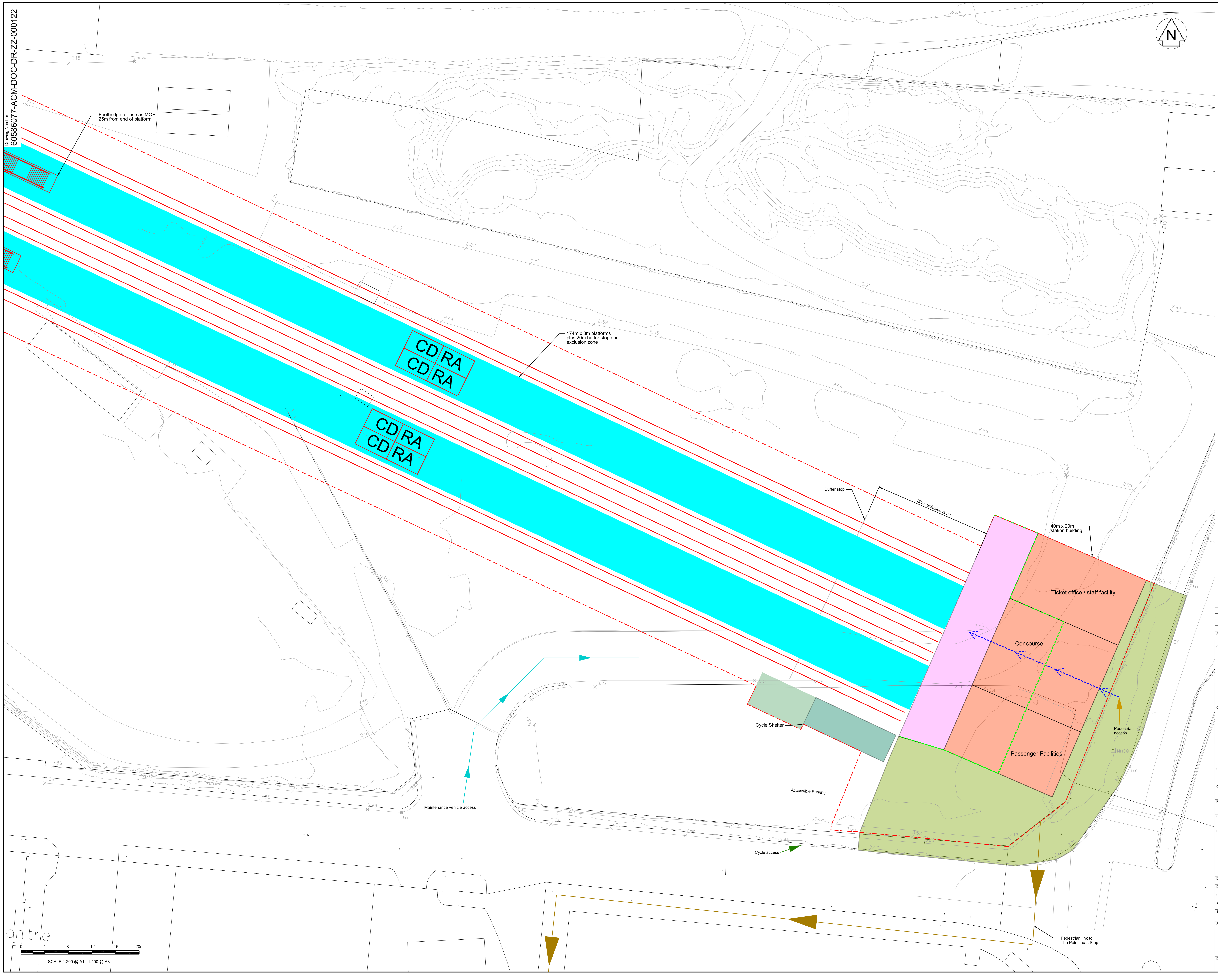
Drawing Title
DOCKLANDS STATION
OPTION C
GENERAL LAYOUT

Designed	B. George	Signed	Date
Drawn	D. Franklin	Signed	Date
Checked	J. Donaghy	Signed	Date
Approved	B. George	Signed	Date
Scale(s)	1:1000 @ A0	ELR & Mileage	-
Alternative Reference	-	Signed	Sheet 1 of 1

Drawing Number
60586077-ACM-DOC-DR-ZZ-000121

Revision
P02

Sheet Size A0 841 x 1189



Legend/Notes

Signalling Impact Assessment

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🟧	Proposed area for development
🟩	Proposed station forecourt
►	Vehicle access
►	Cycle access
►	Pedestrian access
○┤	Junction Signal
CD	Close Doors Indicator
RA	Right Away Indicator
- - ◄ - -	Pedestrian Route
- - - -	Revenue Protection

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P02	12/02/19	Issued for SIFT 2 Option Review	DF	JD	BG
P01	18/01/19	Issued for SIFT 2 Option Review	DF	JD	BG

Status
FOR INFORMATION

Suitability
-

Client

Údarás Náisiúnta Iompair
National Transport Authority

Contractor(s)

AECOM Ireland Limited
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Dun Laoghaire
Co. Dublin A96 T927
Ireland

AECOM

Contract Title
Docklands Station Options Study

Contract No.
60586077

Project
Engineering Consultancy Services

Grip Stage
FEASIBILITY

Drawing Title

DOCKLANDS STATION
OPTION C
STATION LAYOUT

Designed	B. George	Signed	Date
Drawn	D. Franklin	Signed	Date
Checked	J. Donaghy	Signed	Date
Approved	B. George	Signed	Date

Scale(s)
1:200 @ A0

ELR & Mileage
-

Alternative Reference
-

Signed

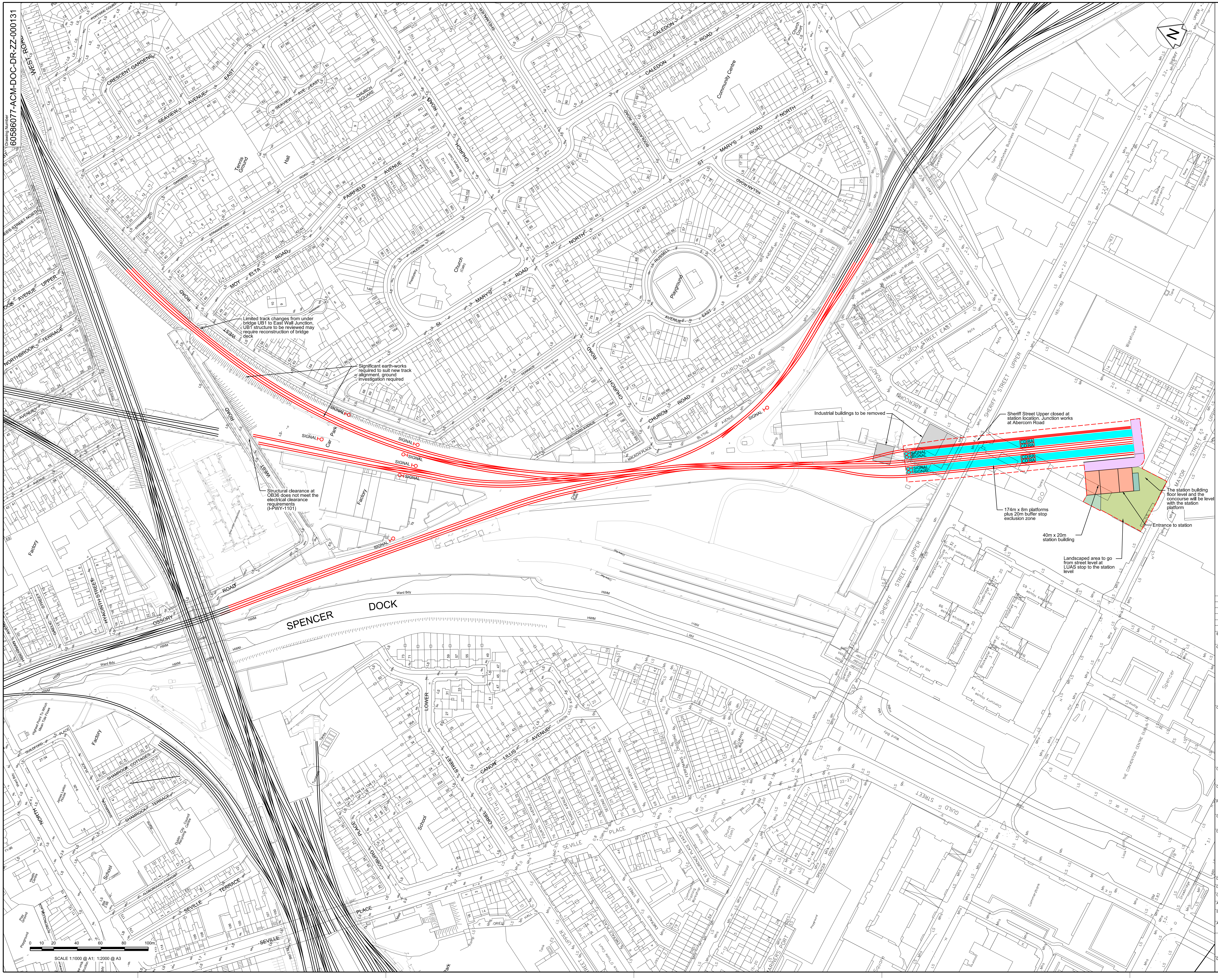
Sheet
1 of 1

Drawing Number
60586077-ACM-DOC-DR-ZZ-000122

Revision
P02

Sheet Size A0 841 x 1189

Drawing Number
60586077-ACM-DOC-DR-ZZ-000131



Limited track changes from under bridge UB1 to East Wall Junction, UB1 structure to be reviewed may require reconstruction of bridge deck

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Industrial buildings to be removed

Sheriff Street Upper closed at station location. Junction works at Abercorn Road

174m x 8m platforms plus 20m buffer stop exclusion zone

40m x 20m station building

Landscaped area to go from street level at LUAS stop to the station level

The station building floor level and the concourse will be level with the station platform

Entrance to station

SCALE 1:1000 @ A1; 1:2000 @ A3

Legend/Notes

Signalling Impact Assessment

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- - - -	Land ownership boundary
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P02	12/02/19	Issued for SIFT 2 Option Review	DF	JD	BG
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Status
FOR INFORMATION

Suitability
-

Client

Údarás Náisiúnta Iompair
National Transport Authority

Contractor(s)

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Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

AECOM

Contract Title
Docklands Station Options Study

Contract No.
60586077

Project
Engineering Consultancy Services

Grip Stage
FEASIBILITY

Drawing Title
DOCKLANDS STATION
OPTION M
GENERAL LAYOUT

Designed	B. George	Signed	Date
Drawn	D. Franklin	Signed	Date
Checked	J. Donaghy	Signed	Date
Approved	B. George	Signed	Date

Scale(s)
1:1000 @ A0

ELR & Mileage
-

Alternative Reference
-

Signed

Sheet
1 of 1

Drawing Number
60586077-ACM-DOC-DR-ZZ-000131

Revision
P02

Sheet Size A0 841 x 1189

Industrial buildings to be removed

Sheriff Street Upper closed at station location. Junction works at Abercorn Road

174m x 8m platforms plus 20m buffer stop exclusion zone

The station building floor level and the concourse will be level with the station platform

40m x 20m station building

Maintenance vehicle parking

Entrance to station

Landscaped area to go from street level at LUAS stop to the station level

Legend/Notes

Signalling Impact Assessment

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🟩	Proposed station forecourt
→	Vehicle access
→	Cycle access
○⊣	Junction Signal
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- - -	Revenue Protection

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
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Status
FOR INFORMATION

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Ireland

AECOM

Contract Title
Docklands Station Options Study

Contract No.
60586077

Project
Engineering Consultancy Services

Grip Stage
FEASIBILITY

Drawing Title

DOCKLANDS STATION
OPTION M
STATION LAYOUT

Designed	B. George	Signed	Date
Drawn	D. Franklin	Signed	Date
Checked	J. Donaghy	Signed	Date
Approved	B. George	Signed	Date

Scale(s)
1:200 @ A0

ELR & Mileage
-

Alternative Reference
-

Signed

Sheet
1 of 1

Drawing Number
60586077-ACM-DOC-DR-ZZ-00132

Revision
P02

Sheet Size A0 841 x 1189

Drawing Number
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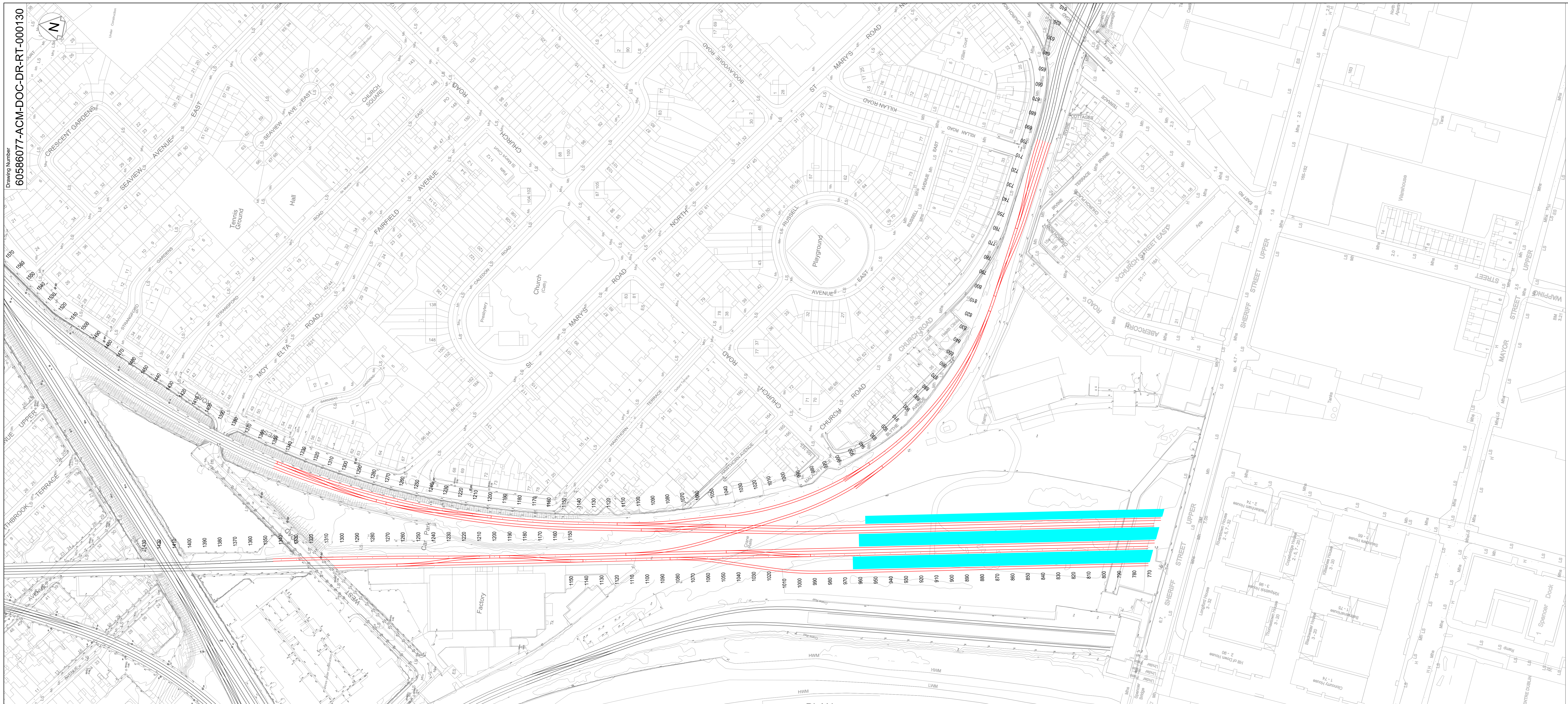
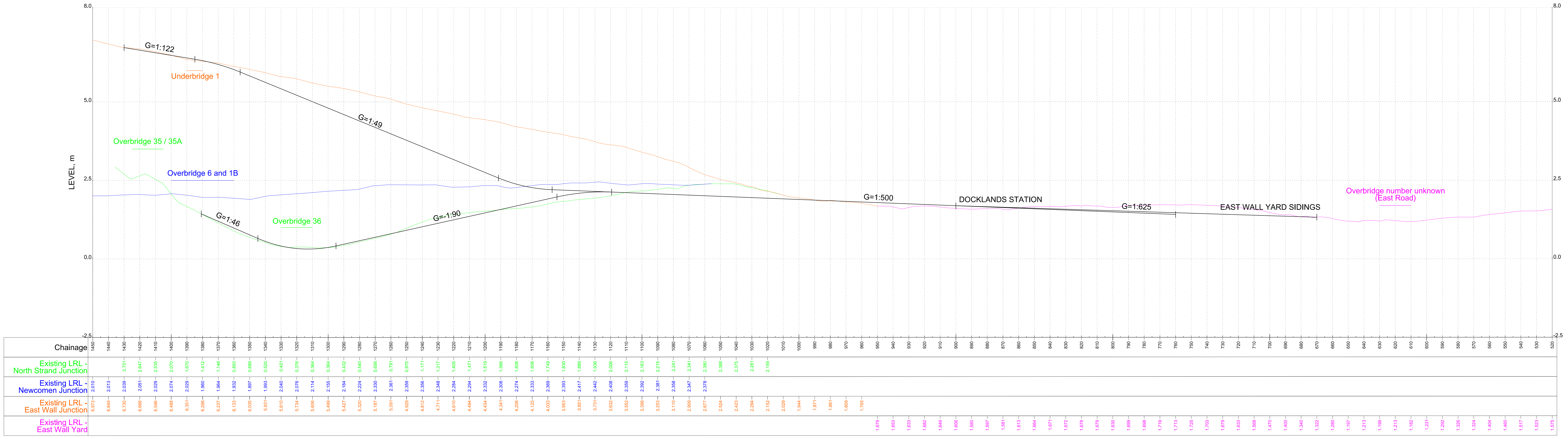


PLAN



VERTICAL PROFILE

0 1 2 3 4 5m
SCALE 1:50

0 20 40 60 80 100m
SCALE 1:1000

Legend/Notes

1. Horizontal and Vertical track details shown are based upon Lidar survey data not topographical.

🟩	Existing LRL - North Strand Junction
🟦	Existing LRL - New Common Junction
🟧	Existing LRL - East Wall Junction
🟪	Existing LRL - East Wall Yard
—	Proposed LRL
LRL	Low Rail Level
G	Gradient
|	Change in grade
■	Proposed platforms
🟥	Proposed Track
- - -	Existing track to be recovered
—	Existing track to remain

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P06	14/02/19	Issued for SIFT 2 Option Review	CS	SB	BG
P05	12/02/19	Issued for SIFT 2 Option Review	CS	SB	BG
P04	04/02/19	Issued for SIFT 2 Option Review	CS	SB	BG
P03	01/02/19	Issued for SIFT 2 Option Review	CS	SB	BG
P02	25/01/19	Issued for SIFT 2 Option Review	CS	SB	BG
P01	18/01/19	Issued for SIFT 2 Option Review	CS	SB	BG

Status: FOR INFORMATION
Suitability: -

Client
Údarás Náisiúnta Iompair
National Transport Authority

Contractor(s)

AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

AECOM

Contract Title: Docklands Station Options Study

Contract No.: 60586077

Project: Engineering Consultancy Services

Grip Stage: N/A

Drawing Title

DOCKLANDS STATION
OPTION A
VERTICAL PROFILE

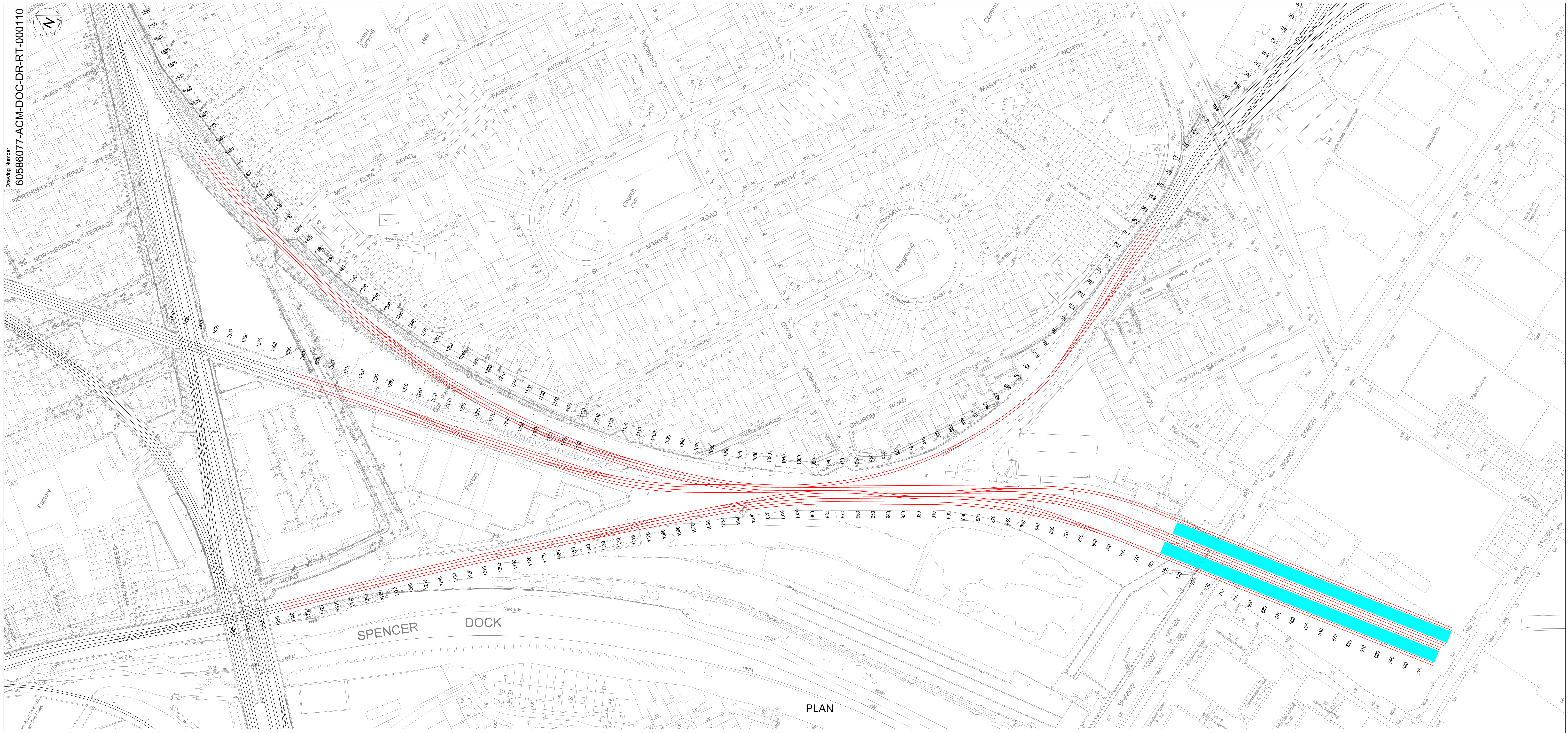
Designed	C. Sansome	Signed	Date
Drawn	C. Sansome	Signed	Date
Checked	S. Bridgwater	Signed	Date
Approved	B. George	Signed	Date

Scale(s): Horizontal: 1:1000 @ A0
Vertical: 1:50 @ A0
ELR & Mileage: -
Alternative Reference: -
Signed
Sheet 1 of 1

Drawing Number: 60586077-ACM-DOC-DR-RT-000100
Revision: P06

Sheet Size A0 841 x 1189

Drawing Number
60586077-ACM-DOC-DR-RT-000110

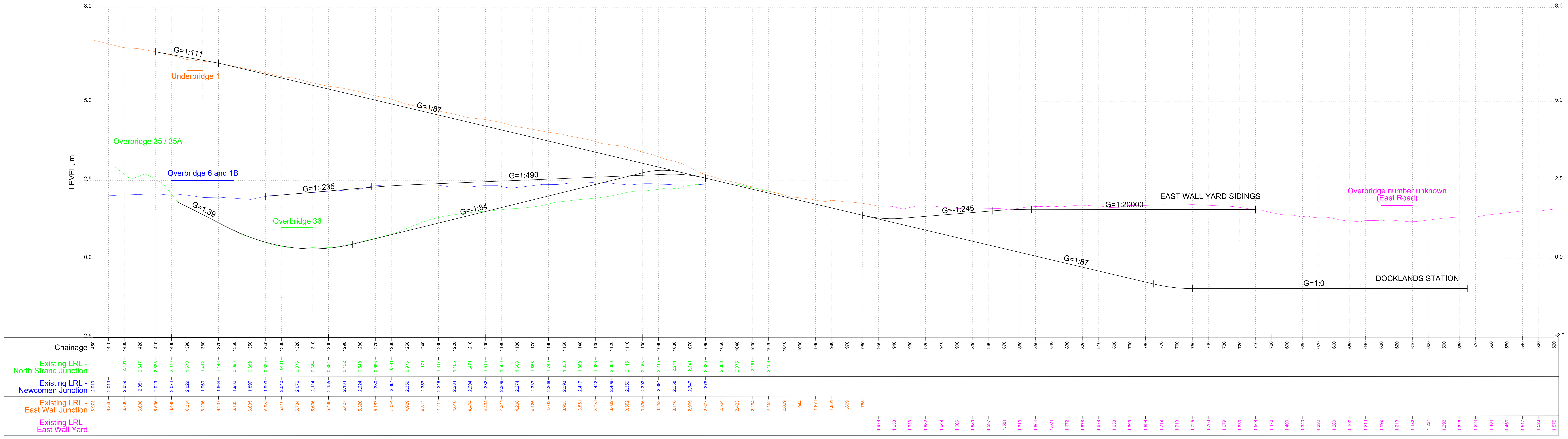


PLAN

Legend/Notes

1. Horizontal and Vertical track details shown are based upon Lidar survey data not topographical.

🟩	Existing LRL - North Strand Junction
🟦	Existing LRL - Newcomen Junction
🟧	Existing LRL - East Wall Junction
🟪	Existing LRL - East Wall Yard
—	Proposed LRL
LRL	Low Rail Level
G	Gradient
|	Change in grade
▬	Proposed platforms
🟥	Proposed Track
- - -	Existing track to be recovered
—	Existing track to remain



VERTICAL PROFILE

SCALE 1:50

SCALE 1:1000

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P04	14/02/19	Issued for SIFT 2 Option Review	JO	SB	BG
P03	12/02/19	Issued for SIFT 2 Option Review	JO	SB	BG
P02	01/02/19	Issued for SIFT 2 Option Review	JO	SB	BG
P01	18/01/19	Issued for SIFT 2 Option Review	JO	SB	BG

Status: FOR INFORMATION
Suitability: -

Client
Údarás Náisiúnta Iompair
National Transport Authority

Contractor(s)
AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

AECOM

Contract Title: Docklands Station Options Study
Contract No.: 60586077
Project: Engineering Consultancy Services
Grip Stage: N/A

Drawing Title
DOCKLANDS STATION
OPTION B
VERTICAL PROFILE

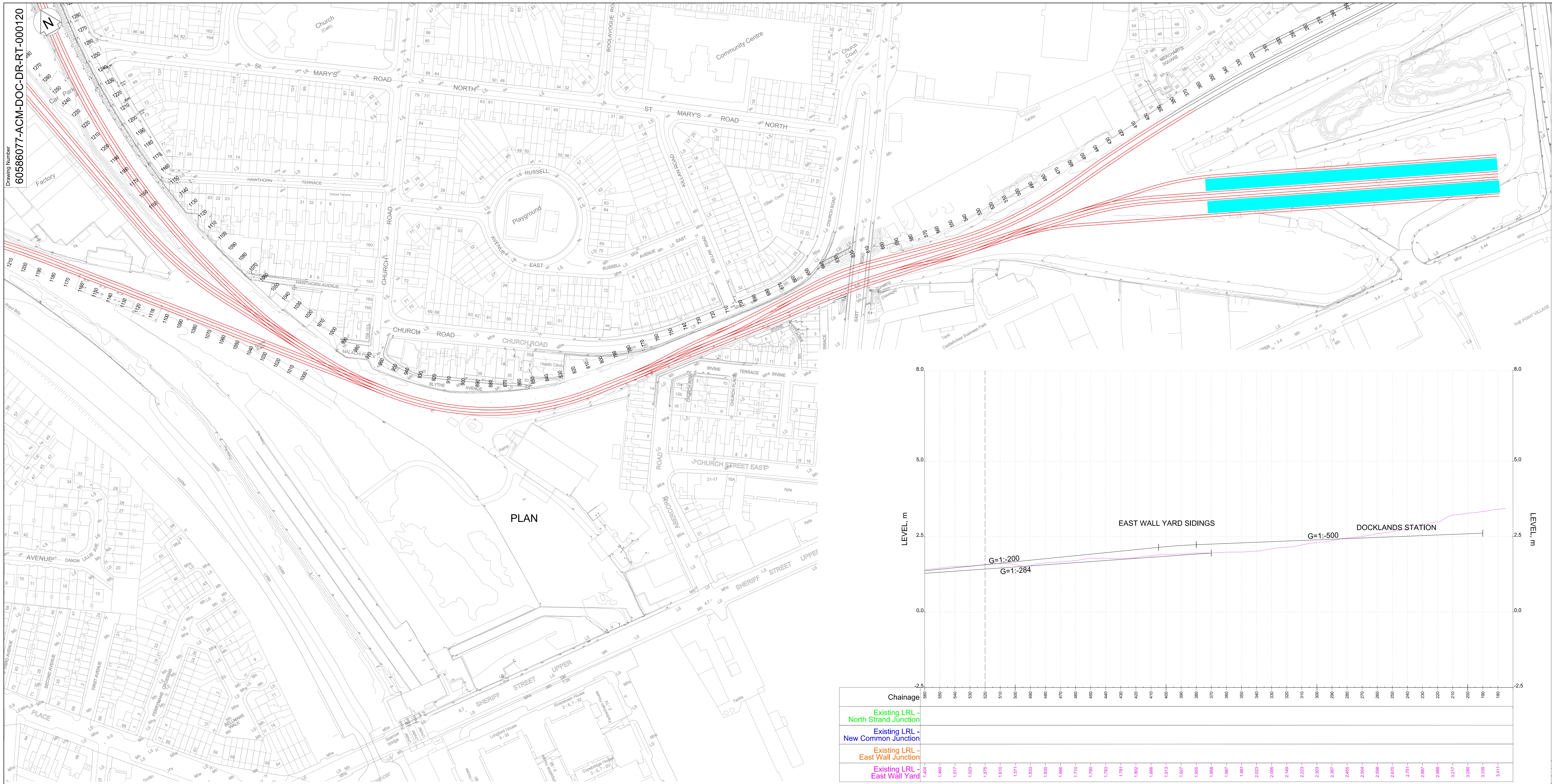
Designed	J. O'Toole	Signed	Date
Drawn	J. O'Toole	Signed	Date
Checked	S. Bridgwater	Signed	Date
Approved	B. George	Signed	Date

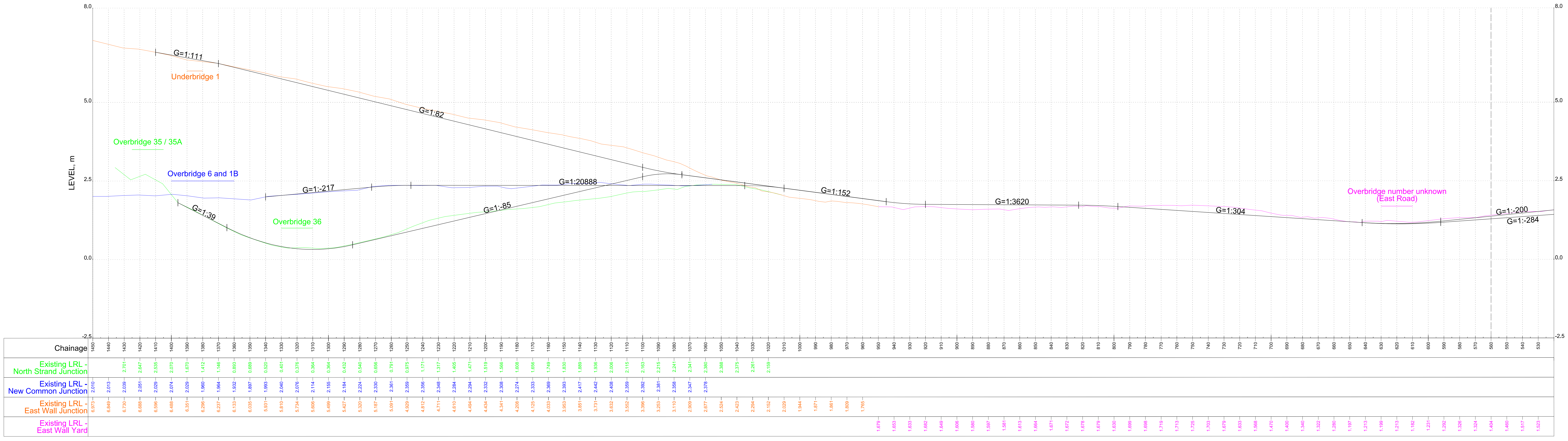
Scale(s): Horizontal: 1:1000 @ A0
Vertical: 1:50 @ A0
ELR & Mileage: -
Alternative Reference: -
Signed
Sheet 1 of 1

Drawing Number: 60586077-ACM-DOC-DR-RT-000110
Revision: P04

Sheet Size A0 841 x 1189

Drawing Number
60586077-ACM-DOC-DR-RT-000120





VERTICAL PROFILE

SCALE 1:50

SCALE 1:1000

Legend/Notes

1. Horizontal and Vertical track details shown are based upon Lidar survey data not topographical.

🟩	Existing LRL - North Strand Junction
🟦	Existing LRL - New Common Junction
🟧	Existing LRL - East Wall Junction
🟪	Existing LRL - East Wall Yard
—	Proposed LRL
LRL	Low Rail Level
G	Gradient
|	Change in grade
■	Proposed platforms
🟥	Proposed Track
- - - -	Existing track to be recovered
—	Existing track to remain

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P03	14/02/19	Issued for SIFT 2 Option Review	JO	SB	BG
P02	12/02/19	Issued for SIFT 2 Option Review	JO	SB	BG
P01	18/01/19	Issued for SIFT 2 Option Review	JO	SB	BG

Status
FOR INFORMATION

Suitability
-

Client
Údarás Náisiúnta Iompair
National Transport Authority

Contractor(s)
AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

AECOM

Contract Title
Docklands Station Options Study

Contract No.
60586077

Project
Engineering Consultancy Services

Grip Stage
N/A

Drawing Title
DOCKLANDS STATION
OPTION C
VERTICAL PROFILE

Designed	J. O'Toole	Signed	Date
Drawn	J. O'Toole	Signed	Date
Checked	S. Bridgwater	Signed	Date
Approved	B. George	Signed	Date

Scale(s)
Horizontal: 1:1000 @ A0
Vertical: 1:50 @ A0

ELR & Mileage
-

Alternative Reference
-

Signed

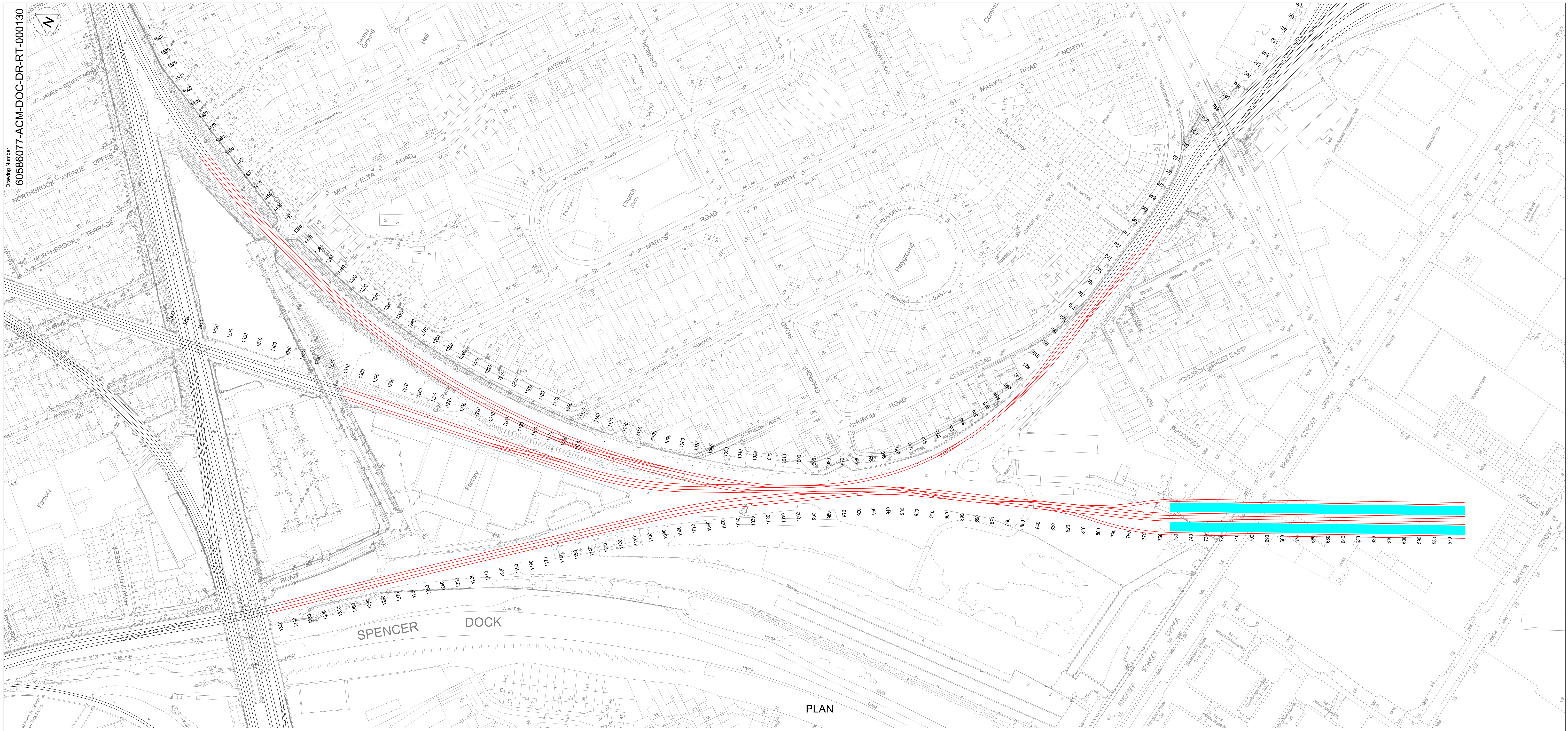
Sheet
1 of 1

Drawing Number
60586077-ACM-DOC-DR-RT-000120

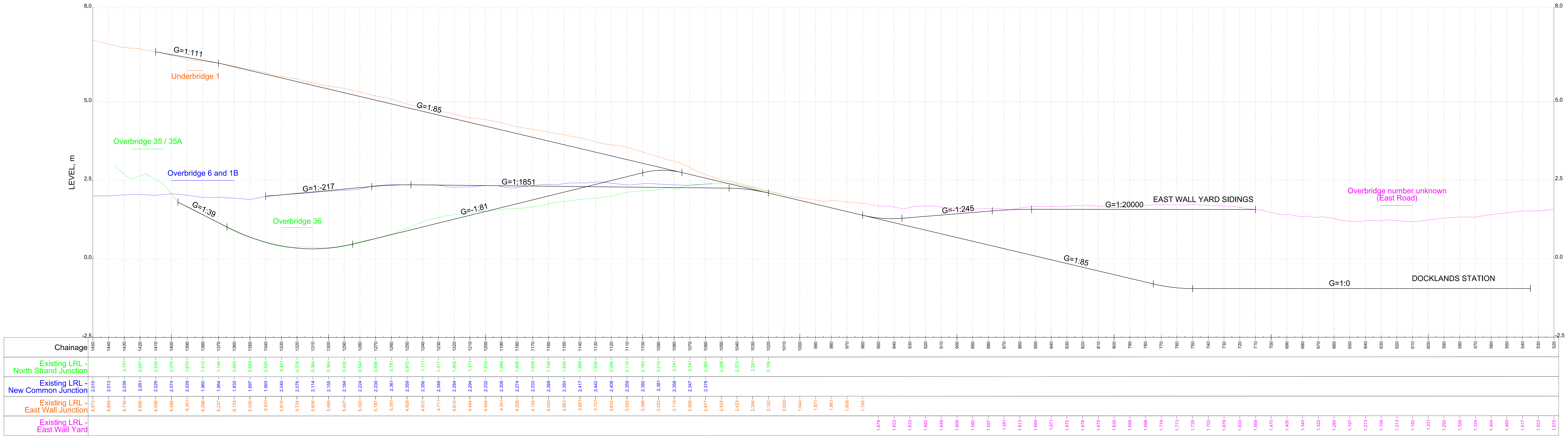
Revision
P03

Sheet Size A0 841 x 1189

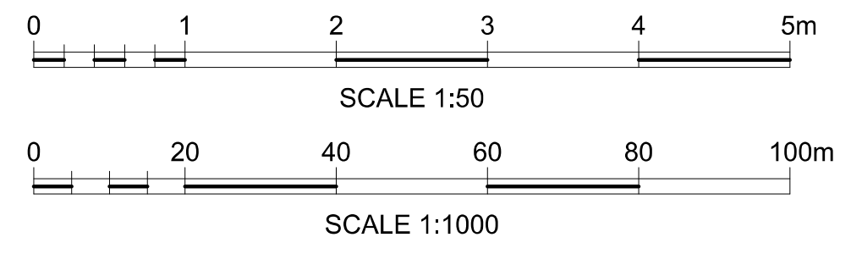
Drawing Number
60586077-ACM-DOC-DR-RT-000130



PLAN



VERTICAL PROFILE



Legend/Notes

1. Horizontal and Vertical track details shown are based upon Lidar survey data not topographical.

🟩	Existing LRL - North Strand Junction
🟦	Existing LRL - New Common Junction
🟧	Existing LRL - East Wall Junction
🟪	Existing LRL - East Wall Yard
—	Proposed LRL
LRL	Low Rail Level
G	Gradient
|	Change in grade
■	Proposed platforms
🟥	Proposed Track
- - -	Existing track to be recovered
—	Existing track to remain

Rev	Date	Description of Revisions	Drawn	Chkd	Appr
P03	14/02/19	Issued for SIFT 2 Option Review	JO	SB	BG
P02	12/02/19	Issued for SIFT 2 Option Review	JO	SB	BG
P01	18/01/19	Issued for SIFT 2 Option Review	JO	SB	BG

Status
FOR INFORMATION

Suitability
-

Client
Údarás Náisiúnta Iompair
National Transport Authority

Contractor(s)
AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

AECOM

Contract Title
Docklands Station Options Study

Contract No.
60586077

Project
Engineering Consultancy Services

Grip Stage
N/A

Drawing Title
DOCKLANDS STATION
OPTION M
VERTICAL PROFILE

Designed	J. O'Toole	Signed		Date	
Drawn	J. O'Toole	Signed		Date	
Checked	S. Bridgwater	Signed		Date	
Approved	B. George	Signed		Date	

Scale(s) Horizontal: 1:1000 @ A0
Vertical: 1:50 @ A0

ELR & Mileage
-

Alternative Reference
-

Signed

Sheet
1 of 1

Drawing Number
60586077-ACM-DOC-DR-RT-000130

Revision
P03

Sheet Size A0 841 x 1189

Appendix B Capital Cost estimates

OMC No.2

for

OPTION STUDY - DOCKLANDS STATION STUDY

for

THE NATIONAL TRANSPORT AUTHORITY

11-February-2019

Quality information

Document name	Rev	Prepared for	Prepared by	Date	Reviewed by
Order of Magnitude	2	NTA	Mark Hallinan	11.02.2019	Colm Tully

Revision history

Revision	Revision date	Details	Name	Position

11 February 2019
Docklands Station - Option Study
OMC No. 2
60586077

DOCKLANDS STATION STUDY

DESCRIPTION	Option A	Option B	Option C	Option M
CONSTRUCTION COSTS				
Site Clearance / Demolitions	€ 1,180,000.00	€ 3,180,000.00	€ 4,810,000.00	€ 2,720,000.00
Railways - at grade	€ 6,430,000.00	€ 7,740,000.00	€ 9,250,000.00	€ 7,440,000.00
Structures	€ 7,740,000.00	€ 13,820,000.00	€ 5,880,000.00	€ 24,440,000.00
Platforms	€ 5,660,000.00	€ 5,660,000.00	€ 5,660,000.00	€ 5,660,000.00
Fittings, Furnishings and Equipment	€ 110,000.00	€ 110,000.00	€ 110,000.00	€ 110,000.00
External Works	€ 140,000.00	€ 290,000.00	€ 140,000.00	€ 290,000.00
Electrification / Substation Allowance	€ 3,370,000.00	€ 5,220,000.00	€ 5,830,000.00	€ 4,520,000.00
Utilities	€ 10,890,000.00	€ 14,540,000.00	€ 17,240,000.00	€ 13,790,000.00
Sub-Total Construction Costs	**€ 35,520,000.00**	**€ 50,560,000.00**	**€ 48,920,000.00**	**€ 58,970,000.00**
INDIRECT CONSTRUCTION COSTS				
Phasing / Working in Live Environment	€ 1,780,000.00	€ 2,530,000.00	€ 2,450,000.00	€ 2,950,000.00
Preliminaries @ 25%	€ 9,330,000.00	€ 13,270,000.00	€ 12,850,000.00	€ 15,480,000.00
Overheads and Profit	Incl.	Incl.	Incl.	Incl.
Sub-Total Indirect Construction Costs	**€ 11,110,000.00**	**€ 15,800,000.00**	**€ 15,300,000.00**	**€ 18,430,000.00**
EMPLOYER'S INDIRECT COSTS				
Professional Fees @ 15%	€ 6,990,000.00	€ 9,950,000.00	€ 9,640,000.00	€ 11,610,000.00
Allowance for Client fees, compensation costs etc. @ 10%	€ 5,360,000.00	€ 7,630,000.00	€ 7,390,000.00	€ 8,900,000.00
Sub-Total Employer's Indirect Costs	**€ 12,350,000.00**	**€ 17,580,000.00**	**€ 17,030,000.00**	**€ 20,510,000.00**
RISK				
Risk / Contingency Allowance	€ 17,690,000.00	€ 33,580,000.00	€ 24,380,000.00	€ 29,380,000.00
Sub-Total Risk	**€ 17,690,000.00**	**€ 33,580,000.00**	**€ 24,380,000.00**	**€ 29,380,000.00**
CONSTRUCTION WORKS TOTAL (excl. VAT)	**€ 76,700,000.00**	**€ 117,500,000.00**	**€ 105,600,000.00**	**€ 127,300,000.00**
VAT				
VAT @ 13.5%	€ 10,350,000.00	€ 15,870,000.00	€ 14,260,000.00	€ 17,180,000.00
CONSTRUCTION WORKS TOTAL (incl. VAT)	**€ 87,000,000.00**	**€ 133,400,000.00**	**€ 119,900,000.00**	**€ 144,500,000.00**
Land Acquisition Costs				
Land Acquisition Costs **	€ 4,340,000.00	€ 4,336,500.00	€ 4,336,500.00	€ 77,436,500.00
OPTION TOTAL (incl. VAT)	**€ 91,340,000.00**	**€ 137,736,500.00**	**€ 124,236,500.00**	**€ 221,936,500.00**

**Land Acquisition Costs as per GVA Donal O Buachalla Report and Valuation dated January 2019

11 February 2019
Docklands Station - Option Study
OMC No. 2
60586077

OPTION A - OMC

Description	Qty	Unit	Rate	Total	Comments
Site Clearance / Demolitions					
Existing track to be removed as outlined on the Docklands Station Option A General Layout Drawing.	2140	m	€ 550.00	€ 1,177,000.00	Benchmarked from an AECOM project involving a Depot extension and removal of existing tracks
Railways - at grade					
New plain line track includes for sleepers, ballast and rails as outlined on the Docklands Station Option A General Layout Drawing.	3796	m	€ 1,500.00	€ 5,694,000.00	AECOM reference project €1,340 per m, rate increased to allow for inflation to Q1 2019.
Signaling systems - Signaling Equivalent Unit (SEU); assumed qty	8	Nr	€ 30,000.00	€ 240,000.00	Rate is benchmarked off AECOM projects of a similar nature.
Allowance for Overhead Line Equipment	1	Item	€ 500,000.00	€ 500,000.00	Allowance further detail required.
Structures					
Allowance for internal alterations to existing station building	1	Item	€ 300,000.00	€ 300,000.00	Scope of works to be confirmed, general allowance until further detail developed.
Allowance for proposed walkway access with lift tower from Sheriff Street to proposed Docklands Station	1	Item	€ 500,000.00	€ 500,000.00	Allowance for walkway access
Concourse	1961	m2	€ 1,600.00	€ 3,137,600.00	AECOM Reference project concourse rate per m2.
Allowance for site wide CCTV / Intruder alarms / access control	1	Item	€ 300,000.00	€ 300,000.00	Allowance further detail required.
Redevelopment of West Road Bridge (Allowance)	1	Item	€ 3,500,000.00	€ 3,500,000.00	Scope of works to be confirmed, general allowance until further detail developed.
Platforms					
2 no platforms to be installed as per the engineers drawings and specifications, including excavation for foundations, general excavation, filling, placing of concrete, formwork, reinforcement, manholes, gullies, pipework and ancillaries, ducting and paving, cables etc.	3104	m2	€ 1,600.00	€ 4,966,400.00	AECOM Reference project platform rate per m2.
Canopies to platforms	2328	m2	€ 300.00	€ 698,400.00	Canopies @ £275 per m2 on reference AECOM project in the UK.
Fittings, Furnishings and Equipment					
General fittings, furnishings and equipment	1	Sum	€ 75,000.00	€ 75,000.00	General allowance, full scope unknown
Signs and notices	1	Sum	€ 35,000.00	€ 35,000.00	General allowance, full scope unknown
External Works					
Car Park including line marking drainage, stone base, black top etc.	450	m2	€ 200.00	€ 90,000.00	Rate as per AECOM project tender return Q3 2018, additional allowance made for inflation
Landscaping allowance	1	Item	€ 50,000.00	€ 50,000.00	General allowance, full scope unknown
Electrification					
Allowance for substation	1	Item	€ 650,000.00	€ 650,000.00	Allowance for substation based on AECOM projects of a similar nature
Allowance for overhead electrification of track as far as the northern line	1601	m	€ 1,700.00	€ 2,721,700.00	Allowance for electrification based on AECOM projects of a similar nature
Utilities					
Allowance for electric power and plant	1	Item	€ 5,469,000.00	€ 5,469,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for water supply and distribution	1	Item	€ 3,125,000.00	€ 3,125,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for underground drainage system	1	Item	€ 1,969,000.00	€ 1,969,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for tele-comms	1	Item	€ 324,000.00	€ 324,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Phasing					
Allowance for phasing, working in a live environment and any disruptions that this may cause. Allowance of 5% being carried.				€ 1,780,000.00	Percentage based on projects of a similar nature.
Professionals Fees, Consultants and Contingency					
Preliminaries @ 25%				€ 9,330,000.00	Percentage based on projects of a similar nature.
Professional Fees @ 15%				€ 6,990,000.00	Percentage based on projects of a similar nature.
Allowance for Client fees, compensation costs etc. @ 10%				€ 5,360,000.00	Allowance Client to advise if this is required.
Risk / Contingency @ 30%				€ 17,690,000.00	Risk / Contingency allowed for at 30% due to rail associated works.
Construction Works Total (Excl. VAT)				**€ 76,672,100.00**	
VAT @ 13.5%				€ 10,350,733.50	
Construction Works Total (Incl. VAT)				**€ 87,022,833.50**	
Land Acquisition Costs - Site 1 (Incl. VAT)				€ 4,336,500.00	
Land Acquisition Costs - Site 2 (Incl. VAT)				€ -	
Total				**€ 91,359,333.50**	

11 February 2019
Docklands Station - Option Study
OMC No. 2
60586077

OPTION B - OMC

Description	Qty	Unit	Rate	Total	Comments
Site Clearance / Demolitions					
Demolish existing buildings on site	11800	m3	€ 80.00	€ 944,000.00	Current market rate, based on AECOM reference projects.
Existing track to be removed as outlined on the Docklands Station Option B General Layout Drawing.	4061	m	€ 550.00	€ 2,233,600.00	Benchmarked from an AECOM project involving a Depot extension and removal of existing tracks
Railways - at grade					
New plain line track includes for sleepers, ballast and rails as outlined on the Docklands Station Option B General Layout Drawing.	4665	m	€ 1,500.00	€ 6,997,500.00	AECOM reference project €1,340 per m, rate increased to allow for inflation to Q1 2019.
Signaling systems - Signaling Equivalent Unit (SEU); assumed qty	8	Nr	€ 30,000.00	€ 240,000.00	Rate is benchmarked off AECOM projects of a similar nature.
Allowance for Overhead Line Equipment	1	Item	€ 500,000.00	€ 500,000.00	Allowance further detail required.
Structures					
New Docklands Station building (40m x 20m)	800	m2	€ 1,960.00	€ 1,568,000.00	AECOM reference project Depot extension @ €1,820 per sq m additional allowance carried for inflation
Concourse	595	m2	€ 1,600.00	€ 952,000.00	AECOM Reference project concourse rate per m2.
Allowance for site wide CCTV / Intruder alarms / access control	1	Item	€ 300,000.00	€ 300,000.00	Allowance further detail required to develop costs.
Overbridge required as platforms and track will need to run under Sheriff Street Upper	1	Item	€ 7,500,000.00	€ 7,500,000.00	Allowance as per AECOM reference project, further detail required to develop costs further.
Redevelopment of West Road Bridge (Allowance)	1	Item	€ 3,500,000.00	€ 3,500,000.00	Scope of works to be confirmed, general allowance until further detail developed.
Platforms					
2 no platforms to be installed as per the engineers drawings and specifications, including excavation for foundations, general excavation, filling, placing of concrete, formwork, reinforcement, manholes, gullies, pipework and ancillaries, ducting and paving, cables etc.	3104	m2	€ 1,600.00	€ 4,966,400.00	AECOM Reference project platform rate per m2.
Canopies to platforms	2328	m2	€ 300.00	€ 698,400.00	Canopies @ £275 per m2 on reference AECOM project in the UK.
Fittings, Furnishings and Equipment					
General fittings, furnishings and equipment	1	Sum	€ 75,000.00	€ 75,000.00	General allowance, full scope unknown
Signs and notices	1	Sum	€ 35,000.00	€ 35,000.00	General allowance, full scope unknown
External Works					
Car Park including line marking drainage, stone base, black top etc.	450	m2	€ 200.00	€ 90,000.00	Rate as per AECOM project tender return Q3 2018, additional allowance made for inflation
Landscaping allowance	1	Item	€ 50,000.00	€ 50,000.00	General allowance, full scope unknown
Pumping Station	1	Item	€ 150,000.00	€ 150,000.00	General allowance based off projects of a similar nature, further details relating to the pumping station will be required to develop the costs further.
Electrification					
Allowance for substation	1	Item	€ 650,000.00	€ 650,000.00	Allowance for substation based on AECOM projects of a similar nature
Allowance for overhead electrification of track as far as the northern line	2690	m	€ 1,700.00	€ 4,573,000.00	Allowance for electrification based on AECOM projects of a similar nature
Utilities					
Allowance for electric power and plant	1	Item	€ 7,302,000.00	€ 7,302,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for water supply and distribution	1	Item	€ 4,172,000.00	€ 4,172,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for underground drainage system	1	Item	€ 2,629,000.00	€ 2,629,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for tele-comms	1	Item	€ 433,000.00	€ 433,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Phasing					
Allowance for phasing, working in a live environment and any disruptions that this may cause. Allowance of 5% being carried.				€ 2,530,000.00	Percentage based on projects of a similar nature.
Professionals Fees, Consultants and Contingency					
Preliminaries @ 25%				€ 13,270,000.00	Percentage based on projects of a similar nature.
Professional Fees @ 15%				€ 9,950,000.00	Percentage based on projects of a similar nature.
Allowance for Client fees, compensation costs etc. @ 10%				€ 7,630,000.00	Allowance Client to advise if this is required.
Risk / Contingency @ 40%				€ 33,580,000.00	Risk / Contingency allowed for at 40% due to rail associated works.
Construction Works Total (Excl. VAT)				**€ 117,518,900.00**	
VAT @ 13.5%				€ 15,865,051.50	
Construction Works Total (Incl. VAT)				**€ 133,383,951.50**	
Land Acquisition Costs - Site 1 (Incl. VAT)				€ 4,336,500.00	
Land Acquisition Costs - Site 2 (Incl. VAT)				€ -	
Total				**€ 137,720,451.50**	

11 February 2019
Docklands Station - Option Study
OMC No. 2
60586077

OPTION C - OMC

Description	Qty	Unit	Rate	Total	Comments
Site Clearance / Demolitions					
Existing track to be removed as outlined on the Docklands Station Option C General Layout Drawing.	8022	m	€ 550.00	€ 4,412,100.00	Benchmarked from an AECOM project involving a Depot extension and removal of existing tracks
Relocating engineering works (Allowance)	1	Item	€ 400,000.00	€ 400,000.00	Provisional allowance, scope tbc.
Railways - at grade					
New plain line track includes for sleepers, ballast and rails as outlined on the Docklands Station Option B General Layout Drawing.	5534	m	€ 1,500.00	€ 8,301,000.00	AECOM reference project €1,340 per m, rate increased to allow for inflation to Q1 2019.
Signaling systems - Signaling Equivalent Unit (SEU); assumed qty	15	Nr	€ 30,000.00	€ 450,000.00	Rate is benchmarked off AECOM projects of a similar nature.
Allowance for Overhead Line Equipment	1	Item	€ 500,000.00	€ 500,000.00	Allowance further detail required.
Structures					
New Docklands Station building (40m x 20m)	800	m2	€ 1,960.00	€ 1,568,000.00	AECOM reference project Depot extension @ €1,820 per sq m additional allowance carried for inflation
Concourse	322	m2	€ 1,600.00	€ 515,200.00	AECOM Reference project concourse rate per m2.
Allowance for site wide CCTV / Intruder alarms / access control	1	Item	€ 300,000.00	€ 300,000.00	Allowance further detail required.
Redevelopment of West Road Bridge (Allowance)	1	Item	€ 3,500,000.00	€ 3,500,000.00	Scope of works to be confirmed, general allowance until further detail developed.
Platforms					
2 no platforms to be installed as per the engineers drawings and specifications, including excavation for foundations, general excavation, filling, placing of concrete, formwork, reinforcement, manholes, gullies, pipework and ancillaries, ducting and paving, cables etc.	3104	m2	€ 1,600.00	€ 4,966,400.00	AECOM Reference project platform rate per m2.
Canopies to platforms	2328	m2	€ 300.00	€ 698,400.00	Canopies @ £275 per m2 on reference AECOM project in the UK.
Fittings, Furnishings and Equipment					
General fittings, furnishings and equipment	1	Sum	€ 75,000.00	€ 75,000.00	General allowance, full scope unknown
Signs and notices	1	Sum	€ 35,000.00	€ 35,000.00	General allowance, full scope unknown
External Works					
Car Park including line marking drainage, stone base, black top etc.	450	m2	€ 200.00	€ 90,000.00	Rate as per AECOM project tender return Q3 2018, additional allowance made for inflation
Landscaping allowance	1	Item	€ 50,000.00	€ 50,000.00	General allowance, full scope unknown
Electrification					
Allowance for substation	1	Item	€ 650,000.00	€ 650,000.00	Allowance for substation based on AECOM projects of a similar nature
Allowance for overhead electrification of track as far as the northern line	3049	m	€ 1,700.00	€ 5,183,300.00	Allowance for electrification based on AECOM projects of a similar nature
Utilities					
Allowance for electric power and plant	1	Item	€ 8,662,000.00	€ 8,662,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for water supply and distribution	1	Item	€ 4,950,000.00	€ 4,950,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for underground drainage system	1	Item	€ 3,118,000.00	€ 3,118,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for tele-comms	1	Item	€ 514,000.00	€ 514,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Phasing					
Allowance for phasing, working in a live environment and any disruptions that this may cause. Allowance of 5% being carried.				€ 2,450,000.00	Percentage based on projects of a similar nature.
Professionals Fees, Consultants and Contingency					
Preliminaries @ 25%				€ 12,850,000.00	Percentage based on projects of a similar nature.
Professional Fees @ 15%				€ 9,640,000.00	Percentage based on projects of a similar nature.
Allowance for Client fees, compensation costs etc. @ 10%				€ 7,390,000.00	Allowance Client to advise if this is required.
Risk / Contingency @ 30%				€ 24,380,000.00	Risk / Contingency allowed for at 30% due to rail associated works.
Construction Works Total (Excl. VAT)				**€ 105,648,400.00**	
VAT @ 13.5%				€ 14,262,534.00	
Construction Works Total (Incl. VAT)				**€ 119,910,934.00**	
Land Acquisition Costs - Site 1 (Incl. VAT)				€ 4,336,500.00	
Land Acquisition Costs - Site 2 (Incl. VAT)				€ -	
Total				**€ 124,247,434.00**	

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OPTION M - OMC

Description	Qty	Unit	Rate	Total	Comments
Site Clearance / Demolitions					
Existing track to be removed as outlined on the Docklands Station Option M General Layout Drawing.	3967	m	€ 550.00	€ 2,181,900.00	Benchmarked from an AECOM project involving a Depot extension and removal of existing tracks
Additional excavation works as tracks leading into platform at a lower level	9775	m3	€ 20.00	€ 195,500.00	Further detail required to confirm quantum, currently allowing an assumed quantity, rate is based on current market rates
Extra over for disposal of material off site	9775	m3	€ 35.00	€ 342,100.00	Further detail required to confirm quantum, currently allowing an assumed quantity, rate is based on current market rates
Railways - at grade					
New plain line track includes for sleepers, ballast and rails as outlined on the Docklands Station Option M General Layout Drawing.	4427	m	€ 1,500.00	€ 6,640,500.00	AECOM reference project €1,340 per m, rate increased to allow for inflation to Q1 2019.
Signaling systems - Signaling Equivalent Unit (SEU); assumed qty	10	Nr	€ 30,000.00	€ 300,000.00	Rate is benchmarked off AECOM projects of a similar nature.
Allowance for Overhead Line Equipment	1	Item	€ 500,000.00	€ 500,000.00	Allowance further detail required.
Structures					
New Docklands Station building (40m x 20m)	800	m2	€ 1,960.00	€ 1,568,000.00	AECOM reference project Depot extension @ €1,820 per sq m additional allowance carried for inflation
Concourse	671	m2	€ 1,600.00	€ 1,073,600.00	AECOM Reference project platform extenstion rate per m2.
Allowance for site wide CCTV / Intruder alarms / access control	1	Item	€ 300,000.00	€ 300,000.00	Allowance further detail required
Overbridge required as platforms and track will need to run under Sheriff Street Upper	1	Item	€ 18,000,000.00	€ 18,000,000.00	Allowance as per AECOM reference project, further detail required to develop costs further.
Redevelopment of West Road Bridge (Allowance)	1	Item	€ 3,500,000.00	€ 3,500,000.00	Scope of works to be confirmed, general allowance until further detail developed.
Platforms					
2 no platforms to be installed as per the engineers drawings and specifications, including excavation for foundations, general excavation, filling, placing of concrete, formwork, reinforcement, manholes, gullies, pipework and ancillaries, ducting and paving, cables etc.	3104	m2	€ 1,600.00	€ 4,966,400.00	AECOM Reference project platform rate per m2.
Canopies to platforms	2328	m2	€ 300.00	€ 698,400.00	Canopies @ £275 per m2 on reference AECOM project in the UK.
Fittings, Furnishings and Equipment					
General fittings, furnishings and equipment	1	Sum	€ 75,000.00	€ 75,000.00	General allowance, full scope unknown
Signs and notices	1	Sum	€ 35,000.00	€ 35,000.00	General allowance, full scope unknown
External Works					
Car Park including line marking drainage, stone base, black top etc.	450	m2	€ 200.00	€ 90,000.00	Rate as per AECOM project tender return Q3 2018, additional allowance made for inflation
Landscaping allowance	1	Item	€ 50,000.00	€ 50,000.00	General allowance, full scope unknown
Pumping Station	1	Item	€ 150,000.00	€ 150,000.00	General allowance based off projects of a similar nature, further details relating to the pumping station will be required to develop the costs further.
Electrification					
Allowance for substation	1	Item	€ 650,000.00	€ 650,000.00	Allowance for substation based on AECOM projects of a similar nature
Allowance for overhead electrification of track as far as the northern line	2276	m	€ 1,700.00	€ 3,869,200.00	Allowance for electrification based on AECOM projects of a similar nature
Utilities					
Allowance for electric power and plant	1	Item	€ 6,929,000.00	€ 6,929,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for water supply and distribution	1	Item	€ 3,960,000.00	€ 3,960,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for underground drainage system	1	Item	€ 2,494,000.00	€ 2,494,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Allowance for tele-comms	1	Item	€ 411,000.00	€ 411,000.00	Allowance based on AECOM projects of a similar nature, full extent of services requirements are not yet known.
Phasing					
Allowance for phasing, working in a live environment and any disruptions that this may cause. Allowance of 5% being carried.				€ 2,950,000.00	Percentage based on projects of a similar nature.
Professionals Fees, Consultants and Contingency					
Preliminaries @ 25%				€ 15,480,000.00	Percentage based on projects of a similar nature.
Professional Fees @ 15%				€ 11,610,000.00	Percentage based on projects of a similar nature.
Allowance for Client fees, compensation costs etc. @ 10%				€ 8,900,000.00	Allowance Client to advise if this is required.
Risk / Contingency @ 40%				€ 29,380,000.00	Risk / Contingency allowed for at 40% due to rail associated works.
Construction Works Total (Excl. VAT)				**€ 127,299,600.00**	
VAT @ 13.5%				€ 17,185,446.00	
Construction Works Total (Incl. VAT)				**€ 144,485,046.00**	

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OPTION M - OMC

Description	Qty	Unit	Rate	Total	Comments
Land Acquisition Costs - Site 1 (Incl. VAT)				€ 4,336,500.00	
Land Acquisition Costs - Site 2 (Incl. VAT)				€ 73,100,000.00	
Total				**€ 221,921,546.00**	

BASIS OF ESTIMATE

Design Information Used

1. Docklands Station Option A General Layout (Rev -)
2. Docklands Station Option A Station Layout (Rev -)
3. Docklands Station Option B General Layout (Rev -)
4. Docklands Station Option B Station Layout (Rev -)
5. Docklands Station Option C General Layout (Rev -)
6. Docklands Station Option C Station Layout (Rev -)
7. Docklands Station Option M General Layout (Rev -)
8. Docklands Station Option M Station Layout (Rev -)
9. Docklands Station Option A Vertical Profile
10. Docklands Station Option B Vertical Profile

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NOTES, ASSUMPTIONS & EXCLUSIONS

Assumptions

1. The main contract will be competitively tendered to pre-qualified competent contractors
2. Assumes work to be carried out in a single continuous and uninterrupted phase.
3. Works to be carried out during normal working hours.
4. Allowances for external works including; site services, site structures, landscaping etc. have been assumed and will require development.
5. Allowances for the overbridge on Sheriff Street Upper and the redevelopment of West Road Bridge have been assumed and will require development.
6. Assumed that no problems will be encountered with contaminated soil, rock or high water table.
7. Assumed that the project will be 100% design by clients design team. No allowance in preliminaries for contractor design input.
8. Assumed that there will not be any Luas contributions or other special contributions
9. Acquisition of Land costs included as per GVA Donal O Buachalla Report and Valuation dated January 2019
10. Allowance made for electrification to the northern line, details relating to electrification requried to provide a more robust costing.

Exclusions

1. Whole Life costing of the project.
2. Piling
3. Inflation as no indication of proposed construction period.
4. Excludes work associated with Environmental Impact.
5. Scope changes and post contract contingencies.
6. Compression of schedule, premium or shift work, and restrictions on the contractor's working hours are excluded.
7. Legal, accounting and agents fees
8. Additional works required due to unforseen ground conditions such as hazardous materials, rock, water etc.
9. Client Insurances
10. Boundary treatments such as walls and fences
11. Infrastructure upgrades outside the site boundaries
12. Costs associated with / resulting from archaeology discovery
13. Costs associated with additional planning conditions.
14. No allowance included for contractor design elements.
15. Any bridge rebuilds that may be required for future electrification

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Appendix C Operational Assessment

C.1 Methodology

The operations review aims to quantify the ability of the station to handle different timetables.

Each of options A and B is initially tested to establish the maximum trains per hour per direction. This depends on:

Number of platforms accessible to and from that route. Because a greater number of trains on one route implies a lesser number on another route, the assumption is made that any platforms accessible by more than one route will be available at the time they are needed by the busier route.

Minimum turnaround time spent in the platform. This is ideally 8 minutes but shorter times may be acceptable subject to measures such as driver step-back and a possible performance penalty. The minimum turnaround time to achieve a particular service frequency is calculated and represents a measure of service robustness.

Platform re-occupation time, from the departure of one train to the arrival of another train in the same platform. It has four components:

- Time from the first train starting to move until its tail is clear of the last point of conflict with an incoming train on the same route. This is assessed via AECOM's ARTEM model, using recorded performance data of an 8-car DART unit and the gradients and permitted speeds predicted for the station area.
- 10s for the setting of points and signals for the second train.
- 7s for the driver of the second train to observe and react to the signal ahead changing from yellow to green.
- Time from the second train passing (at line speed) the signal before the signal protecting the platform approach, until it stops at the platform. This is also taken from ARTEM and represents an approach without signal checks.

The minimum sustained interval can be reduced for a short period, if several platforms are simultaneously empty for trains to arrive in quick succession, but such a period will be preceded and followed by a period during which the normal minimum sustained interval is not achievable.

Consideration is also given to whether arriving and departing trains conflict with each other. A conflict occurs when all of the following apply at any moment:

- A departing train is somewhere between starting to move in the platform and its tail passing over the last point of conflict with an arriving train.
- An arriving train is somewhere between passing the signal before the signal protecting the station approach and stopping in the platform.
- The two trains must take conflicting rather than parallel routes.

The duration of the first two conditions is the same as the times calculated when assessing the platform reoccupation time. The third condition depends on track layout, but for a simple layout with parallel tracks to two available platforms, linked by two crossovers, it represents a probability of 50%. The probability of conflict increases with the number of accessible platforms, so adding extra platforms does not increase the station capacity proportionately. It also tends to result in longer turnaround times for trains, thereby reducing the efficiency of train utilisation.

Capacity at both Connolly and Docklands is maximised if trains to and from the same station pass each other close to the three junctions where their routes diverge. To facilitate this, and to maximise the use of the 20tphpd nominal capacity of each route, timetables are based on intervals at the three junctions being multiples of 3min.

C.2 Assumptions

Platform numbering at Docklands is assumed to run from south/west to north/east.

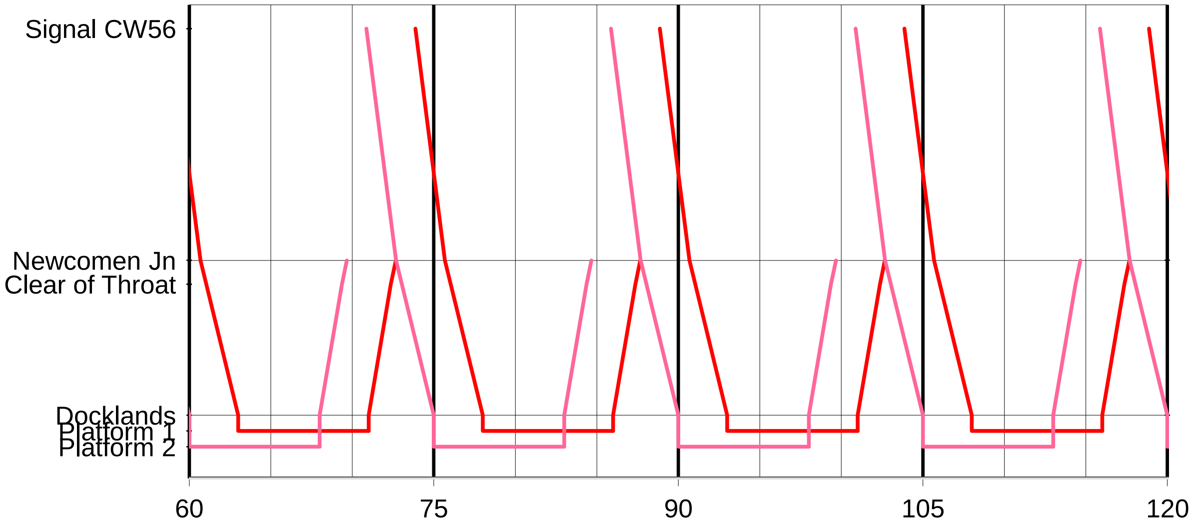
Train performance is based on acceleration recorded for a DART unit, and a braking rate in normal operation of $0.78 m/s^2$. A greater braking rate may be available but is assumed not to be used in normal operation. On entering a section with a greater permitted speed, the train does not accelerate until its front is 8 car lengths beyond the start of the section.

Permitted speeds on unmodified track are taken from the Irish Rail Working Timetable, with any available speed information from signalling plans being used to confirm exact position of restrictions. The speeds as quoted in km/h are taken as definitive.

In the Docklands area the speeds developed for the proposed layouts are used, with all trains assumed to take a turnout route and therefore not take advantage of any faster “straight through” speeds. A 15km/h speed is assumed for arriving trains within the platforms.

Unless otherwise shown on signalling plans, speed restrictions for lower-speed diverging junctions are assumed to apply from the signal protecting the junction.

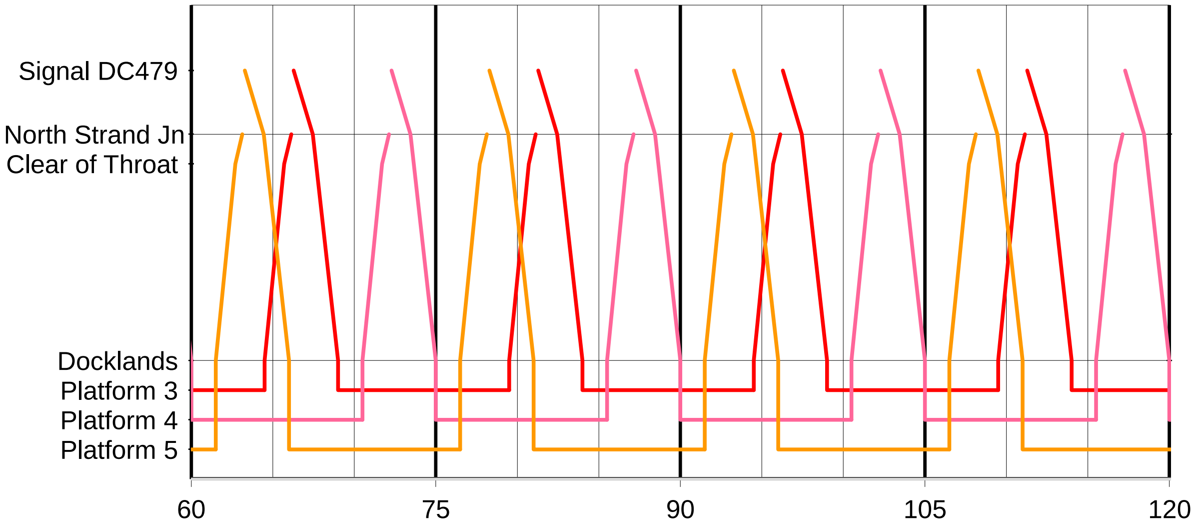
C.3 Option A Results



Graph for Option A via Newcomen Junction

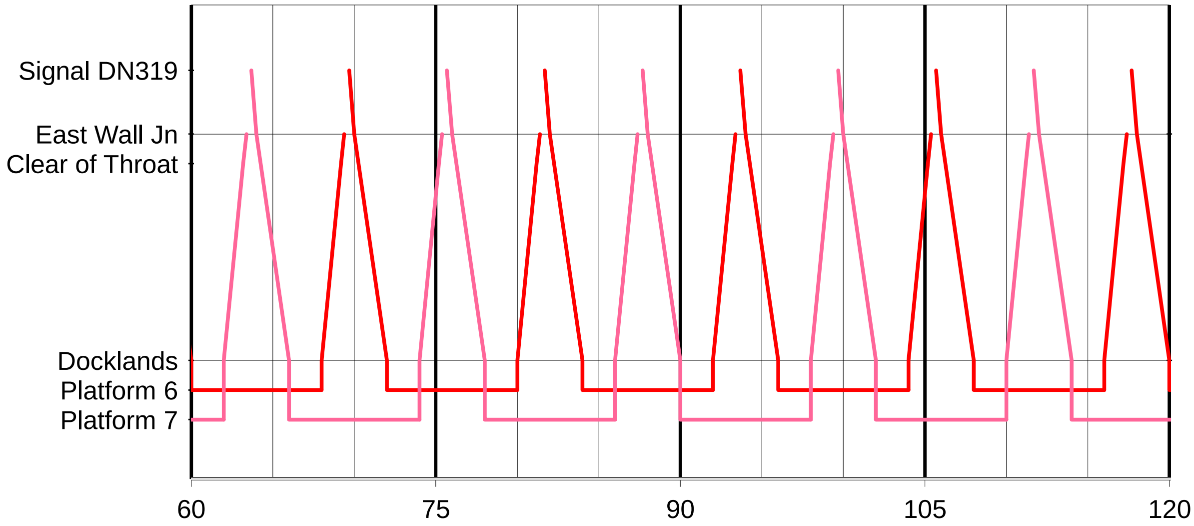
Trains accessing Option A via Newcomen Junction use the existing tracks and station. The platform re-occupation time is significantly longer than for the other routes, because there is insufficient length for a signal between the platforms and Newcomen Junction so the route into the platform must be available much earlier for the approaching train to avoid signal checks. Lack of these signals in both directions is also a risk to reliable operation if significant numbers of trains are routed via Newcomen Junction to both Connolly and Docklands, as the route has to be available over both the station throat and the junction for a Docklands train to proceed.

Hence the maximum achievable service is 8tphpd, shown as solid lines. The figure above shows an uneven service with trains passing each other close to Newcomen Junction at multiples of 3min intervals. This maximises the capacity available for Connolly trains by this route. Alternatively, if there was no significant Connolly service via Newcomen Junction, a more even interval could be worked into Docklands at the same frequency.



Graph for Option A via North Strand Junction

Option A includes a third platform having access to and from the route via North Strand Junction. However the number of potential conflicts between incoming and outgoing trains limits the benefit of the extra platform. The service shown above gives 12tphpd, spaced at multiples of 3min but with the turnaround time extended to 10.5min. Alternatively a 10tphpd service could be operated using only two platforms and turnarounds of 7.5min.

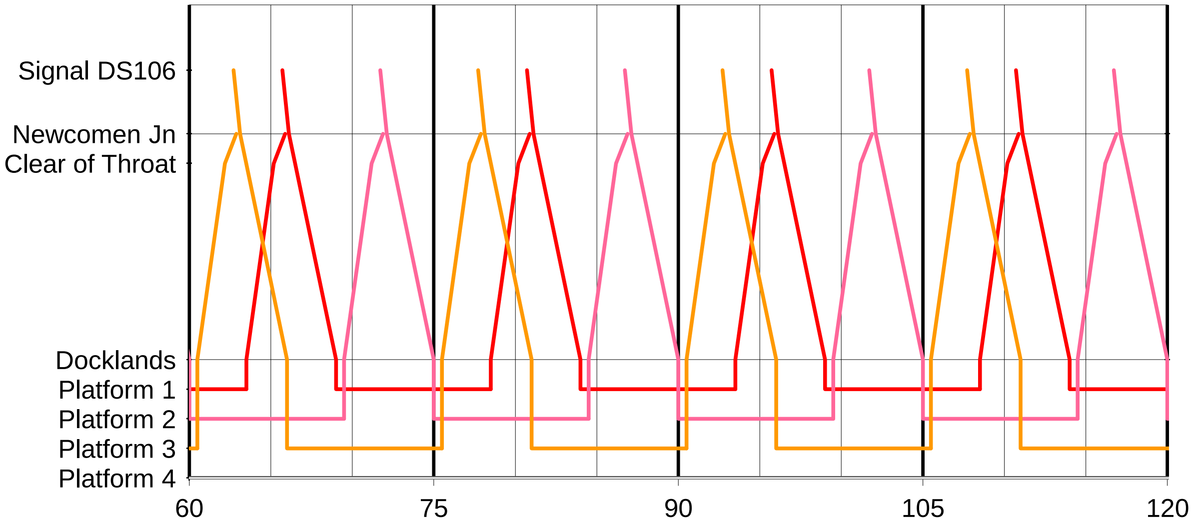


Graph for Option A via East Wall Junction

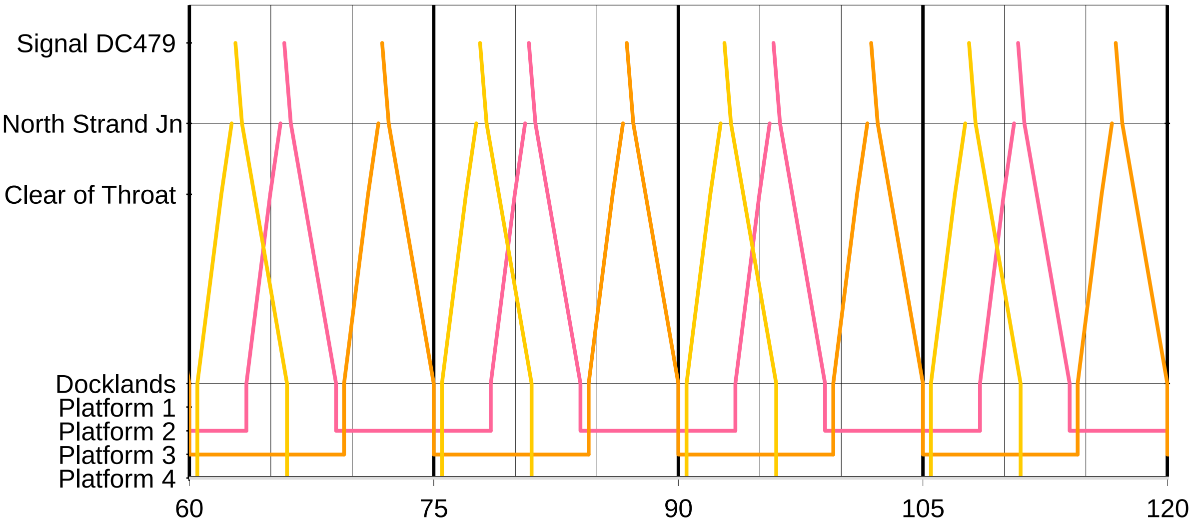
For the route via East Wall Junction the maximum service with an 8min turnaround is 10tphpd. This service has trains at regular 6min intervals, passing each other close to East Wall Junction, so is consistent with maximising the number of trains on the Northern line assuming it is signalled for 20tphpd.

Time (minutes:seconds)	Via Newcomen Jn	Via North Strand Jn	Via East Wall Jn
Departing train to clear throat	1:22	1:12	1:11
Arriving train from second signal	4:08	2:43	2:19
Interlocking and point operation and signal sighting	0:17	0:17	0:17
Platform re-occupation time, sum of above	5:47	4:12	3:50
Sustained trains per hour (turnaround ≥8min, service interval multiple of 3min)	8	12	10

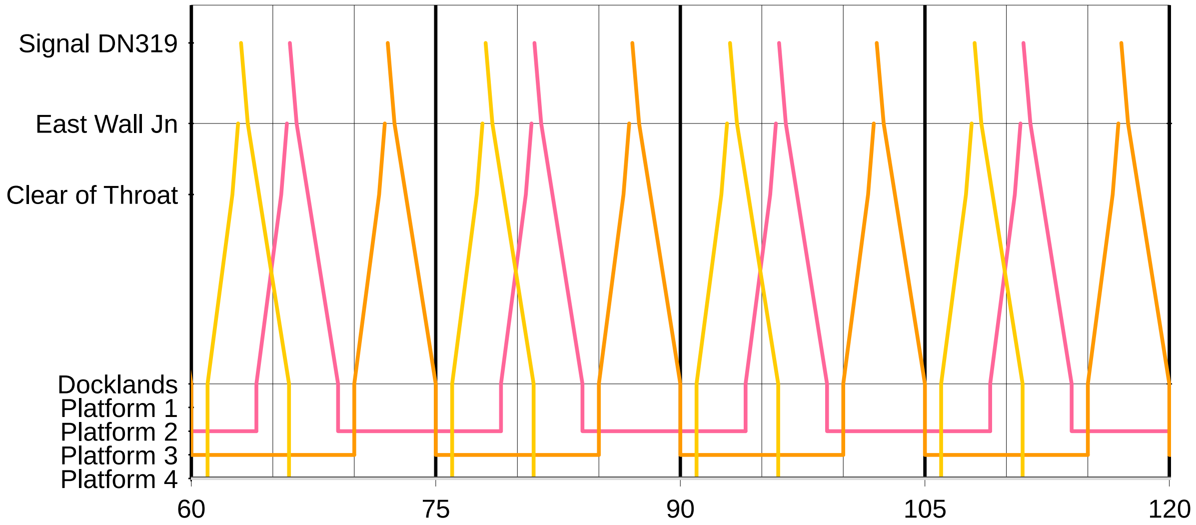
C.4 Option B Results



Graph for Option B via Newcomen Junction



Graph for Option B via North Strand Junction



Graph for Option B via East Wall Junction

Platform re-occupation times are very similar for the three routes, and therefore a similar service is possible on each route before consideration of conflicting services. In each case 12tphpd can be operated with exclusive use of three platforms. Turnaround time is 10min for the route via East Wall and 9.5min for the other two routes. Reducing turnaround to 7min and 6.5min respectively would allow 10tphpd per route on two platforms, but this short turnaround is unlikely to be operationally robust unless using driver step-back.

However these services cannot be operated simultaneously because they share platform and throat tracks. The figure above gives possible combinations based on specific platforms either being dedicated to the Newcomen Junction route or shared between the other two routes. In these scenarios the station operates as two independent stations with no track shared between them. There are some constraints on scheduling trains towards East Wall Junction and from North Strand Junction simultaneously.

Time (minutes:seconds)	Via Newcomen Jn	Via North Strand Jn	Via East Wall Jn
Departing train to clear throat	1:41	1:28	1:33
Arriving train from second signal	3:17	3:10	2:57
Interlocking and point operation and signal sighting	0:17	0:17	0:17
Platform re-occupation time, sum of above	5:15	4:55	4:47
Sustained trains per hour (turnaround ≥8min, service interval multiple of 3min, no conflicting services on other routes)	12	12	12
Maximum simultaneous services (subject to some constraints on timetabling conflicting routes)	4	12 shared between the routes	
	8	8 shared between the routes	
	12	4 shared between the routes	

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APPENDIX C DOCKLANDS STATION OPTIONS STUDY ADDENDUM TRANSPORT MODELLING REPORT

Docklands Station Options Study

Addendum Transport Modelling Report

February 2020

NTA
Údarás Náisiúnta Iompair
National Transport Authority

AECOM Imagine it. Delivered.

Quality information

Prepared by	Checked by	Verified by	Approved by
Damien Lambert	Ian Taylor	Shane Dunny	Damien Lambert

Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	23/12/2019	Addendum report			
2	6/2/2020	NTA comments incorporated			

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Contents

1. Introduction

The NTA has requested AECOM to carry out further analysis of the Emerging Preferred Options for Dockland DART Station. This analysis builds on the previous assessment carried out by AECOM for the redevelopment and potential relocation of Docklands Station. This report is presented as an addendum to the Sift 2 report and should be read in conjunction with this previous analysis.

The analysis presented in this addendum report includes transport modelling of the two Emerging Preferred Options, Option A and Option B, using the NTAs Eastern Regional Model (ERM) and TUBA appraisal software.

This approach allows for the quantification of benefits accruing from each option (within the context of the wider DART Expansion Programme) to be compared against the incremental cost differences between the two options.

Costs used in the analysis are the cost estimates developed previously by AECOM as part of the Sift 2 assessment.

2. Objectives

The objectives of this phase of the project are to;

- Develop transport models for Option A and Option B.
- Develop potential economic benefits accruing from each option and compare the strength of the case for both options.
- Facilitate the NTA decision making processes.

3. Background

Previously the National Transport Authority (NTA) has appointed AECOM to undertake a Docklands Station Options Study to determine the preferred location and layout of Docklands DART Station. This study has been carried out in two phases and is detailed in reports previously submitted, including;

Sift 1 Report[1]

The Sift 1 report identified a long list of potential variants of Docklands station. Options were then subjected to a high level pass/fail assessment which considered technical, environmental and planning constraints. Options which failed this assessment were discarded and not taken forward for further analysis. Options which passed this assessment were then taken forward for further analysis within the Sift 2 assessment. Based on this approach four of the twelve options were shortlisted for further assessment.

These included;

- Option A
- Option B
- Option C
- Option M

Figure 1: Long list of Site Options identified as part of assessment

Sift 2 Report[2]

In the Sift 2 report, short listed options were further developed and subjected to a multi-criteria assessment. This process ranked each option with regard to economy, integration and environmental impact. This process found that the two best preforming options for Docklands Station were as below;

- Option A
- Option B

While Option A benefits from the lower level of investment required to develop the site, the adjacent dedicated cycle routes and the presence of attractive walking routes along the canal, Option B performs strongly given its closer proximity to higher density employment zones on the south and western side of the study area.

3.1 Option A

Option A is located on the existing site of the current Docklands Station. In this option the existing platforms are retained without modification and continue to serve the route via Newcomen Junction, with the new platforms and canopies to be developed to the east of the current station. The existing station building is to be modified with an eastward extension to access these new platforms. Passenger access to and from the new station would continue via the existing western (at-grade) entrance, leading to a walkway under the Sheriff Street Upper viaduct and along the canal bank to Mayor Street Upper. Additional access is provided onto Sheriff Street Upper via lifts and stairs, and by a new route from the east of the extended building through an existing span of the Sheriff Street Upper viaduct to reach the north end of Park Lane.

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[1] Docklands Station Options Study Sift 1 Report, AECOM, December 2018

[2] Docklands Station Options Study Sift 2 Report, AECOM, February 2019

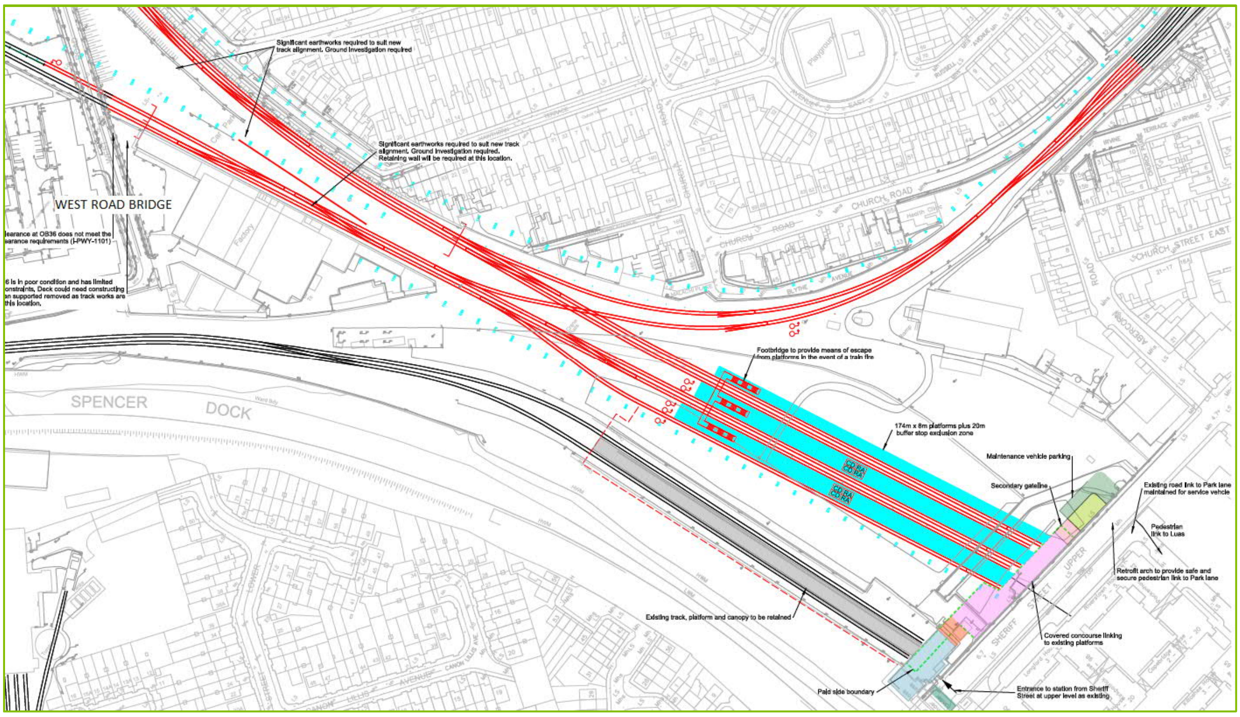

Figure 2: Extract from Option A General Layout

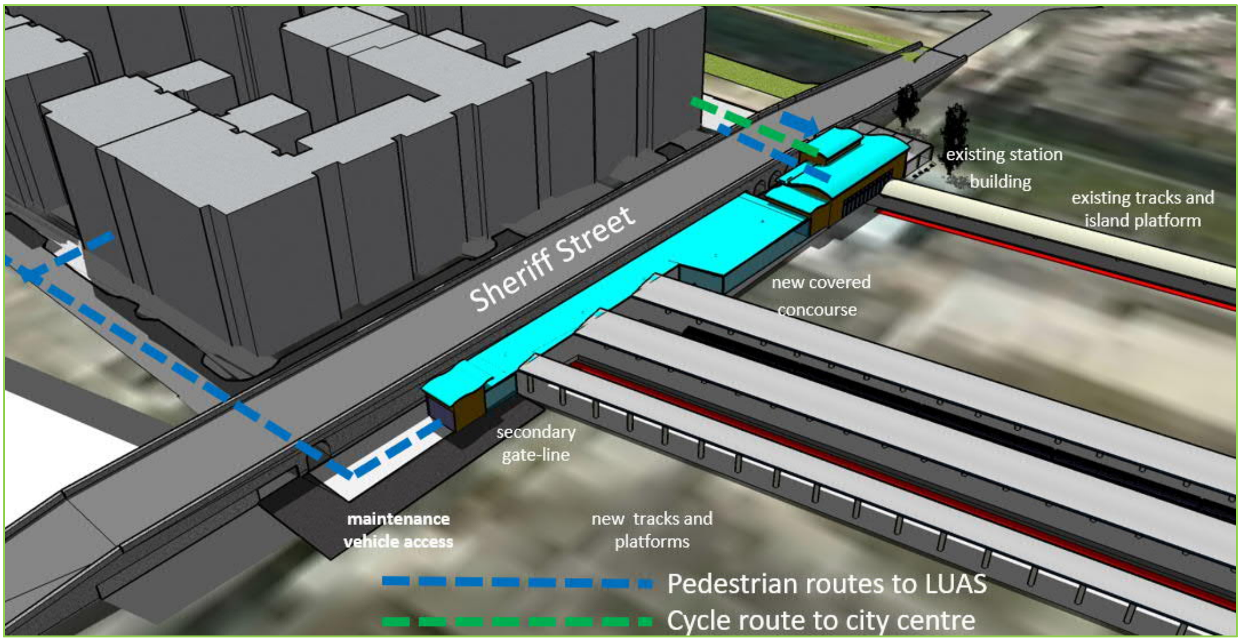

Figure 3 Option A Design Model

3.2 Option B

Option B occupies a site south east of the existing Dockland Station, adjacent to the Spencer Dock LUAS station. To keep the four platforms straight and to limit curves outside the platform to a 200m radius, the platforms of option B have been angled relative to Park Lane. The southern end of the eastern platform track is now at the western boundary of the development now under construction between Mayor Street Upper, New Wapping Street and Sheriff Street Upper. The station building is located west of the tracks, between the buffer stops and Park Lane with a cross-walk separating the buffer stop exclusion zones from Mayor Street.

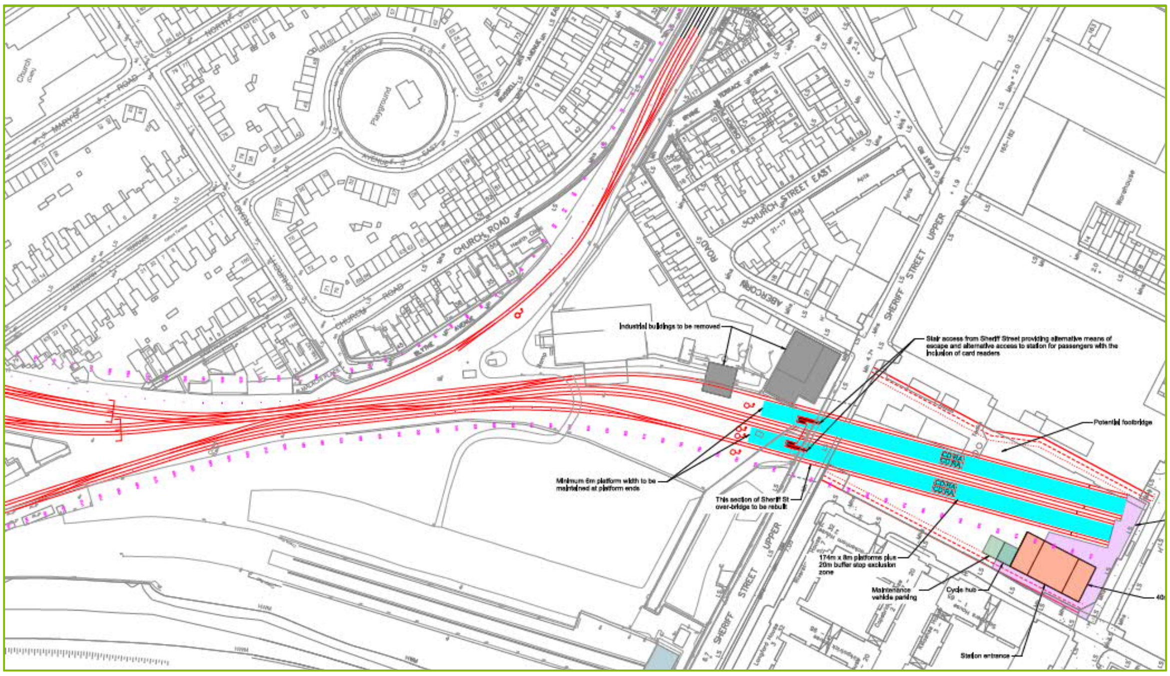

Figure 4: Extract from Option B General Layout

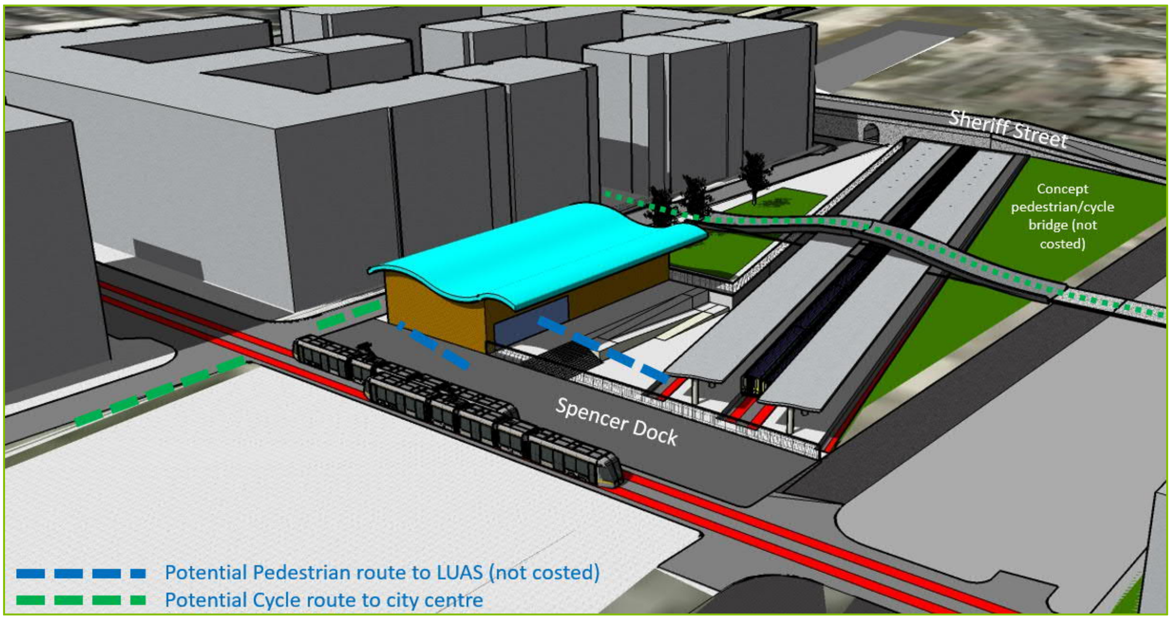

Figure 5 Option B Design Model

4. Transport Modelling

The Easter Regional Model 2.6.1 has been used to test two different locations for the proposed Docklands DART Station.

The model has been run for two forecast years 2026 and 2057 for the Do Minimum and for the two scheme scenarios.

This addendum report outlines the results of the modelling and the cost benefit analysis run to compare the two options.

4.1 Do Minimum Scenario

Ideally the Do Minimum scenario should represent the case without Docklands station so that the impact of including the station could be isolated. Given that the Docklands station is an intrinsic part of the proposed DART network upgrade it is difficult to devise a scenario that includes all proposed DART upgrades with the exception of an upgrade to Docklands station.

Consequently, the Do Minimum scenario for the tests has been the Do Minimum scenario as provided by the NTA. The Do Minimum network represents a scenario prior to the DART upgrade and only includes committed schemes.

Given that the primary objective is to compare different configurations of the Docklands station, this is considered reasonable since the primary comparison will be between the two do something scenarios rather than between the do something and Do Minimum scenarios.

The Do Minimum model scenarios used represented years 2026 and 2057.

4.2 Test Scenarios

Two test scenarios were coded using the Do Minimum scenario as a base. The test scenarios differ only by the location of Docklands Station.

4.2.1 Scenario A Coding

Docklands station was coded at the same location as the existing station as shown in Figure 2 above.

4.2.2 Scenario B Coding

Docklands station was coded at a location adjoining the existing Spencer Dock Luas station as shown in Figure 4 above. Walk links[3] were coded connecting the DART station to Luas station and the surrounding walk network.

4.2.3 Rail services Coding

For both options, the service patterns and frequencies were coded to reflect those given in DART Expansion Programme Options Assessment Addendum Report Bundle 6 Enhanced TSS Option 1 (Balanced City Centre Distribution).

Bus and Luas services were unchanged from the Do Minimum network. The change in the number of commuter rail services by operator, is shown in Table 1. The reduction in commuter rail services is due to some rail routes being converted to DART routes.

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[3] Walk links are along public footpaths, costs not included in Table 5 costs but assumed to be minimal.

Table 1 Average number of services run per hour

	DM		Test Scenarios A and B	
	AM	IP	AM	IP
DART services	12.0	8.0	90.0	50.0
Commuter Rail services	65.0	33.7	33.0	23.0
LUAS Services	74.1	72.0	74.1	72.0
TOTAL	**151.1**	**113.7**	**197.1**	**145.0**

Thus the difference between Option A and Option B is solely the location of the Docklands station.

The Docklands station is served by 24 (27%) of the 90 peak hour services and by 14 (28%) of the 50 inter peak DART services.

4.3 Model Runs

The full ERM variable demand model was run for 2026 and 2057 for scenario A and B. Each demand-supply model was allowed to run for 12 iterations.

4.4 Results

An assessment was made of passenger boardings by mode across the network to identify differences between the two scenarios. Total average weekday rail passenger boardings for each scenario are shown in Table 2 and Table 3 below. In these tables values refer to train boardings rather than passenger journeys so any journey requiring interchange would count as two or more boardings.

The results show that the additional rail services lead to an overall increase in rail based public transport of around 27% in both 2026 and 2057 compared to the Do Minimum services, with a 300% - 400% increase in DART use, coupled with some reduction in demand on Rail and LUAS.

Comparing the two test options the results show that they return broadly similar overall numbers of passengers.

Table 2 Network Passenger Boardings (2026)

	DM	Scenario A	Scenario B
DART	68,314	210,899	209,611
Rail	112,710	79,702	79,636
LUAS	162,160	146,464	145,087
TOTAL	**343,183**	**437,066**	**434,334**

Table 3 Network Passenger Boardings (2057)

	DM	Scenario A	Scenario B
DART	110,045	398,013	398,898
Rail	244,745	164,818	163,705
LUAS	301,298	264,010	264,409
TOTAL	**656,089**	**826,841**	**827,012**

The numbers of passengers boarding and alighting at the Docklands station in the two scenarios during an average 12-hour weekday is shown in Table 4. The results show that there is little difference between the two locations with Option B attracting around 110 (2%) more passengers than Option A in 2026 and 915 (5%) more passengers in 2057.

Table 4 Docklands Station Boarding and Alighting

	Scenario A		Scenario B	
	2026	2057	2026	2057
Boarding	2,589	8,193	2,691	8,516
Alighting	3,227	8,962	3,237	9,553

5. TUBA Analysis

A cost benefit analysis to compare the benefits of Scenario A and Scenario B has been carried out using TUBA v1.9.4. Cost skims for highway and public transport modes have been extracted from the model using a standard TUBA output process included within the model. The analysis has been carried out in accordance with 'TII PAG Unit 6.3: Guidance on Using TUBA' and the 'Common Appraisal Framework'.

The opening year for DART Expansion has been assumed to be 2025 and the assessment has been carried out over 60 years, a 30-year appraisal period and a 30-year residual period. The NTA standard cost and economic parameters have been used in the assessment. A discount rate of 4% is applied for years 1-30 and 3.5% for years 31-60.

Table 5 Scheme Costs (€ million)

	Option A € million	Option B € million	Difference € million
Docklands Station Construction Costs[4]	81.01	121.86	40.85

Table 6 TUBA Benefit Outputs (€ million)

	Option B minus Option A € million
Highway	133.78
PT	-43.20
Greenhouse gas	-0.02
Indirect tax	2.89
Revenue	-8.71
Total	**84.74**

A Benefit to Cost ratio is not reported since the costs reported above relate directly to the costs of the Docklands station construction but do not fully reflect the total cost of the changes to the service patterns between the Do Minimum and Do Something scenarios.

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[4] Docklands Station Study Sift2, OMC Cost Report, AECOM, 2019

6. Validation

Given the scale of the NTA ERM compared to the scale of the Docklands Station intervention being tested, it was deemed prudent to undertake a realism test to validate the findings. For this test the time saving benefits for Option B (associated with the walk time reduction between the station and the high density employment zones on the south quay) were calculated for a range of travel time reductions. This showed that walk time reductions of approximately 96 seconds were required to generate time saving benefits equivalent to the €40.85 million additional investment required to deliver Option B. Even with investment in pedestrian links between Option A and the south quays it is not considered feasible to achieve the same connectivity. Conversely, additional investment in the area (such as planned Liffey pedestrian bridges) would reduce the travel time between the station and the south quay even more and increase benefits further.

This test was carried out using value of time rates as given in the CAF and excludes benefits arising from highways, public transport and other sources.

7. Summary of Findings

This exercise has been carried out to compare the two potential locations for the Docklands station.
Both scenarios tested include very large scale changes to the public transport networks, the one difference between the two was the location of the Docklands station. Thus the TUBA results for the two tests were very similar. Overall both options perform well and generate additional benefits resulting from the changes to rail services. These changes bring about a large-scale change in the public transport demand, significant increases in overall public transport usage and benefits to public transport users as demonstrated by the TUBA output.

While this analysis shows the overall TUBA benefits of Option B to be €84.7 million greater than Option A, the public transport benefits of Option B are €43.2 million lower than for Option A, and the highway benefits of Option B are €133.78 million greater than Option A. These differences between the two scenarios were less than 1% of overall PT travel benefit and less than 2% of overall benefits in terms of the impact of either scenario. These proportions are very low in terms of the sensitivity of the model and at this network wide level are too small to suggest that there is a significant difference between the two schemes in this regard.

In terms of boardings, Scenario B showed higher levels of usage than Scenario A in the long term which suggests that, of the two, this scenario was performing better at a local level.

Overall, given the location of Option B closer to high density offices and improved interchange with Luas and Bus (both of which are realised through higher passenger usage) it is concluded that Option B would provide a positive return on the additional investment costs and is aligned with long term transport policy for the region.

SUMMARY REPORT – DOCKLANDS STATION OPTIONS STUDY

APPENDIX D GIS ANALYSIS OF DOCKLANDS STATION CATCHMENT

National Transport Authority

TO119 – Dart Expansion

Report and Methodology

May 2020

compassinformatics.ie • compassinformatics.eu • compassinformatics.co.uk

TO119 – Dart Expansion Report

Population:

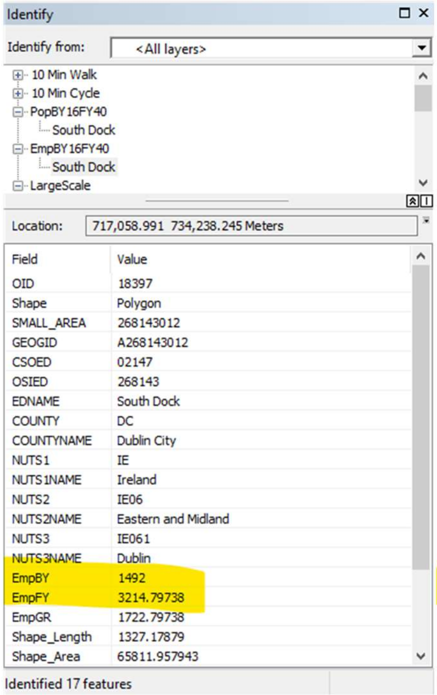
		Location A	Location B	Location A - With BSB	Location B - With BSB
Within 0-5 min Walk	**Population 2016**	1813	1290	1813	1291
	Population 2040	2456	1903	2456	1908
Within 0-10 min Walk	**Population 2016**	6870	6629	6980	7595
	Population 2040	9891	9933	10233	12260
Within 0-10 min Cycle	**Population 2016**	56157	53103	56326	53412
	Population 2040	69989	66611	70158	66920

In location A there should be no difference in the numbers with and without the Blood Stoney Bridge as the bridge is not within the 5 min walk service area. Only a very slight difference in Location B.

Employment:

		Location A	Location B	Location A - With BSB	Location B - With BSB
Within 0-5 min Walk	**Work 2016**	1324	1485	1324	1495
	Work 2040	1994	2541	1994	2569
Within 0-10 min Walk	**Work 2016**	10382	10464	10469	11687
	Work 2040	17385	17662	17521	19737
Within 0-10 min Cycle	**Work 2016**	88743	86832	88843	87033
	Work 2040	135010	131871	135118	132109

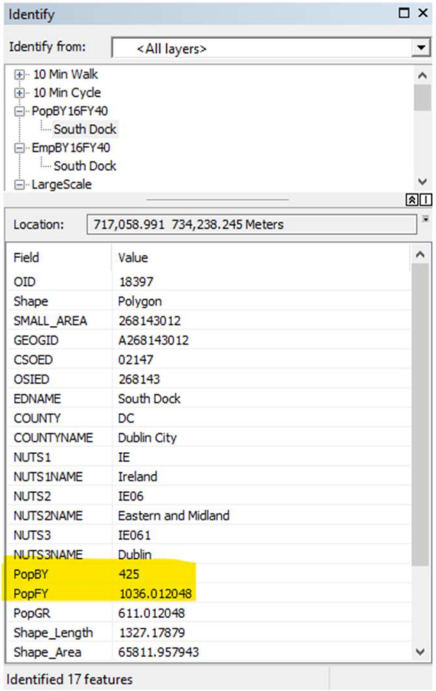
Employment figures are significantly higher than population particularly at the further distances from the two proposed DART locations. We verified that this was correct manually. Looking at the areas just south of the River Liffey, there is a significantly higher employment number than population. Screenshots shown below are an example of this.



Location: 717,058.991 734,238.245 Meters

Field	Value
OID	18397
Shape	Polygon
SMALL_AREA	268143012
GEOGID	A268143012
CSOED	02147
OSIED	268143
EDNAME	South Dock
COUNTY	DC
COUNTYNAME	Dublin City
NUTS1	IE
NUTS1NAME	Ireland
NUTS2	IE06
NUTS2NAME	Eastern and Midland
NUTS3	IE061
NUTS3NAME	Dublin
EmpBY	1492
EmpFY	3214.79738
EmpGR	1722.79738
Shape_Length	1327.17879
Shape_Area	65811.957943

Identified 17 features



Location: 717,058.991 734,238.245 Meters

Field	Value
OID	18397
Shape	Polygon
SMALL_AREA	268143012
GEOGID	A268143012
CSOED	02147
OSIED	268143
EDNAME	South Dock
COUNTY	DC
COUNTYNAME	Dublin City
NUTS1	IE
NUTS1NAME	Ireland
NUTS2	IE06
NUTS2NAME	Eastern and Midland
NUTS3	IE061
NUTS3NAME	Dublin
PopBY	425
PopFY	1036.012048
PopGR	611.012048
Shape_Length	1327.17879
Shape_Area	65811.957943

Identified 17 features

Notes:

The map outputs from this project are only used for this report. Should this report be published, the NTA will need to include their licence information for the OSI basemap used in the maps.

The service areas outputs from the network analysis would ideally be clipped to remove any areas that a user could not walk, such as over water. We have decided not to do this for two reasons:

1. The sample data provided by the NTA did not have this clipped. We decided to leave the data as produced so the NTA could see our generated data was the exact same as their supplied data.
2. The employment and population data supplied by the NTA was not cropped by the Liffey. Cropping our data would reduce the surface area of our analysis while not reducing it for the population or employment area. This would affect accuracy of our results. Ideally both the employment and population data and our service areas would be cropped before analysis.

Future Recommendations:

Should this analysis need to be repeated this task could be automated to produce the outputs for this task. Distance of the service area, mode of transport (walking or cycling) and what statistics are output could all be selected by the user before running the tool to produce an excel output. Map generation could also be completed by this script once a map template was supplied to the tool.

TO119 – Dart Expansion Methodology

Datasets provided for this analysis:

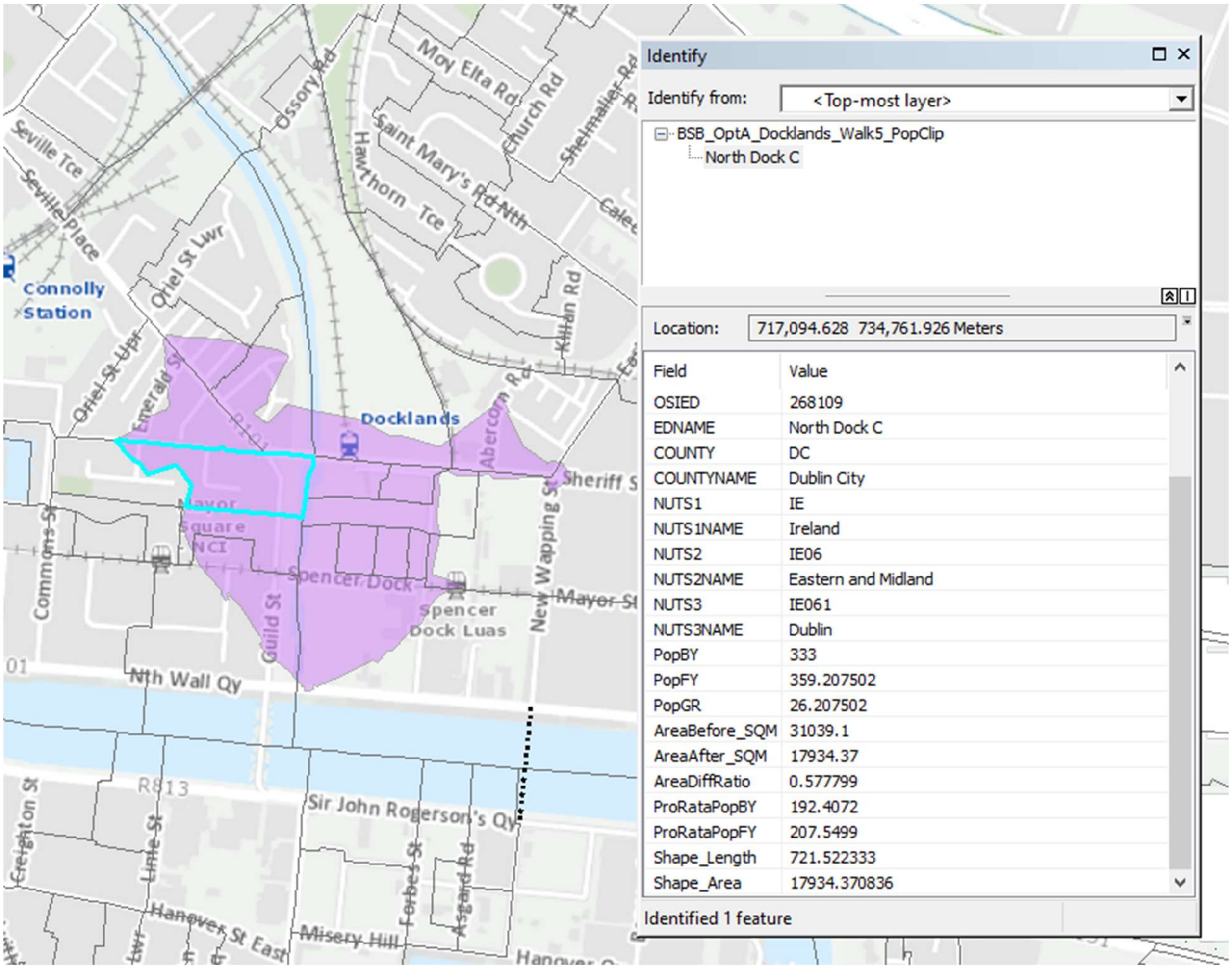
- Location data for the two proposed locations, Docklands and Spencer Dock, for the new DART station.
- NTA Network
- EmpBY16FY40 (Employment data for 2016 and 2014)
- PopBY16FY40 (Population data for 2016 and 2014)

Steps:

1. The dataset provided by the NTA did not include a cost for cycling, therefore this cost had to be added as an attribute to the network in advance of performing the network analysis. This was done by calculating time in minutes to cycle a section of the network. This was done using the provided attribute of 12km/h cycling speed and the length of the network section.
2. Rebuild the network including the cycle cost this time.
3. Duplicated the previous dataset containing the network. Edited this network to include Blood Stoney Bridge. Rebuild network.
4. Using the network analysis tool create service areas for the following:
    - 5 mins walk from locations A and B using regular network.
    - 10 mins walk from locations A and B using regular network.
    - 10 mins cycle from locations A and B using regular network.
    - 5 mins walk from locations A and B using Blood Stoney Bridge network.
    - 10 mins walk from locations A and B using Blood Stoney Bridge network.
    - 10 mins cycle from locations A and B using Blood Stoney Bridge network.
5. Export all these service areas as separate features (12 outputs).
6. Add a field to PS_BY16_FY40_NPF_Pop called AreaBefore_SQM. Calculate geometry of features using square meters in this field. This was calculated to work out the ratio required for the pro-rata analysis.
7. Add the following fields to PopBY16FY40:
    - AreaAfter_SQM
    - AreaDiffRatio
    - ProRataPopBY
    - ProRataPopFY
8. Add the following fields to EmpBY16FY40:
    - AreaAfter_SQM
    - AreaDiffRatio
    - ProRataEmpBY
    - ProRataEmpFY
9. Using the exported service areas feature classes clip both EmpBY16FY40 and PopBY16FY40 feature for each of the service areas (24 total outputs).

Note: The clip tool was used rather than intersect as we only needed the attributes from the pop/emp features. If we used the intersect tool both attributes from the pop/emp data and the service area would be included.

10. Calculate each of the following fields for each of the 24 previous outputs:
    - For both employment and population features:
        - AreaAfter_SQM: Calculate area of features after clip.
        - AreaDiffRatio: Divide AreaAfter_SQM by AreaBefore_SQM. This is the ratio used to calculate pro rata population and employment statistics.
    - Population only:
        - ProRataPopBY: Multiply AreaDiffRatio by PopBY. This is the pro rata 2016 population.
        - ProRataPopFY: Multiply AreaDiffRatio by PopFY. This is the pro rata 2040. population.
    - Employment only:
        - ProRataEmpBY: Multiply AreaDiffRatio by EmpBY. This is the pro rata 2016 employment.
        - ProRataEmpFY: Multiply AreaDiffRatio by EmpFY. This is the pro rata 2040 employment.



Identify

Identify from: <Top-most layer>

BSB_OptA_Docklands_Walk5_PopClip
North Dock C

Location: 717,094.628 734,761.926 Meters

Field	Value
OSIED	268109
EDNAME	North Dock C
COUNTY	DC
COUNTYNAME	Dublin City
NUTS1	IE
NUTS1NAME	Ireland
NUTS2	IE06
NUTS2NAME	Eastern and Midland
NUTS3	IE061
NUTS3NAME	Dublin
PopBY	333
PopFY	359.207502
PopGR	26.207502
AreaBefore_SQM	31039.1
AreaAfter_SQM	17934.37
AreaDiffRatio	0.577799
ProRataPopBY	192.4072
ProRataPopFY	207.5499
Shape_Length	721.522333
Shape_Area	17934.370836

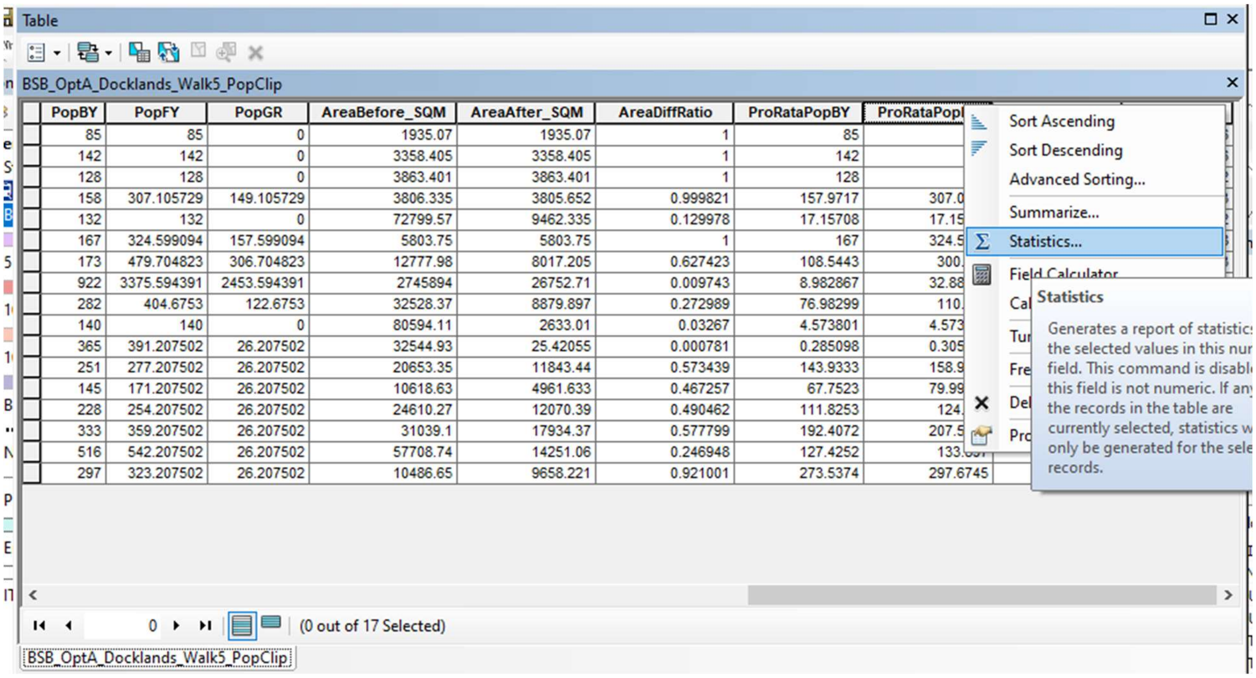
Identified 1 feature

The above image shows the Population data after being clipped. This was clipped by the 5 min walk from Location A – Docklands using the Blood Stoney Bridge network. The BY population for the total

North Dock C area before clipping was 333, after clipping the area is 0.57779 times the size. Multiplying 0.57779 by 333 results in 192.40407. The new pro rata BY population is 192.40407.

Note: Float fields were used for all calculations. Rounding was only done on the final output of the summary table of statistics.

11. Using the statistics function in the attribute table calculate all required statistics for the employment and populations in the catchment areas of the DART stations.



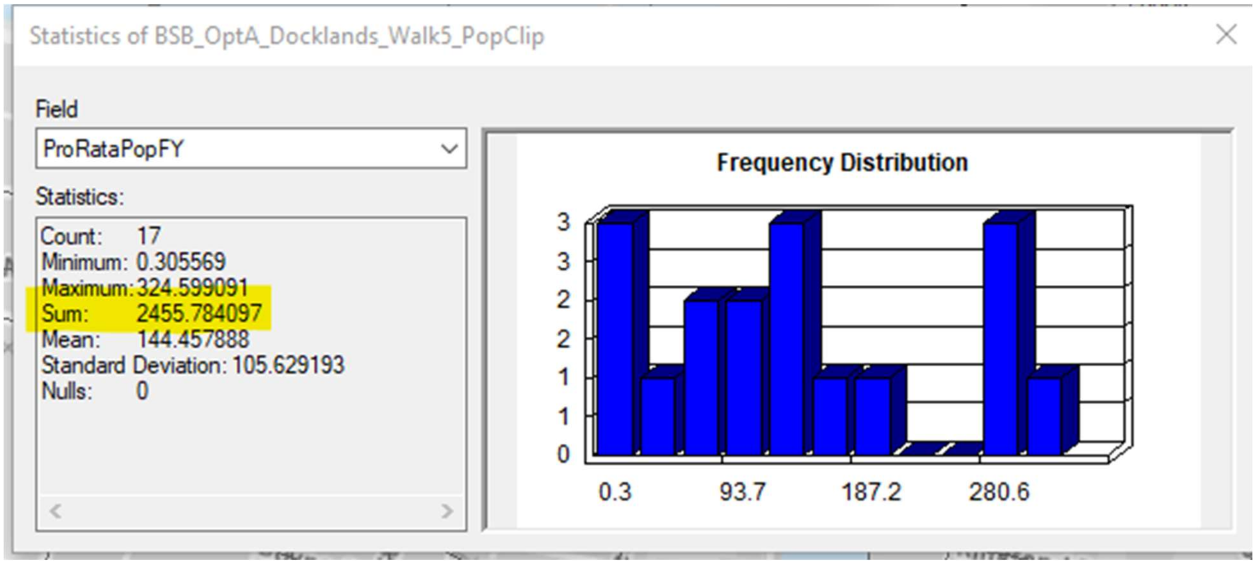
BSB_OptA_Docklands_Walk5_PopClip

PopBY	PopFY	PopGR	AreaBefore_SQM	AreaAfter_SQM	AreaDiffRatio	ProRataPopBY	ProRataPopl
85	85	0	1935.07	1935.07	1	85	
142	142	0	3358.405	3358.405	1	142	
128	128	0	3863.401	3863.401	1	128	
158	307.105729	149.105729	3806.335	3805.652	0.999821	157.9717	307.0
132	132	0	72799.57	9462.335	0.129978	17.15708	17.15
167	324.599094	157.599094	5803.75	5803.75	1	167	324.5
173	479.704823	306.704823	12777.98	8017.205	0.627423	108.5443	300.
922	3375.594391	2453.594391	2745894	26752.71	0.009743	8.982867	32.88
282	404.6753	122.6753	32528.37	8879.897	0.272989	76.98299	110.
140	140	0	80594.11	2633.01	0.03267	4.573801	4.573
365	391.207502	26.207502	32544.93	25.42055	0.000781	0.285098	0.305
251	277.207502	26.207502	20653.35	11843.44	0.573439	143.9333	158.9
145	171.207502	26.207502	10618.63	4961.633	0.467257	67.7523	79.99
228	254.207502	26.207502	24610.27	12070.39	0.490462	111.8253	124.
333	359.207502	26.207502	31039.1	17934.37	0.577799	192.4072	207.5
516	542.207502	26.207502	57708.74	14251.06	0.246948	127.4252	133.
297	323.207502	26.207502	10486.65	9658.221	0.921001	273.5374	297.6745

Statistics

Generates a report of statistics
the selected values in this nu
field. This command is disabl
this field is not numeric. If an
the records in the table are
currently selected, statistics w
only be generated for the sele
records.

BSB_OptA_Docklands_Walk5_PopClip



Statistics of BSB_OptA_Docklands_Walk5_PopClip

Field: ProRataPopFY

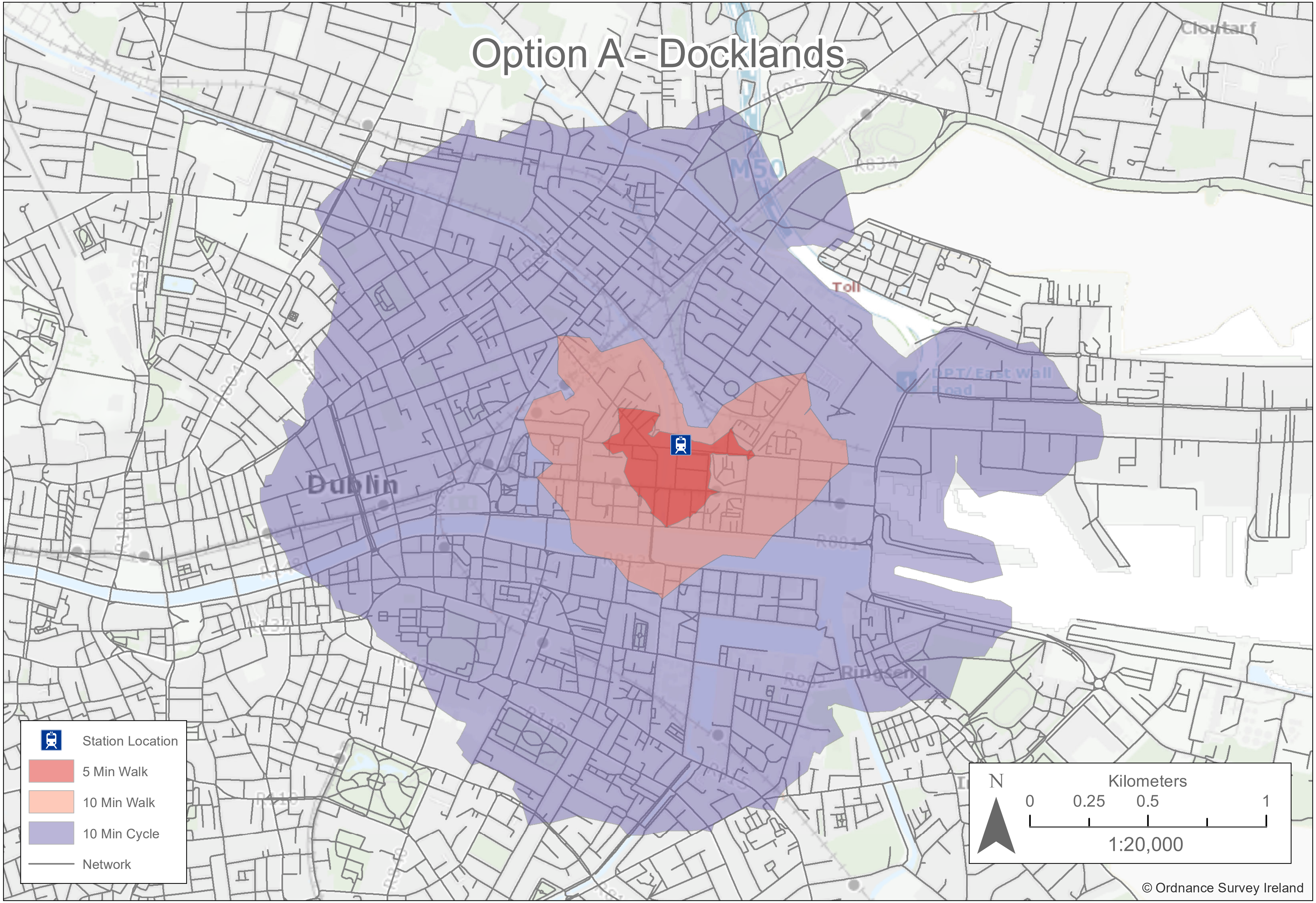
Statistics:

Count: 17
Minimum: 0.305569
Maximum: 324.599091
Sum: 2455.784097
Mean: 144.457888
Standard Deviation: 105.629193
Nulls: 0

Data created in this analysis:

Dataset	Feature Class	Explanation
BloodStoneyBridge_Network	BloodStoneyBridge_Network	Network created to include Blood Stoney Bridge
BloodStoneyBridge	BSB_OptA_Docklands_Cycle10	This dataset contains all isochrone features generated using the Blood Stoney Bridge network.
	BSB_OptA_Docklands_Walk10	
	BSB_OptA_Docklands_Walk5	
	BSB_OptB_SpencerDock_Cycle10	
	BSB_OptB_SpencerDock_Walk10	
	BSB_OptB_SpencerDock_Walk5	
NoBridge	OptA_Docklands_Cycle10	This dataset contains all isochrone features generated using the network without the Blood Stoney Bridge.
	OptA_Docklands_Walk10	
	OptA_Docklands_Walk5	
	OptB_SpencerDock_Cycle10	
	OptB_SpencerDock_Walk10	
	OptB_SpencerDock_Walk5	
Pop_Clip	BSB_OptA_Docklands_Cycle10_PopClip	This dataset contains all features generated by clipping the Population statistics feature class with both the BSB network isochrones and the isochrones from the original network.
	BSB_OptA_Docklands_Walk10_PopClip	
	BSB_OptA_Docklands_Walk5_PopClip	
	BSB_OptB_SpencerDock_Cycle10_PopClip	
	BSB_OptB_SpencerDock_Walk10_PopClip	
	BSB_OptB_SpencerDock_Walk5_PopClip	
	OptA_Docklands_Cycle10_PopClip	
	OptA_Docklands_Walk10_PopClip	
	OptA_Docklands_Walk5_PopClip	
	OptB_SpencerDock_Cycle10_PopClip	
	OptB_SpencerDock_Walk10_PopClip	
	OptB_SpencerDock_Walk5_PopClip	
Emp_Clip	BSB_OptA_Docklands_Cycle10_EmpClip	This dataset contains all features generated by clipping the Employment statistics feature class with both the BSB network isochrones and the isochrones from the original network.
	BSB_OptA_Docklands_Walk10_EmpClip	
	BSB_OptA_Docklands_Walk5_EmpClip	
	BSB_OptB_SpencerDock_Cycle10_EmpClip	
	BSB_OptB_SpencerDock_Walk10_EmpClip	
	BSB_OptB_SpencerDock_Walk5_EmpClip	
	OptA_Docklands_Cycle10_EmpClip	
	OptA_Docklands_Walk10_EmpClip	
	OptA_Docklands_Walk5_EmpClip	

	OptB_SpencerDock_Cycle10_EmpClip	
	OptB_SpencerDock_Walk10_EmpClip	
	OptB_SpencerDock_Walk5_EmpClip	



Option A - Docklands

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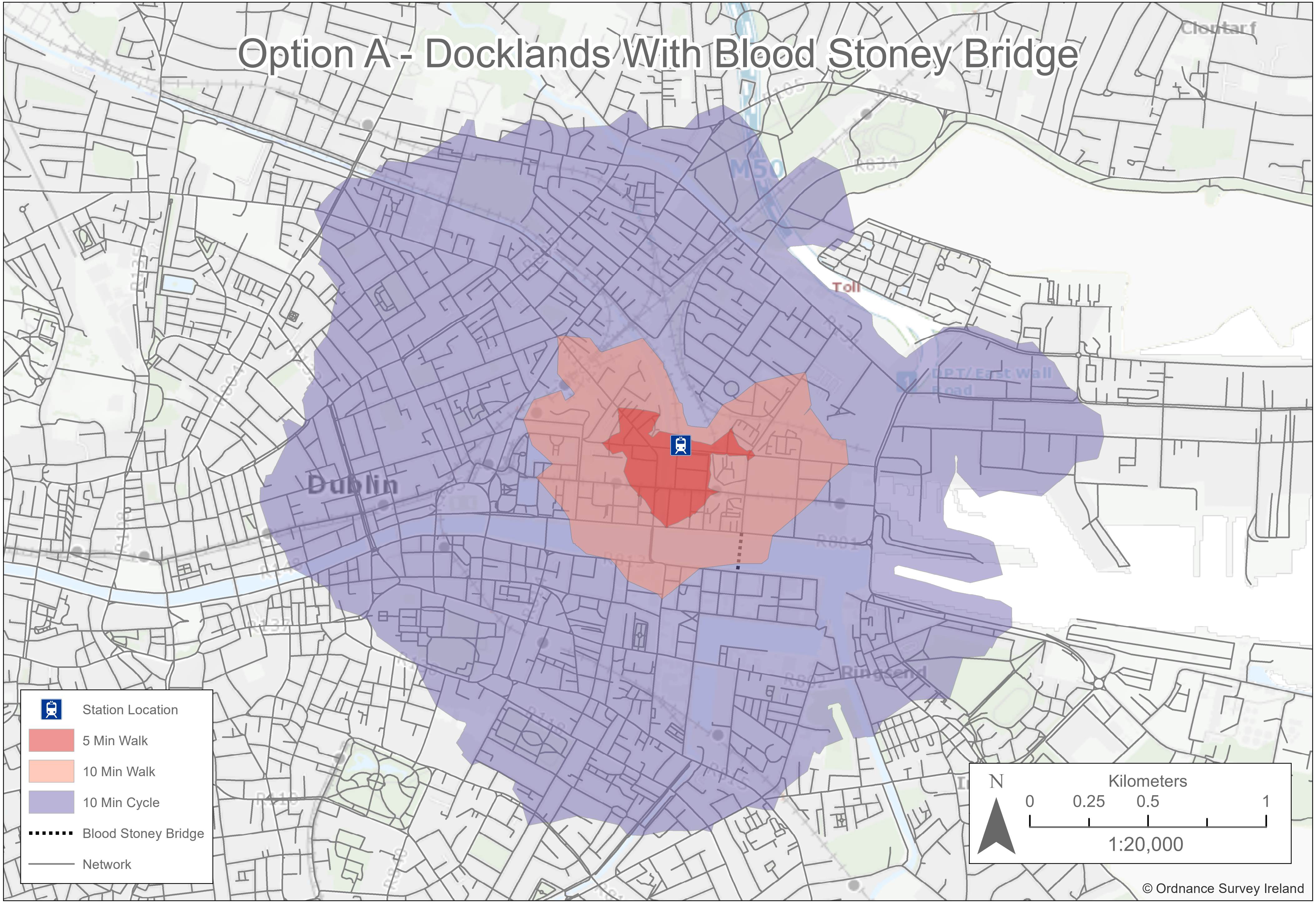
Option A - Docklands With Blood Stoney Bridge



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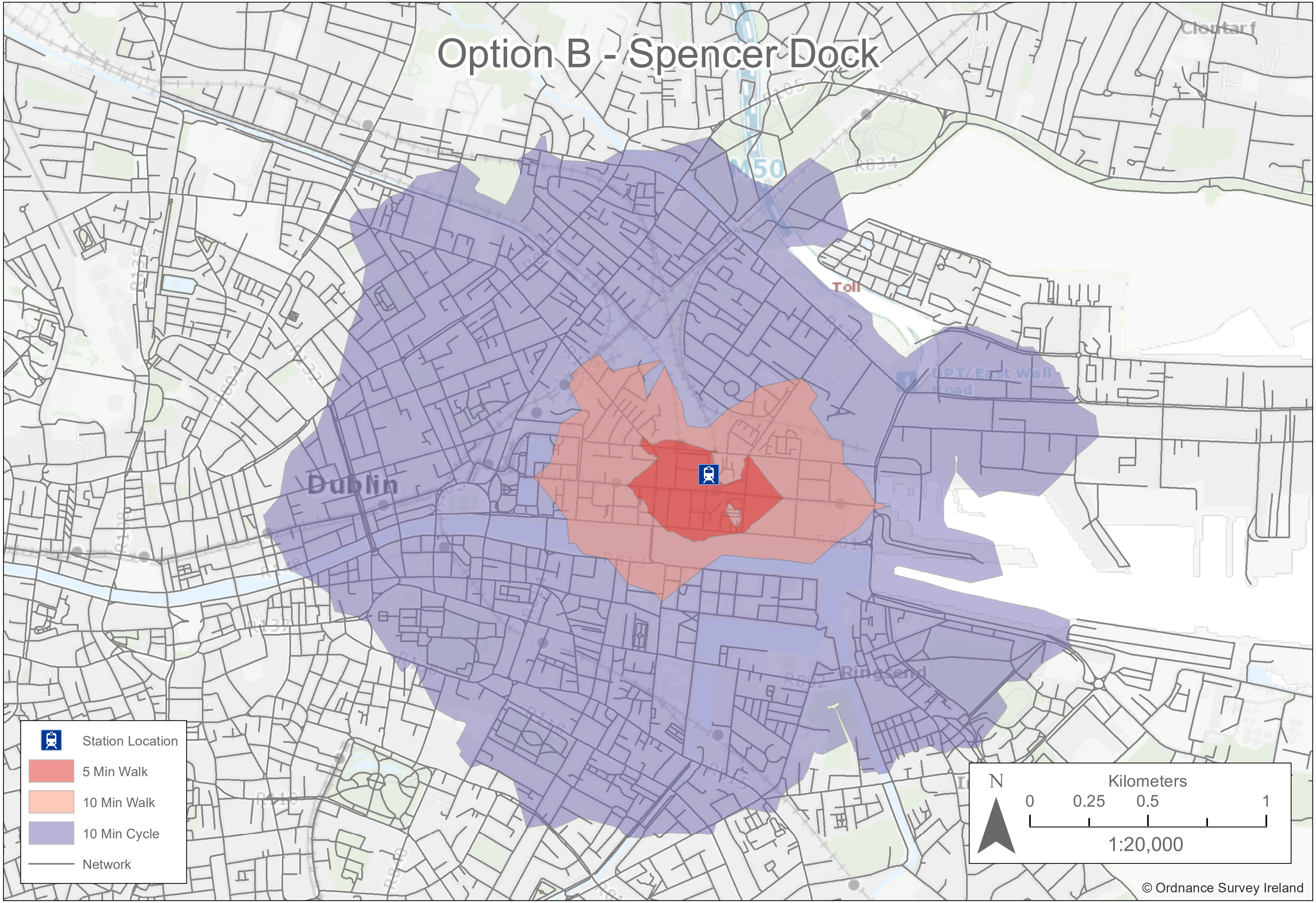
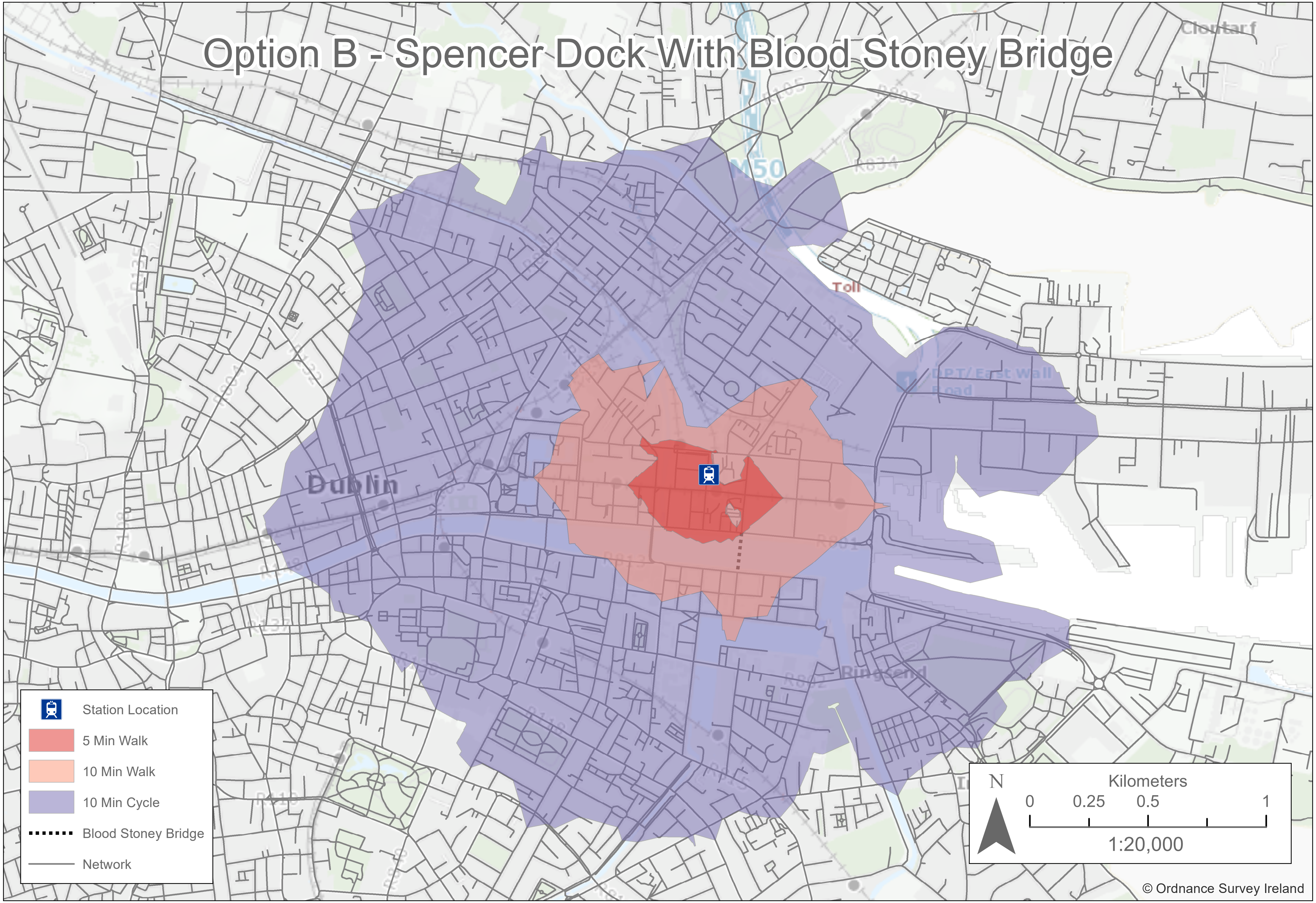
Option B - Spencer Dock



Option B - Spencer Dock With Blood Stoney Bridge



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