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# ENVIRONMENTAL IMPACT STATEMENT – METRO NORTH

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## DUBLIN AIRPORT SOUTH PORTAL TO SANTRY AVENUE

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AREA MN104 (PART 1 – CHAPTERS 1 TO 5)  
VOLUME 2 – BOOK 4 OF 7

# METRO NORTH ROUTE AREA MN101 – MN107

**LEGEND**

- METRO ROUTE
- AREA BOUNDARY
- METRO ROUTE (EXISTING TUNNEL)
- METRO ROUTE (SOUTH COVER TUNNEL)
- METRO ROUTE (ELEVATED TRACK)
- METRO WEST
- AREA NAME
- METRO NORTH FUTURE POSSIBLE STOP
- METRO WEST FUTURE POSSIBLE STOP
- METRO STOP/STATION
- RWA & RIDE SHELTER
- LIGHT RAIL INTERCHANGE
- SUBWAY INTERCHANGE
- RAIL INTERCHANGE
- FUTURE LIGHT RAIL



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# ENVIRONMENTAL IMPACT STATEMENT – METRO NORTH

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## DUBLIN AIRPORT SOUTH PORTAL TO SANTRY AVENUE

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AREA MN104

VOLUME 2 – BOOK 4 OF 7



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## ENVIRONMENTAL IMPACT STATEMENT

For ease of local identification this Environmental Impact Statement (EIS) has been divided into seven areas. These areas are numbered Area MN101 to Area MN107 inclusive going from Belinstown in north County Dublin to St. Stephen's Green in the city centre.

The environmental impact of the proposed scheme in each of these areas is set out in individual books numbered MN101 to MN107 and which collectively make up Volume 2 of this EIS.

The Environmental Impact Statement (EIS) is being published in three separate Volumes as follows:

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### VOLUME 1

Introduction to the scheme and a description of the receiving environment

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#### **Volume 1 of the EIS is set out in 25 Chapters as follows:**

- Chapter 1 Introduction
- Chapter 2 Need and Objectives
- Chapter 3 Legislation
- Chapter 4 Planning and Policy Context
- Chapter 5 Alternatives
- Chapter 6 Description of the Scheme
- Chapter 7 Consultation
- Chapter 8 Human Health
- Chapter 9 Difficulties Encountered
- Chapter 10 – 25  
Description of the baseline environment

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### VOLUME 2

- Environmental Impact – Area MN101
- Environmental Impact – Area MN102
- Environmental Impact – Area MN103
- Environmental Impact – Area MN104
- Environmental Impact – Area MN105
- Environmental Impact – Area MN106
- Environmental Impact – Area MN107

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#### **Volume 2 of the EIS is set out in 18 Chapters as follows:**

- Chapter 1 Introduction to Areas MN101 -107
- Chapter 2 Human Beings: Landuse
- Chapter 3 Human Beings: Socio-economics
- Chapter 4 Human Beings: Noise
- Chapter 5 Human Beings: Vibration
- Chapter 6 Human Beings: Radiation and Stray Current
- Chapter 7 Human Beings: Traffic
- Chapter 8 Flora and Fauna
- Chapter 9 Soil and Geology
- Chapter 10 Groundwater
- Chapter 11 Surface Water
- Chapter 12 Air and Climatic Factors
- Chapter 13 Landscape and Visual
- Chapter 14 Material Assets: Agronomy
- Chapter 15 Material Assets: Archaeology, Architectural Heritage and Cultural Heritage
- Chapter 16 Material Assets: Non Agricultural Property
- Chapter 17 Material Assets: Utilities
- Chapter 18 Interrelationships, Interactions and Cumulative Impacts

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### VOLUME 3

- Book 1 of 2  
Specialist maps – baseline and impact
- Book 2 of 2  
Annexes to the EIS

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#### **Volume 3 of the EIS is set out in 2 books.**

Book 1 of 2 contains all baseline and impact assessment maps and Book 2 of 2 contains annexes to the EIS e.g. technical reports.

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### EIS NON-TECHNICAL SUMMARY (NTS)

## EIS METHODOLOGY

The methodology used in this EIS generally involves the following steps:

- Definition of the study area;
- Data collection and description;
- Baseline description and evaluation;
- Identification of potential environmental impacts and the potential areas to be affected;
- Description and evaluation of the impacts;
- Derivation of mitigation measures to minimise the impact;
- Description of the residual impacts of the scheme.

Further detail in relation to the EIS methodology is provided in Volume 1 of the EIS.

## ENVIRONMENTAL IMPACT STATEMENT STUDY TEAM

The EIS was prepared on behalf of the Railway Procurement Agency (RPA) by a study team led by Environmental Resources Management (Ireland) Ltd, who were responsible for the overall assessment management and co-ordination as well as for the production of the Landuse, Socio-economics, Noise, Vibration (part), Radiation and Stray current, Flora and Fauna, Soil and Geology (part), Air and Climatic factors, Non Agricultural Property and Utilities chapters of this EIS. The other members of the study team are outlined in the table below.

Input	Contributor
Human Health	EHA Consulting Group
Human Beings: Vibration	Rupert Taylor F.I.O.A
Human Beings: Traffic	MVA Consulting
Soil and Geology	Jacobs Engineering Ireland Ltd.
Groundwater	AWN Consulting
Surface Water	AWN Consulting
Landscape and Visual (photomontages)	Digitech
Material Assets: Agronomy	Curtin Agricultural Consultants
Material Assets: Archaeology, Architectural Heritage and Cultural Heritage	CRDS Ltd.

## AVAILABILITY OF THE EIS

This EIS is available to download for free through the RPA website at [www.dublinmetronorth.ie](http://www.dublinmetronorth.ie)

Copies of this EIS including the Non-Technical Summary may be purchased by any member of the public during normal office hours at the following location:

Railway Procurement Agency (RPA)  
Parkgate Street  
Dublin 8

The EIS may be purchased as a complete document for a sum of €170.00 (Volumes 1, 2 & 3)

The EIS can also be purchased as individual books e.g:

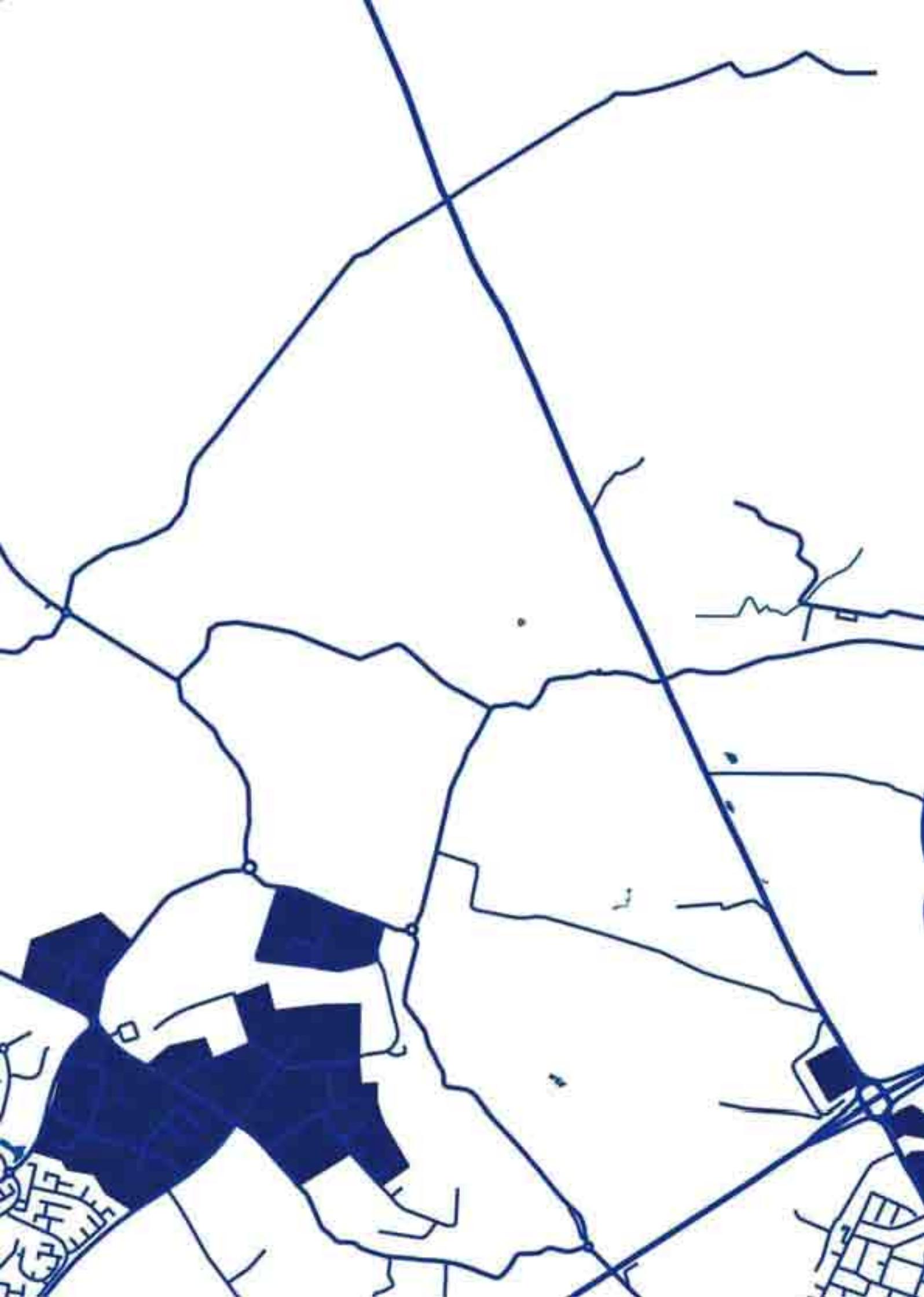
- Copies of Volume 1 may be purchased for €30.00 each;
- Copies of Volume 2 (individual book e.g. MN101) may be purchased for €15.00 each;
- Copies of Volume 3 (individual books e.g. Book 1 of 2) may be purchased for €15.00 each;
- Copies of the NTS of this EIS may be purchased for €5.00 each.

A DVD version of the whole EIS may be purchased for €15.00 which includes Volume 1; Volume 2 (Area MN101 – MN107); Volume 3 (Book 1 of 2 and Book 2 of 2) and the Non-Technical Summary.

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# 01

## INTRODUCTION TO AREA MN104





Metro North is the next phase of Dublin's integrated light rail network. The proposed scheme will serve an 18km corridor from Belinstown in the north of County Dublin to St. Stephen's Green in the city centre via Dublin Airport.

Metro North is the next phase of Dublin's integrated light rail network. The proposed scheme will serve an 18km corridor from Belinstown in the north of County Dublin to St. Stephen's Green in the city centre via Dublin Airport. Metro North is a light rail system running on a line of sight basis, at grade, in underpasses or on elevated sections between Belinstown and Fosterstown and under full signal control on a segregated alignment between Fosterstown Stops and St. Stephen's Green. Metro North will run in a mix of bored and cut and cover tunnels beneath the city and beneath Dublin Airport.

For ease of local identification, in this EIS the proposed scheme is divided into seven areas. These areas are numbered Area MN101 to Area MN107 inclusive going from Belinstown in north County Dublin to St Stephen's Green in the city centre. The environmental impact of the proposed scheme in each of these areas is set out in individual books numbered MN101 to MN107 which collectively make up Volume 2 of this EIS. This document relates to **Area MN104** Dublin Airport south portal to Santry Avenue.

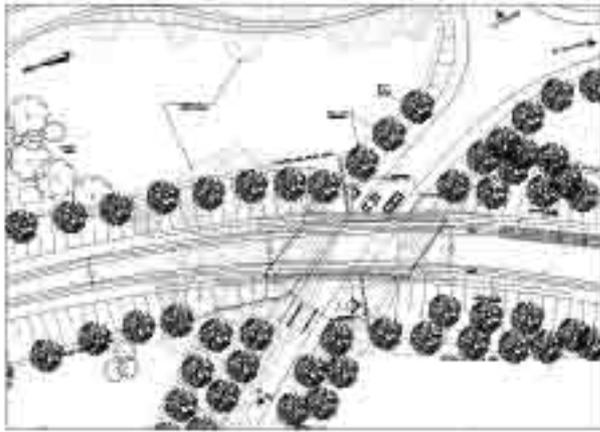
South of the Airport Perimeter Road, the route emerges from tunnel and rises to surface level. A tunnel portal and ventilation building is located in this area. The route then turns south-west to cross agricultural lands between Dublin Airport and the M50 motorway. Dardistown Stop is located in this area on a greenfield site to the north of the M50. An at grade Park & Ride facility with 300 parking spaces is proposed for this location, to the north of the stop. Space provision is made at this stop for a future operational link to the proposed Metro West line. A 110kV substation is to be located in this area. Continuing south, the route crosses the M50, associated slip roads, and Old Ballymun Road on bridges. South of these bridges the route passes over the culverted Santry River, and proceeds south descending to surface level at the next stop, Northwood, which is an at grade stop located near Santry Lodge, south of the M50.

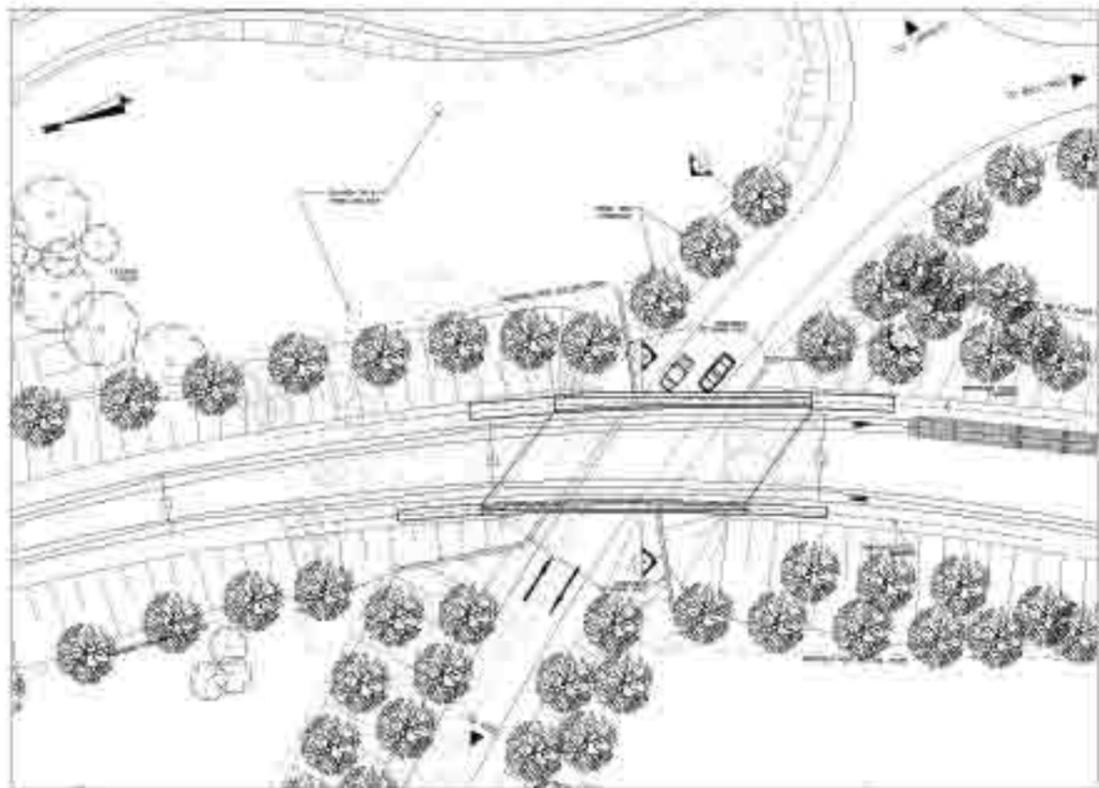
South of Northwood Stop, the route descends into a cut and cover tunnel along the median of the R108 (Ballymun Road). This tunnel passes under Santry Avenue. This area is also marked by the boundary between the Fingal County Council and Dublin City Council.

# Structure drawings

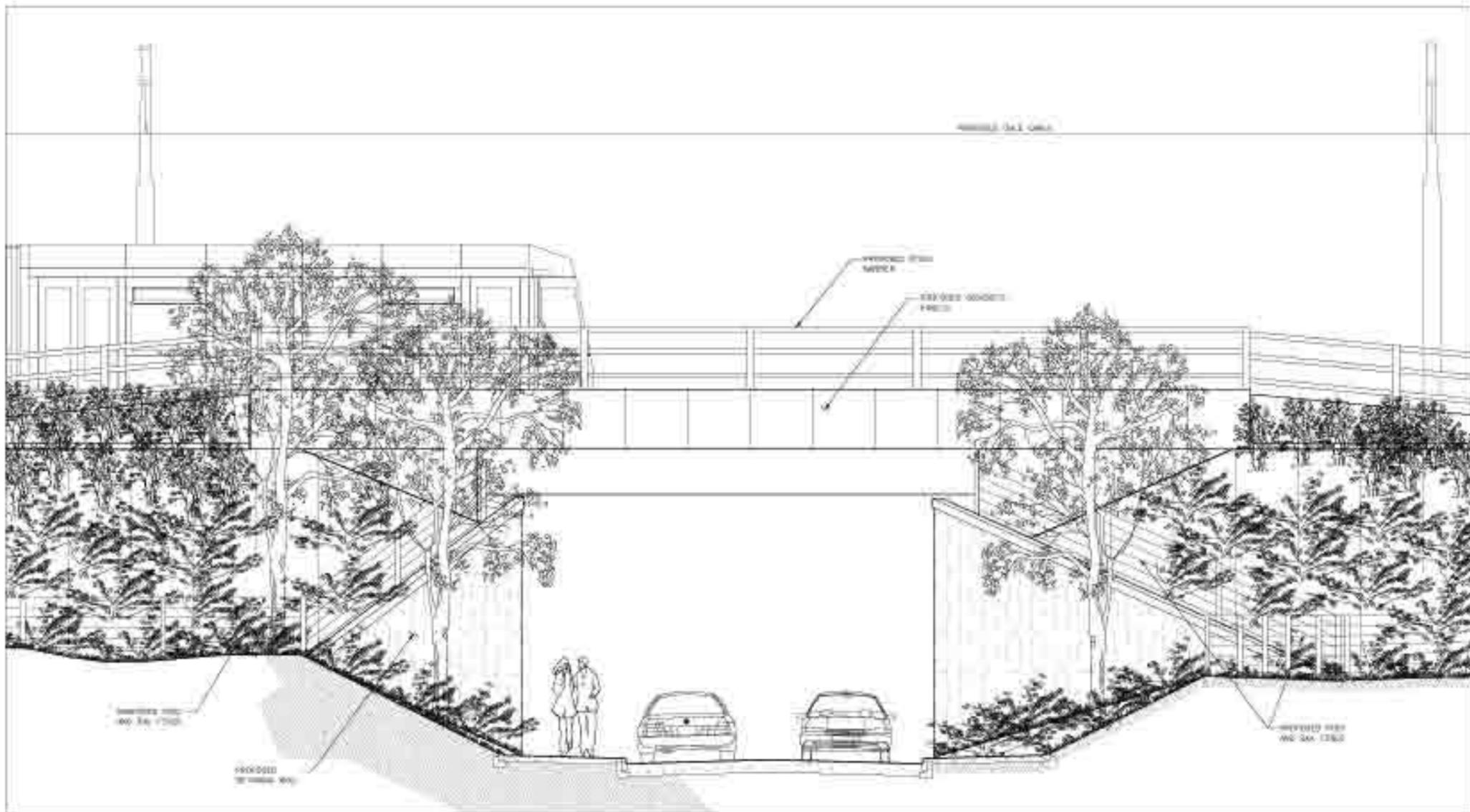
# Structure drawings

## Northwood Overbridge





Plan

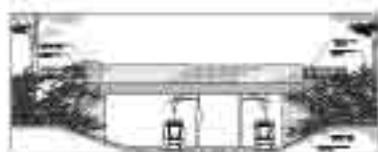
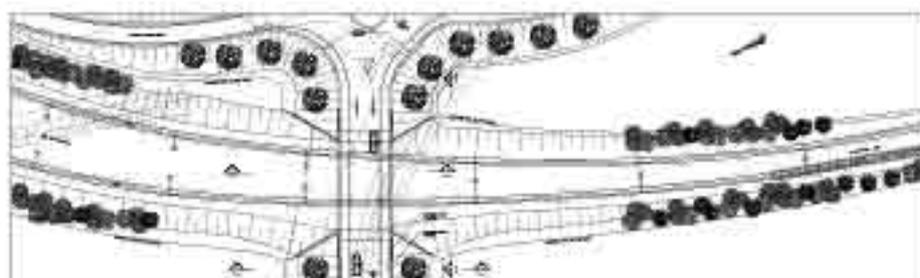


Strengthened elevation A-A

# Structure drawings

# Structure drawings

## Metropark Overbridge

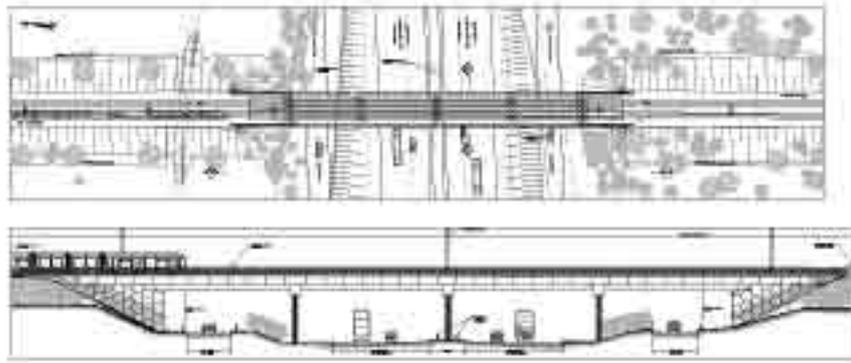


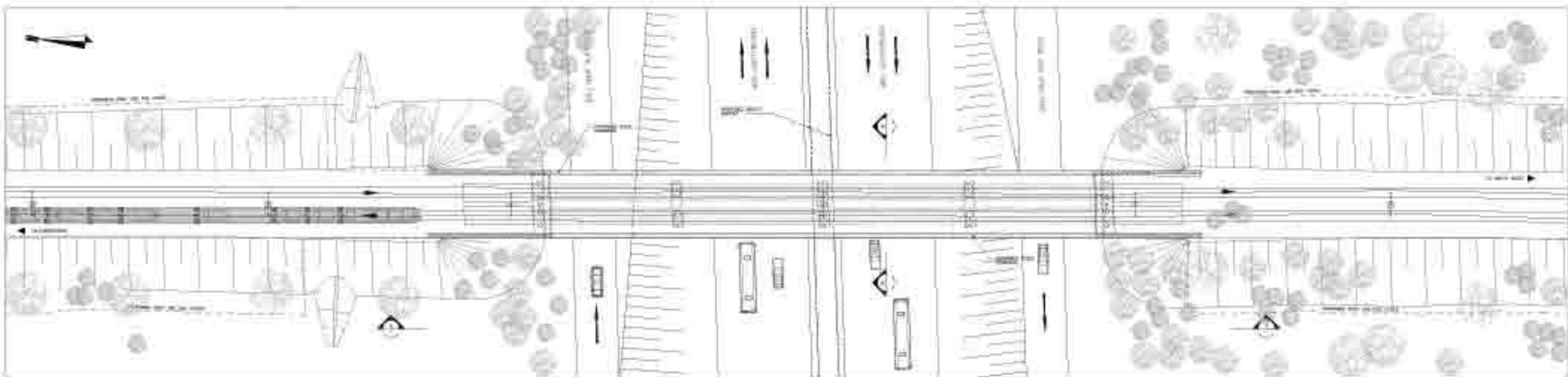


# Structure drawings

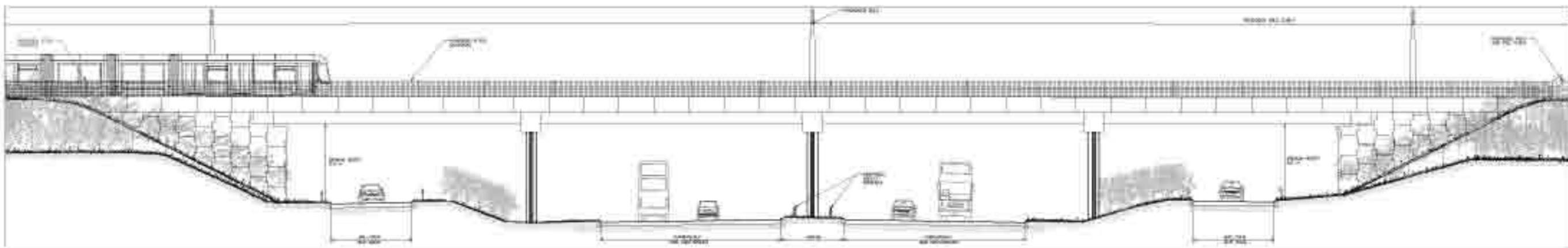
# Structure drawings

## M50 Viaduct

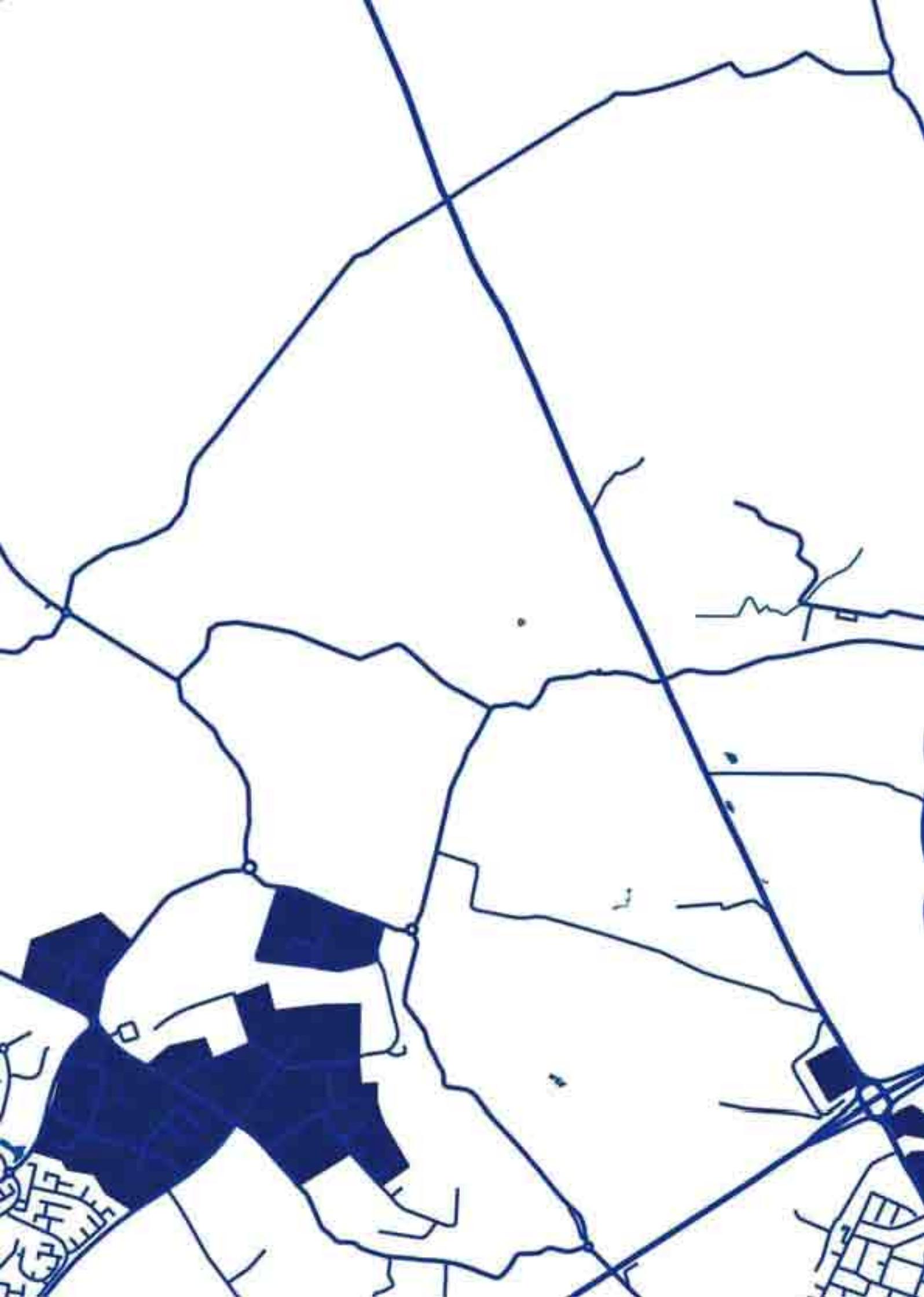




Plan



Sectional elevation A-A



# 02

## HUMAN BEINGS: LANDUSE

- 2.1 Introduction
- 2.2 Study area
- 2.3 Impact assessment methodology
  - 2.3.1 Magnitude
  - 2.3.2 Significance
- 2.4 Impact assessment
  - 2.4.1 Impact identification
  - 2.4.2 Mitigation measures
  - 2.4.3 Assessment of residual impacts





This chapter of the EIS describes the potential impacts on landuse which may arise due to activities associated with the construction and operation of the proposed scheme in Area MN104.

## 2.1 INTRODUCTION

This chapter of the EIS describes the potential impacts on landuse which may arise due to activities associated with the construction and operation of the proposed scheme in Area MN104.

## 2.2 STUDY AREA

The study area for the assessment is set out in Table 2.1.

**Table 2.1 Study area**

Criteria	Width of study area (on both sides of the alignment)
Temporary and permanent land-take Severance	All areas encompassed by the Compulsory Purchase Order (CPO) line for permanent and temporary land-take and construction compounds.

## 2.3 IMPACT ASSESSMENT METHODOLOGY

The source and type of all potential impacts are described in Section 2.4.1. Mitigation measures to be put in place are defined in Section 2.4.2. The extent to which mitigation is needed increases as the significance of the impact increases. Residual impacts are evaluated in Section 2.4.3 in terms of magnitude and significance.

### 2.3.1 Magnitude

The criteria used to assess the magnitude of impacts are shown in Table 2.2.

Table 2.2 Criteria for assessment of impact magnitude

Criteria	Impact magnitude
Permanent land-take	very high
Permanent severance	
Temporary land-take for a period of more than 1 year or near/ in residential areas	high
Temporary severance for a period of more than 1 year or near/in residential areas	
Temporary land-take for a period of less than 1 year	medium
Temporary severance for a period of less than 1 year	
Land-take in existing streetscapes	low
N/A	very low

### 2.3.2 Significance

The significance of all impacts is assessed in consideration of the magnitude of the impact and the quality of the area (functional value) upon which the impact has an effect. The quantity of the land-take, relative to the affected landuse, is necessarily a factor of magnitude, and has therefore been taken into account in the assessment of an impact's significance.

## 2.4 IMPACT ASSESSMENT

### 2.4.1 Impact identification

The impact of the proposed scheme on the landuse along the alignment is assessed with reference to two categories: temporary and permanent impacts.

#### Temporary impacts

Temporary impacts typically occur during construction. These impacts are short to medium-term in nature. Sources of temporary impact include construction compounds and construction activities.

#### Permanent impacts

Permanent impacts are long-term impacts associated with the structure and operation of the proposed scheme. Sources of permanent impacts include all permanent, above-ground, built structures associated with the proposed scheme including stops, tracks, bridges, viaducts, substations, Park & Ride site, ancillary roads, access ways, tunnel portals and areas affected by permanent changes to traffic routes.

The types and sources of impact considered in this chapter are summarised in Table 2.3. Table 2.3 also provides clarification as to whether the impact assessment of each impact type is carried out on a qualitative or quantitative basis.

Table 2.3 Impact identification

Potential impact type	Impact source	Assessment type: qualitative / quantitative*
<b>Construction phase</b>		
Temporary land-take	Temporary construction compounds, construction roads, tunnel launching sites, cut & cover locations, tunnel portals, storage areas, temporary land-take associated with the CPO etc.	Quantitative and qualitative
Temporary severance (only impacts that don't result in permanent land-take)		Qualitative
Permanent land-take	Road widening for construction roads, etc.	Quantitative and qualitative
<b>Operational phase</b>		
Permanent land-take	Proposed scheme infrastructure: track; stop locations; access and egress locations; substations etc.	Quantitative and qualitative
Permanent severance		Qualitative

\*Quantities are not calculated for land-takes in the existing streetscapes.

## 2.4.2 Mitigation measures

The amount of land taken for the proposed scheme has been minimised as much as possible and areas of land-take have been carefully chosen so as to try to minimise the level of impact that occurs.

In cases where land that has to be taken on a temporary basis, existing landuses will be maintained where possible and the land will be reinstated and returned to its original use as quickly as possible. Measures are to be taken where possible to ensure that open spaces remain easily accessible through the provision of, for example, adequate gating, redirected footpaths, pedestrian crossings and agricultural access routes.

Road diversions and other traffic management mechanisms are to put in place before roads are closed to minimise severance impacts. Temporary road closures and diversions will be minimised, in number and duration, wherever possible.

In some locations, hoarding and other mechanisms will be used to ensure that the boundary of land-take is clearly demarcated so as to minimise the potential for 'drift' of the sites and impacts on adjacent landuses. Landscaping of areas will be designed so as to complement the surrounding landuses. The hoarding will be used to provide public information about the proposed scheme and alternative access arrangements to local businesses and facilities. A more detailed specific description of the mitigation measures to be put in place at each location is provided in Table 2.4 and Table 2.5.

## 2.4.3 Assessment of residual impacts

### 2.4.3.1 Project scenario: construction phase

#### Temporary land-take

Within Area MN104 there will be various temporary land-takes associated with the construction phase of the proposed scheme. They will include

construction compounds, the excavation and reconstruction of tunnels beneath the R108 and the temporary areas surrounding permanent land-takes required for construction.

Construction Compound 8, at the south portal of the Dublin Airport Tunnel, is determined to be of Low significance. The area in which it is located has a medium functional value. Even though the construction compound will be in place for more than 1 year its impact is Low due to the fact that the site is not of recreational importance and that there is plenty of agricultural land surrounding it. The majority of the site will be returned to its original use immediately after its use as a construction compound.

Construction Compound 8A at the Dardistown Stop and Park & Ride facilities, will be in place for a period of more than 1 year and will be located in lands classified as Agricultural and Rural Amenity lands which have a medium functional value. The construction compound will be located adjacent to lands that are classified as Industrial/Warehouse/Storage use. It has been determined that post mitigation the significance of the impact of the construction compound is Low. The majority of this site will ultimately form part of the permanent land-take.

There will be some temporary land-take surrounding the permanent features of the proposed scheme in Area MN104. A small amount of additional land will be required to facilitate the construction of Dardistown Stop and Park & Ride, new access roads within the area and the track. This temporary land-take, surrounding the permanent features, is of Low impact significance due to it being only a small amount of land which will be returned to its original use within 1 year. The temporary land-take is from agricultural land, of which there is plenty of in the vicinity.

Two construction compounds, one on either side of the M50, will be required for the construction of the M50 bridge. Both construction compounds will be used for a period of more than 1 year and are located on lands classified as Agricultural and Rural Amenity. Construction Compound 9 to the north of the M50 will be in an area of medium functional value that is currently used solely for agricultural purposes. Due to the fact that agricultural landuses surround the site the significance of the impact is Low. On the south side of the M50 Construction Compound 10 will be located in an area of very high functional value which is used as a garden of a private residence. The impact of this land-take does not impact on adjacent landuses. For this reason the impact on this land is of Medium significance.

Construction Compound 10a will be located slightly to the south of the M50 adjacent to the Northwood Stop. The significance of this temporary impact is determined to be Medium due to the fact that the area is of very high functional value, is classified as Agricultural and Rural Amenity lands and will be used for more than 1 year. Although the lands in the vicinity of the Northwood Stop are classified as Agricultural and Rural Amenity and Residential Areas, there has been considerable development in the general area recently. The lands to the east of Construction Compound 10a have been developed as mixed use, including commercial, retail, and residential areas. The construction works will not impact on these nearby landuses.

Surrounding the permanent land-take, north of the M50, is a small amount of land that will be temporarily required to facilitate the construction of permanent features. This temporary land-take will be required for the construction of the track sections, the new access roads and new roundabouts. This land-take with mitigation measures in place, used temporarily for construction, is of Low significance due to it being for a period of less than 1 year and occurring in an area of medium functional value. Similarly, land surrounding the permanent land-take of the Northwood Stop and the associated approach roads will also be used temporarily during construction. This temporary land-take is determined to be of Low significance due to the fact that there are plenty of agricultural lands in the area and that the temporary land-take does not affect the adjacent landuses. This area marks the edge of agricultural lands and the beginning of the urban environments.

There is to be some temporary land-take associated with the process of tunnelling under the Ballymun Road. The process of cut and cover requires that traffic lanes are merged on either side of the road and construction works occur in the centre of the road. The significance of this impact is determined to be Low due to the fact that it occurs in existing streetscape and is temporary.

The locations of the temporary land-take are illustrated on maps (Landuse Impact) included in this EIS as Volume 3, Book 1 of 2.

#### **Temporary severance**

New access roads are to be constructed to avoid severance. Access to the Dublin Airport south portal and the emergency vehicle parking area is to be provided. The Dardistown Stop will also be accessible via a new road which will also maintain access to one private property. On the eastern side of the track access to an industrial property is to be maintained through new roads, one of which crosses over the track. During the construction phase there will be some severance, but all properties will remain accessible through alternative access routes. The existing road surfaces, made obsolete by the new road structures will be removed and the land returned to agricultural uses. New access roads will also provide access to the fields severed within Area MN104.

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#### **2.4.3.2 Project scenario: operational phase**

##### **Permanent land-take**

Within Area MN104, at the south portal of the Dublin Airport tunnel there will be, within an open-cut section, track, emergency access roads running alongside the track and an emergency vehicle parking area. The portal will also be accessible from the Old Airport Road. The impact of this permanent land-take is determined to be Low. Although it will be sited on lands classified as Agricultural and Rural Amenity it will be adjacent to a large car park and some open spaces. It will not affect any of the surrounding landuses. Agriculture is the predominant landuse in Area MN104. There will also be a large permanent land-take of Low significance associated with Dardistown Stop, the Park & Ride facilities and the sections of at grade track. Overall, the impact of these two permanent land-takes will not impact significantly on the ability of the surrounding lands to be used for agriculture or as open spaces.

On the northern side of the M50 the permanent land-take will be from Agricultural and Rural Amenity lands and some Open Space and Recreational lands in an area of medium functional value. The open space that it will use is only a narrow strip bordering the M50 and is not used for recreational purposes. The impact is determined to be of Medium significance as it includes new roads and alters the existing landuses. On the southern side of the M50 the permanent land-take is in an area of very high functional value and on lands classified as Agricultural and Rural Amenity, with some residential areas. The permanent land-take to the south of the M50 will consist of new access roads, track sections, an at grade Northwood Stop with some permanent land-take surrounding the entrance to the cut and cover tunnelling. The significance of the permanent land-take south of the M50 is High as a result of the very high functional value for the area. Agricultural and Rural Amenity lands are not very common in this area. While the permanent land-take associated with the Northwood Stop, track sections, new access road and the track entering cut and cover will be in Agricultural and Amenity lands and Residential Areas there has been considerable development of the lands to the east of this location. The general area has been developed as a mixed use, commercial, retail and residential area with crèche and health centre facilities. There will be no permanent land-take from lands already developed as part of the Northwood area or Gulliver's Retail Centre.

The land beneath the R108, where the track runs in a cut and cover tunnel section, will form part of the permanent sub-stratum land-take. Due to the fact that this land-take will be substratum and will remain within the existing streetscapes, the residual impact significance is Low. While this permanent land-take will limit the future landuses it will not prevent the surface lands being used as streetscapes.

There will be a small area of permanent land-take from Open Space, adjacent to the Ballymun road in order to accommodate a substation. The amount of land that will be required is quite small and there is plenty of Open Space that will remain usable. Hence, the significance of this impact is rated as Low.

The locations of the permanent land-take are illustrated on maps (Landuse Impact) included in Volume 3, Book 1 of 2.

#### **Permanent severance**

There will be no instances of permanent severance within Area MN104. Alternative access is provided to properties through new roads where the track severs the existing road network.

Table 2.4 Summary of predicted impacts in Area MN104 occurring during the construction phase

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN104/ CN-01	LA 12 North and South of the M50 Motorway on lands classified as Agricultural and Rural Amenity	Construction Compound 8 surrounding Airport Tunnel South Portal	<p>Temporary land-take for a period of more than 1 year from Agricultural and Rural Amenity lands and Dublin Airport Zone lands.</p> <p>A construction compound will be located at the south portal of the Airport Tunnel. This site will also be the TBM launch site.</p> <p>This construction compound will be approximately 15.7ha in size.</p> <p>The majority of one complete field will be used as this construction compound.</p> <p>There is a total of approximately 96ha of agricultural lands in Area MN104, north of the M50 motorway.</p>	medium	<p>As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.</p> <p>A full programme of agricultural reinstatement will be designed to ensure that agricultural land is reinstated to productive use; soil profiles will be stored and reused where possible.</p> <p>The construction compound will be located in a landuse that it will have as little impact on as possible.</p> <p>The compound will be located as close to the Old Airport Road as possible in order to minimise its impact on Greenbelt lands.</p> <p>The location and design of the compound minimises the number of individual fields impacted.</p>	low	Low

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN104/ CN-02	LA 12 North and South of the M50 Motorway on lands classified as Agricultural and Rural Amenity	Local Construction Compound 8a to support construction of the surface works	<p>Temporary land-take for a period of more than 1 year from Agricultural and Rural amenity lands.</p> <p>This construction compound will be approximately 1.6ha in size.</p> <p>Construction Compound 8a will support the construction of Dardistown Stop and the Park &amp; Ride facilities.</p> <p>During the construction phase the construction compound will be accessible by the new access roads to be constructed.</p> <p>It will be adjacent to an area of open space as well as land that is classified as Industrial/Warehouse/Storage.</p> <p>There is a total of approximately 96ha of agricultural lands in Area MN104, north of the M50 motorway.</p>	medium	<p>As little land as possible will be temporarily taken.</p> <p>The location and design of the compound minimises the number of individual fields affected.</p> <p>The construction compound will be located in a landuse that it will have as little impact on as possible.</p>	low	Low
MN104/ CN-03	LA 12 North and South of the M50 Motorway on lands classified as Agricultural and Rural Amenity	Land surrounding Dardistown Stop access roads, emergency access roads and Park & Ride facilities	<p>Temporary land-take for a period of less than 1 year fro, Agricultural and Rural Amenity lands.</p> <p>A narrow strip of land surrounding the permanent land-take will be temporarily used during the construction phase.</p> <p>This temporary land-take will total approximately 1ha, and is mostly from agricultural lands, but with minor land-take from Industry/Warehouse, Residential and Open Space and Recreational lands.</p> <p>There is a total of approximately 96ha of agricultural lands in Area MN104, north of the M50 motorway.</p>	medium	<p>As little land as possible will be temporarily taken.</p> <p>The land will be returned to its original use as quickly as possible.</p> <p>The current landuse will not be unnecessarily altered. This will facilitate a prompt return to its original use.</p>	low	Low

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN104/ CN-04	LA 12 North and South of the M50 Motorway on lands classified as Agriculture and Rural Amenity	Local Construction Compound 9 to support construction of the surface works north of M50 and the construction of the M50 bridge.	<p>Temporary land-take for a period of more than 1 year from Agriculture and Rural Amenity lands.</p> <p>This construction compound will be approximately 2.2ha in size and will be used to support the M50 bridge construction.</p> <p>There will be no severance caused by this construction compound.</p> <p>There is a total of approximately 96ha of agricultural lands in Area MN104, north of the M50 motorway.</p> <p>Approximately 0.5ha of this construction compound will ultimately form part of the permanent land-take.</p>	medium	<p>As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.</p> <p>A full programme of agricultural reinstatement will be designed to ensure that agricultural land is reinstated to productive use; soil profiles will be stored and reused where possible.</p> <p>The construction compound will be located in a landuse that it will have as little impact on as possible.</p> <p>The location and design of the compound minimises the number of individual fields impacted.</p>	low	Low
MN104/ CN-05	LA 12 North and South of the M50 Motorway on lands classified as Agricultural and Rural Amenity	Temporary land-take surrounding track, new access roads and roundabout	<p>Temporary land-take for a period of less than 1 year from Agricultural and Rural Amenity lands.</p> <p>A narrow strip of land surrounding the open cut track sections, new access roads and roundabout will be temporarily used during construction.</p> <p>Together with MN104/OCN-08 this temporary land-take will total approximately 0.2ha.</p> <p>There is a total of approximately 132ha of agricultural lands in MN104 and approximately 7.7ha of open space in MN104, south of the M50 motorway, from which there is a small amount of temporary land-take.</p>	medium	<p>As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.</p>	low	Low

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN104/ CN-06	LA 14 Northwood area and Ballymun Residential areas on lands classified as Agricultural and Rural Amenity	Local Construction Compound 10 to support construction of the surface works south of the M50 and the construction of the M50 bridge.	<p>Temporary land-take for a period of more than 1 year from Agricultural and Rural Amenity lands.</p> <p>This construction compound is approximately 1.2ha in size and is used to support the M50 bridge construction.</p> <p>There will be no severance caused by this construction compound.</p> <p>There is approximately 38ha of agricultural land in MN104, south of the M50 motorway.</p> <p>Approximately 0.5ha of this site will ultimately form part of the permanent land-take.</p>	very high	<p>As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.</p> <p>A full programme of agricultural reinstatement will be designed to ensure that agricultural land is reinstated to productive use; soil profiles will be stored and reused where possible.</p> <p>The construction compound is located in a landuse that it will have as little impact on as possible.</p> <p>The location and design of the compound minimises the number of individual fields impacted.</p>	medium	Medium

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN104/ CN-07	LA 14 Northwood area and Ballymun Residential areas on lands classified as Agricultural and Rural Amenity	Construction Compound 10a adjacent to Northwood Stop	<p>Temporary land-take for a period of more than 1 year from Agricultural and Rural Amenity lands.</p> <p>This construction compound is approximately 0.5 ha in size and is used to support the construction of the Northwood Stop and the new access roads.</p> <p>There will be no severance caused by this construction compound.</p> <p>There is approximately 38ha of agricultural lands in MN104, south of the M50 motorway.</p> <p>There has been considerable development in the area surrounding this construction compound, i.e. Northwood and Gulliver's Retail Centre. The area is being developed as a mixed use area with residential, commercial, retail as well as fitness centre and crèche facilities. However, the construction works will not impact on these landuses.</p>	very high	<p>As little land as possible will be temporarily taken. The land will be Open Space and Recreational use post use as a construction compound.</p> <p>A full programme of agricultural reinstatement will be designed to ensure that agricultural land is reinstated to productive use; soil profiles will be stored and reused where possible.</p> <p>The construction compound is located in a landuse that it will have as little impact on as possible.</p> <p>The location and design of the compound minimises the number of individual fields impacted.</p>	medium	Medium

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN104/ CN-08	LA 14 Northwood area and Ballymun Residential Areas on lands classified as Agricultural and Rural Amenity, Open Space and Recreational and Residential Areas	Temporary land-take surrounding Northwood Stop, new access roads, open cut section of track, substation and Construction Compound 10a.	<p>Temporary land-take for a period of less than 1 year from Agricultural and Rural Amenity, Open Space and Recreational and Residential areas Area lands.</p> <p>A narrow strip of land surrounding the open cut section of track, the Northwood Stop, new access roads and the construction compound will be temporarily used during construction.</p> <p>Together with MN104/CN-05 this temporary land-take totals approximately 0.2ha.</p> <p>There is a total of approximately 132ha of agricultural lands in MN104 and approximately 7.7ha of open space in MN104, south of the M50 motorway, from which there is a small amount of temporary land-take.</p>	very high	As little land as possible will be temporarily taken. The land will be returned to its original use as quickly as possible.	low	Low
MN104/ CN-09	LA 14 Northwood area and Ballymun Residential Areas on land in the existing streetscapes	Cut and Cover tunnelling	<p>Temporary land-take for a period of more than 1 year from lands in existing streetscapes.</p> <p>The carriageways on the Ballymun Road are temporarily narrowed during cut and cover construction works.</p> <p>This impact occurs in an area primarily comprising residential landuses.</p>	very high	<p>Existing carriageway to be reinstated upon completion.</p> <p>Roadways, cycleways and footpaths will be diverted and/or reinstated wherever possible.</p>	low	Low

Table 2.5 Summary of predicted impacts in Area MN104 occurring during the operational phase

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN104/ OP-01	LA 12 North and South of the M50 Motorway on land classified as Agricultural and Rural Amenity	Airport tunnel south portal and emergency access roads and parking area for emergency vehicles	<p>Permanent land-take of Agricultural and Rural Amenity lands.</p> <p>This permanent land-take will contain the track in an open-cut section as it returns to an at grade level. There are also access roads to the Dublin Airport Tunnel South Portal with parking area for emergency vehicles. This section of track causes severance between the fields, i.e. where it was previously easy to access fields now it will be more difficult.</p> <p>This permanent land-take consists of approximately 3.1ha from agricultural land. There is approximately 96ha of Agricultural and Rural Amenity lands within Area MN104, north of the M50 motorway.</p>	medium	<p>As little land as possible will be taken.</p> <p>New access roads will provide access to properties that are severed by the permanent land-take.</p>	low	Low

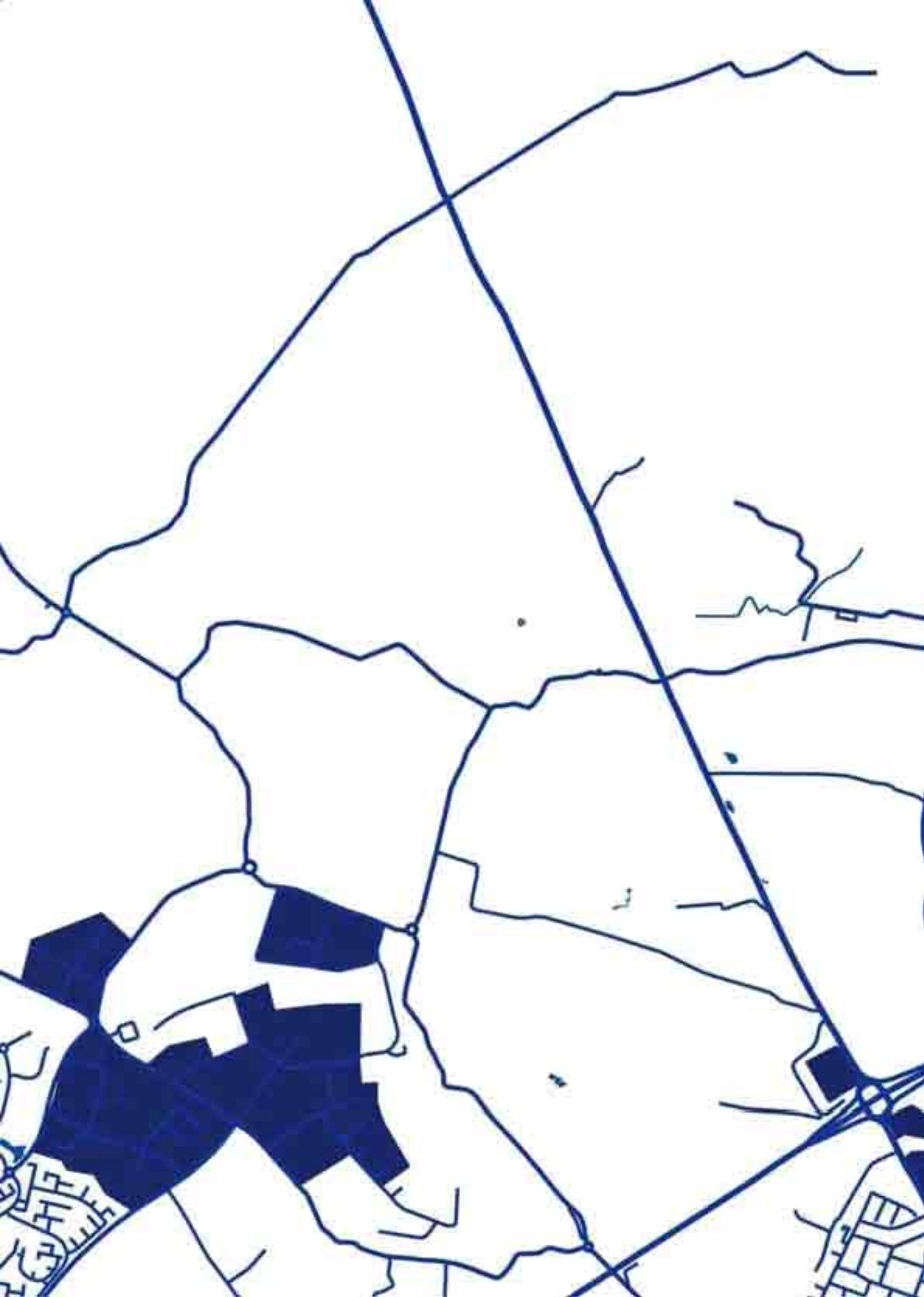
Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN104/ OP-02	LA 12 North and South of the M50 Motorway on lands classified as Agricultural and Rural Amenity and Open Space and Recreational	Dardistown Stop, track, park & ride facilities, at grade track and access road and emergency access road, and M50 bridge	<p>Permanent land-take from Agricultural and Rural Amenity, Open Space and Recreational and Industrial/Warehouse/Storage lands.</p> <p>There will be permanent land-take for the construction of Dardistown Stop and the associated Park &amp; Ride facilities, as well as the at grade track. There will be a high degree of severance due to the track.</p> <p>This permanent land-take consists of approximately 7.1 ha from agricultural land. There is approximately 96 ha of Agricultural and Rural Amenity lands within Area MN104, north of the M50 motorway. There is also minor permanent land-take from open space (0.1 ha) and from Industrial/Warehouse/Storage lands (0.7 ha).</p>	medium	<p>As little land as possible will be taken.</p> <p>New access roads will provide new access to residential buildings and Industrial/Warehouses/Storage uses in the area. There will also be severance on the field structures. The new access roads will also provide alternative access points to fields. Where road structures are made obsolete due to severance, they will be removed and returned to agricultural use.</p>	low	Low

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN104/ OP-03	LA 14 Northwood area and Ballymun on lands classified as Agricultural and Rural amenity and Residential areas/uses	Northwood Stop, track and new access roads	<p>Permanent land-take from Agricultural and Rural amenity and Residential areas/uses.</p> <p>Northwood Stop will be at grade on the east side of the Ballymun Road. From Northwood Stop the track begins to descend into a cut and cover section and travels beneath the Ballymun Road.</p> <p>There will be permanent land-take of approximately 1.4ha from agricultural land, of which there is approximately 38ha within Area MN104, south of the M50 motorway.</p> <p>There will be permanent land-take of approximately 0.3ha of residential land.</p> <p>There will be permanent land-take of approximately 0.1ha of open space, of which there is 7.7ha of within Area Mn104, south of the M50 Motorway.</p> <p>There has been considerable development in the area surrounding this construction compound, i.e. Northwood and Gulliver's Retail Centre. The area is being developed as a mixed use area with residential, commercial, retail as well as fitness centre and crèche facilities. However, the permanent land-take will not impact on these landuses.</p>	very high	<p>As little land as possible will be taken.</p> <p>The new access roads provide alternative access to the residential properties in the area. Where road structures are made obsolete due to severance, they will be removed and returned to agricultural use.</p>	high	High
MN104/ OP-04	LA 12 South of the M50 Motorway on lands in the existing streetscapes and LA 14 Northwood area and Ballymun on lands in the existing streetscapes	Tunnel constructed by cut and cover	<p>Permanent land-take from the existing streetscapes.</p> <p>There will be substratum permanent land-take beneath the R108. This will have no impact on the existing surrounding land-uses, but limits the future landuses of the land above it.</p>	medium and very high	<p>As little land as possible will be taken.</p> <p>The tunnel will be constructed at a depth so that it will not impact on the intended surface-level landuses.</p>	low	Low

Impact ID	Location	Source of impact	Impact description	Functional Value (FV) of affected area	Mitigation measure	Post mitigation	
						Magnitude	Significance
MN104/ OP-05	LA 14 Northwood area and Ballymun on lands classified as Open Space and Recreational uses	Substation	<p>Permanent land-take of Open Spaces and Recreational uses.</p> <p>A substation is to be constructed on the western side of the Ballymun Road.</p> <p>Permanent land-take of approximately 0.03ha of open space. There is approximately 7.7ha of open space within Area MN104, south of the M50.</p>	very high	<p>As little land as possible will be taken.</p> <p>The substation will be maintained and kept clean.</p> <p>There will be plenty remaining open space available.</p>	low	Low

Northwood Stop





# 03

## HUMAN BEINGS: SOCIO-ECONOMICS

- 3.1 [Impact assessment methodology](#)
  - 3.1.1 Study area
  - 3.1.2 Impact identification
  - 3.1.3 Impact assessment
  - 3.1.4 Derivation of mitigation measures
  - 3.1.5 Assessment of residual impacts
- 3.2 [Impact assessment](#)
  - 3.2.1 Project scenario: construction phase
  - 3.2.2 Project scenario: operational phase
- 3.3 [Derivation of mitigation measures](#)
  - 3.3.1 Construction phase
  - 3.3.2 Operational phase
- 3.4 [Assessment of residual impacts](#)



This chapter of the EIS evaluates the potential socio-economics impacts arising from the construction and operation of the proposed scheme in Area MN104.

The socio-economic assessment will examine the potential impacts on:

- Demography;
- Unemployment;
- Employment classification;
- Travel to work data and commuting;
- Economic benefits and employment creation.

### 3.1 IMPACT ASSESSMENT METHODOLOGY

The impact assessment methodology in this section is set out in a number of steps:

- Impact identification
- Impact assessment
- Derivation of mitigation measures
- Assessment of residual impacts

#### 3.1.1 Study area

The study area for this assessment is set out in Table 3.1.

Table 3.1 Study area

Criteria	Width of study area (on both sides of the alignment)
General/scheme-wide impacts	Greater Dublin Area and the Irish State
Localised impacts	Electoral Districts (EDs) in Area MN104 and which are within 500m of the alignment

### 3.1.2 Impact identification

#### 3.1.2.1 General/scheme-wide impacts

These impacts address the overall or 'global' socio-economic impacts of the proposed scheme and will focus on the proposed scheme as a piece of transport infrastructure. This section will examine the scheme-wide positive and negative impacts of the construction and operation of the scheme, which include the cumulative impacts of relevant localised impacts.

#### 3.1.2.2 Localised (MN104) impacts

These impacts will focus on the location of key construction activities along the alignment. The construction methodology will also be of direct interest.

Localised impacts will also focus on the potential impacts which may arise from the operation of proposed scheme.

EDs of particular interest (e.g. those with higher than average unemployment rate or those with a higher than average car ownership rate) will also be highlighted.

### 3.1.3 Impact assessment

#### 3.1.3.1 Magnitude

The criteria used to assess the different impacts associated with this scheme are shown in Table 3.2.

**Table 3.2 Criteria for assessment of impact magnitude**

Criteria	Impact magnitude
<ul style="list-style-type: none"> <li>- Long-term (15+ years) and/or substantial change in population levels, employment, employment classification or mode of travel to work (i.e. reduced congestion and commuting delays).</li> <li>- Long-term economic disruption to residents, businesses and commuters from construction activities.</li> <li>- Substantial improvements in quality of life due to significantly reduced commuting times, improved commuting experience and reliability of service.</li> </ul>	very high
<ul style="list-style-type: none"> <li>- Long-term and significant change in population levels, employment, employment classification or mode of travel to work.</li> <li>- Short-term (1 - 5 years) economic disruption to residents, businesses and commuters from surface-construction activities.</li> <li>- Significant improvements in quality of life due to reduced commuting times, improved commuting experience and reliability of service.</li> </ul>	high
<ul style="list-style-type: none"> <li>- Long-term and moderate change in population levels, employment, employment classification or mode of travel to work.</li> <li>- Short-term and substantial change in population levels, employment, employment classification or mode of travel to work.</li> <li>- Temporary (less than 1 year) economic disruption to residents, businesses and commuters from surface-construction activities.</li> <li>- Moderate improvements in quality of life due to reduced commuting times, improved commuting experience and reliability of service.</li> </ul>	medium
<ul style="list-style-type: none"> <li>- Long-term and minor change in population levels, employment, employment classification or mode of travel to work.</li> <li>- Short-term and significant change in population levels, employment, employment classification or mode of travel to work.</li> <li>- Minor improvements in quality of life due to reduced commuting times, improved commuting experience and reliability of service.</li> </ul>	low
<ul style="list-style-type: none"> <li>- Long-term and insignificant change in population levels, employment, employment classification or mode of travel to work.</li> </ul>	very low

Table 3.3 Criteria for assessment of impact significance

		Magnitude of impact				
		very low	low	medium	high	very high
Functional value of affected receptor	very high	Not significant	Low significance	Medium significance	High significance	Very high significance

### 3.1.3.2 Significance

The matrix used to define the significance of impacts is shown in Table 3.3.

All socio-economic receptors along the alignment have been classified as having a very high functional value. Socio-economic receptors in this case refer to the key socio-economic factors and data sets (employment level, demographics etc.).

### 3.1.4 Derivation of mitigation measures

Mitigation measures are only defined for any impacts that are deemed to be of Medium significance, and greater, in Table 3.3. The extent to which mitigation is needed increases as the significance of the impact increases. The logical basis for providing mitigation for impacts of Medium significance and above is that such measures should only be focused on significant environmental effects of the proposed scheme.

### 3.1.5 Assessment of residual impacts

Residual impacts that will persist after mitigation measures have been put in place are summarised in Table 3.7.

## 3.2 IMPACT ASSESSMENT

### 3.2.1 Project scenario: construction phase

#### 3.2.1.1 General/scheme-wide impacts

##### Direct economic impacts

The expenditure of construction workers' wages will result in a considerable portion of this expenditure being spent in the regional economy of the Greater Dublin Area over the approximate 5 year construction period, thereby resulting in indirect/secondary economic benefits. The estimated level of average direct employment during the 5 year construction programme is approximately 3,100. Table 3.4 provides a breakdown of this estimated level of employment during construction.

Table 3.4 Estimated average construction employment for the proposed scheme

Construction Year	Average direct construction employment
1	4,000
2	4,000
3	3,500
4	2,500
5	1,500
Annual average	3,100

Although the direct employment is short-term (approximately 5 years), it is possible to equate this short-term employment to a level of permanent employment. The EIS for Crossrail (a major rail scheme in London which consists of a twin-bore tunnel on a west-east alignment under central London and the upgrading of existing National Rail lines to the east and west of central London) uses an employment multiplier of 10 employment years during construction as being the equivalent of one permanent/full-time job. Using this employment ratio, the equivalent level of permanent/full-time employment (FTE) is provided in Table 3.5. In total, the full time equivalent direct employment (FTE) generated by the construction phase is 1,550 jobs.

Table 3.5 Permanent equivalent level of construction employment

Construction Year	Person years equivalent	Permanent/full-time years employment equivalent (FTE)
1	4,000	400
2	4,000	400
3	3,500	350
4	2,500	250
5	1,500	150

It is likely that the majority of the construction workforce will be resident in the Greater Dublin Area, given the fact that this is where the majority of construction workers resided during the recent period of high-levels of construction activity in Greater Dublin.

However, there has been a reduction in levels of activity in the construction sector since 2007 and the fall-off in construction activity has accelerated since late 2007 and is continuing. The Quarterly National Household Survey (CSO, 5th March 2008) notes that construction employment in Q4 (Sept. – Nov. '07) fell by 5,600 (-2.0%) and that the overall decrease in construction employment fell by 15,200 during 2007, and stood at 279,000 at the end of November 2007. Provisional 2008 data has indicated ongoing significant falls in construction-related employment in Ireland and a rise in overall unemployment. In the context of the significant fall in construction-related employment (and rising overall unemployment), and given the fact that the Greater Dublin Area is the largest urbanised area of Ireland, it is likely that the majority of construction workers will be sourced from the Greater Dublin Area.

Overall it is likely that there will be more than sufficient capacity in the construction sector of the Greater Dublin Area to build the proposed scheme and construction will not result in displacement of construction employees away from other large-scale infrastructural projects. Thus, the proposed scheme will not delay or impede the development of other strategic infrastructure projects in the Greater Dublin Area.

Overall, the proposed scheme will result in positive impacts due to direct employment creation and this is a positive impact of very low magnitude and Very low significance.

### Indirect socio-economic impacts

Particular sectors of the regional economy (i.e. the economy of the GDA of Dublin, Wicklow, Kildare and Louth) are also likely to benefit from the proposed scheme such as those in construction (and related industries) and the material supplying industry (steel, concrete etc.). There will also be secondary/spin off impacts due to expenditure of wages and salaries in the local economy by the construction workforce. These sectors are likely to include accommodation (e.g. B&Bs) and daily subsistence (e.g. lunch and evening meals) providers. The assessment of socio-economic effects in the Crossrail EIS assumed an employment multiplier of 1.5 (i.e. each permanent jobs (or equivalent) will generate an additional 0.5 permanent jobs). The Crossrail EIS multiplier of 1.5 is based on multipliers used in other recent major rail schemes in the UK, such as:

- Thameslink 2000: 1.5;
- Channel Tunnel Rail Link: 1.4.

Other construction-related employment multipliers used in recent studies for the Scottish Executive were:

- Manufacture of structural metal products: 1.52;
- Manufacture of other general purpose machinery: 1.51;
- Manufacture of special purpose machinery: 1.63;
- Manufacture of other transport equipment: 1.33;
- Construction: 1.86.

Following a consideration of these comparable multipliers, it was decided that a multiplier of 1.5 was appropriate for the proposed scheme. Table 3.6 contains information regarding indirect employment creation due to the construction of the proposed scheme.

**Table 3.6 Permanent/full-time equivalent (FTE) level of construction employment**

Construction Year	Permanent years employment equivalent	Indirect employment creation	Total direct and indirect FTE
1	400	200	600
2	400	200	600
3	350	175	525
4	250	125	375
5	150	75	225

Overall, the construction of the proposed scheme will provide an annual average direct employment of 3,100 for the 5-year construction programme. This equates to 1,550 full-time equivalents, with a further 775 FTE arising as indirect impacts. Overall, the proposed scheme will result in positive impacts due to overall employment creation and this is a positive impact of low magnitude and Low significance.

#### **Impacts due to traffic congestion and diversion**

This impact is addressed in the traffic section of the EIS. However, a brief summary is provided below.

Generally there is an increase in journey times on most of the roads/routes assessed during the five year construction programme. Traffic modelling data (MVA, 2007) indicates that some routes experience significant journey time deterioration, particularly the R132 through Swords, Ballymun Road, N2, Collins Avenue, Church Street and Baggot Street. Overall the impact on journey time can be classified as moderate to severe on the routes assessed.

Traffic modelling results have shown that traffic speeds across the GDA will decrease by over 11%, or drop by 3kmh-1. This represents a situation where traffic movement for all modes will be very difficult with significant delays at key areas. Drivers will travel further distances to avoid construction areas compounding the congestion levels on other parallel routes and affecting the operation of buses through the city. Other traffic modelling statistics such as impact on bus speeds and journey time on key routes further demonstrate the significance of the construction impact. Overall this will result in negative socio-economic impacts on the Greater Dublin Area's commuters and freight movements. These negative impacts are of medium to high magnitude and Medium to High significance, since the duration of these impacts ranges from temporary to short-term.

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#### **3.2.1.2 Localised socio-economic impacts**

The localised socio-economic impacts will be a consequence of the landuse impacts (MN101 to MN107) and are addressed in the Landuse chapter of this EIS (Volume 2, Chapter 2). Similarly localised traffic disruption during construction is addressed in the respective Traffic chapters of this EIS (Volume 2, Chapter 7).

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### **3.2.2 Project scenario: operational phase**

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#### **3.2.2.1 General/scheme-wide impacts**

##### **Facilitating future development and employment creation**

Overall the proposed scheme will facilitate a significant amount of future development along the whole alignment and across the wider northern part of the Greater Dublin Area. While the proposed scheme will not directly result in additional development in the proximity of the alignment the proposed scheme will, indirectly, allow the relevant planning authorities to plan for and grant consent for additional development at key locations.

Essentially, the proposed scheme will permit higher-residential densities (planning policy in Dublin City and Fingal County Councils envisage higher-density development along key transport corridors and close to key transport nodes) thereby maximising the transport and socio-economic benefits of the scheme (Department of the Environment, Heritage and Local Government, 2008). The basis for higher-density zoning adjacent to key transport corridors is that this will provide a realistic and attractive alternative to private-car based commuting, thereby resulting in greater use of public transport (the proposed scheme in this case) with corresponding reductions in journey time and greater access to employment and other key destinations.

Fingal County Council commissioned a report titled 'Economic Development Strategy for the Metro North Economic Corridor (MNEC)' (Indecon International Economic Consultants, 2008) which outlines a long-term development strategy for a period up to 2025/2030. The Strategy has assumed that the MNEC is a 1km corridor on either side of the alignment of the proposed scheme (which corresponds to the width of Fingal County Council's Metro North Development Contributions Scheme) and extends from the terminus of the proposed scheme in the townland of Belinstown to the Fingal County Council-Dublin City Council administrative boundary at Santry Avenue.

In summary, this Strategy envisages an increase in the MNEC population from 59,000 (2006 data) to 128,100 by the period 2025/2030. This represents an increase in residents within this 2km-wide corridor of 69,100, an increase of over 117% over 2006 levels. The basis for this proposed increase in MNEC population is that the attractiveness of the MNEC which will be greatly enhanced by the transport advantages provided by the proposed scheme.

The Strategy recommends that three specific locations within the MNEC will be the focus of the majority of overall new development and growth. These three areas are: Swords-Lissenhall, Dublin airport (Eastlands) and Metropark. The proposed scheme is a key piece of infrastructure which will facilitate the implementation of the Indecon Strategy. Without the proposed scheme many of the elements outlined in the Strategy will not arise. It should be noted that the various targets in the Strategy are acknowledged by Indecon as being ambitious and that they 'will be a major challenge and will require innovative policy initiatives' to ensure its implementation.

The overall objectives of the MNEC Strategy have been adopted by Fingal County Council and it is their intention to prepare a number of variations to the Fingal County Development Plan to facilitate implementing the MNEC Strategy. In May 2008, Fingal County Council published a document titled 'Your Swords: An Emerging City – Strategic Vision 2035'. This states (p.15) that 'the identification and promotion of Metro Economic Corridor(s) will be of strategic importance to the economy and well-being of the county's residential and business/employment population'. Fingal County Council also intends to prepare additional planning policy documentation to support the implementation of the MNEC Strategy as required in future years.

Dublin City Council also sees the proposed scheme as facilitating future development activity in their administrative area. However, in Dublin City Council's area, adjoining lands are predominantly already developed; whereas in Fingal, significant undeveloped sites existing, and it is these locations where the large quantum of future development (as envisaged in the MNEC) is likely to arise.

The proposed scheme will assist Dublin City Council with its development aspirations and objectives at key locations such as Ballymun (currently the focus of one of Europe's largest regeneration projects) and the north inner city. It will also assist with the implementation of the Phibsborough/Mountjoy Local Area Plan – which specifically refers to the proposed scheme and the role it will play on future development patterns and landuses.

In conclusion, the proposed scheme is essential to the planning and development aspiration of both Dublin City Council and Fingal County Council and this is strongly reflected in both of their respective development and planning policies. The proposed scheme will facilitate and greatly assist a more sustainable development pattern in future years and this is a positive impact of high magnitude and High significance.

The proposed scheme will also result in positive development and economic impacts for the Greater Dublin Area and beyond, through creating a positive image of the city – both for national and international markets – and result in wider economic benefits through assisting people move through and around the Greater Dublin Area. A report ('What Light Rail Can Do For Cities - A review of the evidence, prepared by Steer Davies Gleave, February 2005) for pteg (Passenger Transport Executive Group, based in the UK) noted that:

'there is real evidence that UK light rail schemes have provided business with better access for customers; giving better access to labour markets, supporting business expansion and providing the confidence to make investment decisions based on the evident commitment to improved public transport. Increased development activity has brought a 'buzz' to areas served by the tram schemes.'

Dublin Transport Office (DTO) commissioned a study which surveyed household's attitudes to the Luas service (Millward Brown IMS, 2006). The survey was published in November 2006, over two years after the Luas service was introduced. The key findings of the survey were:

- Luas has contributed to people's overall satisfaction within their local area, with higher satisfaction levels in both Luas catchments.
- Luas is widely seen as a quicker way to travel than the car and, in particular, the bus. Many Luas users who have cars still opt for the Luas as the service offers speed and reliability (although the survey did highlight that there was a portion of car-users who were not willing to 'give-up' car-based travel in favour of the Luas).
- Luas has contributed to increased shopping and employment opportunities. Luas also generated incremental shopping trips (i.e. shopping-related trips that would not normally have been made in the absence of Luas). This finding is also reported in another economic paper (Graham, 2003).

In 2006, the DTO commissioned another study ('LUAS 'After' Study: Employers & Retailers, Dublin Transportation Office: prepared by Millward Brown IMS, 2006) November 2006') which examined a range of public attitudes to the Luas light rail system. The study was undertaken from April to May 2006, approximately two years after the service was operational. The study had a number of key findings:

- Positive impact of the Luas on ease of travel around Dublin is widely acknowledged.
- The problem of staff punctuality as a result of inadequate public transport has been eased, in both the Red and Green line catchments.
- One in every four businesses, overall, and three in every ten located in the Luas catchments, believe Luas has been advantageous for their business. Businesses in the Green Line catchment are the most positive. Green Line businesses noted that improved staff access to work was the main advantage while Red Line businesses noted easier and better access for customers and clients.
- Significant satisfaction with improved access to and from the city centre.

Overall, the proposed scheme is likely to result in positive direct and indirect economic benefits for Dublin city, the Greater Dublin Area and the Irish economy through increasing accessibility to the city centre as well as induced/secondary/incremental economic and employment opportunities. It is noted by the pteg report that while it is difficult to quantify the wider economic impacts of rail schemes, 'there is clear empirical evidence of positive effects that light rail has had on the cities where it has been implemented in the UK'.

The proposed scheme will also go some way to reducing the wider costs of congestion and delays in commuting to work. The negative impacts of congestion to Dublin's (and thus, Ireland's) economy are significant: Dublin Chamber of Commerce estimates that 'the cost of congestion to the Greater Dublin Area in 2005 was €2.5bn' (Dublin Chamber of Commerce, 2005).

Overall, the proposed scheme will result in a positive impact to the wider economy in terms of development and reduced congestion of high magnitude, which is of High significance.

### **Improving accessibility to increased employment opportunities**

Fingal County Council's MNEC Strategy will, through the Council's various planning policy documents, facilitate the creation of 37,000 additional jobs in the MNEC, up to the period 2025/2030. This represents an increase of 125% over the level of 2006 employment in the MNEC (which stands at 29,600 jobs). Additionally, the MNEC will have a resident population in excess of 128,000 and over 69% of these people will also work in the MNEC.

The Strategy envisages that most of these additional jobs will be within the services sector and target industries include corporate head offices, IT services, financial and business services, science and technology projects and environmental products and services. The strengths of MNEC, sourced from the MNEC Report, are:

- A high employment rate;
- A low dependency rate (i.e. retired, unable to work);
- Large proportion of young population (25-44 age group);
- High educational attainment;
- Close proximity to Dublin Airport;
- Access to national and international markets via the national road network;
- Proximity to major seaports, including Dublin Port and the proposed Bremore Port;
- Existing base of foreign and indigenous firms;
- Access to major 3rd & 4th-level institutions in the Dublin area;
- A high quality of life.

The MNEC Strategy predicts that the majority of these jobs will be higher skilled and in the Market Services sector (76%: 28,200 additional jobs), followed by Non-Market Services (13%: 4,900) and Industrial jobs (11%: 3,900). Market Services jobs will entail financial and other international services, transport and communications services, and distribution. Industrial jobs comprise manufacturing, utilities and building. The principal future employment areas will be: Swords-Lissenhall, Dublin airport (Eastlands) and Metropark.

In Dublin City Council, the proposed scheme will result in the creation of new employment opportunities, although not to the same extent as the potential additional employment creation in Fingal County Council. Additional employment creation is likely to be focused at Ballymun (aspart of the ongoing regeneration) and in the suburban retail and office concentrations, such as Drumcondra and Phibsborough.

Overall, the proposed scheme will assist with the creation of major employment opportunities in the long-term and this is a positive impact of high magnitude and High significance.

### **Improving accessibility to community and social facilities**

The proposed scheme will provide high-quality and frequent access to community and social facilities, such as typical city and town centre facilities (e.g. banking, post-offices, public sector services, retail, financial and professional services, medical and dental services and educational facilities). Examples of the key locations to which access will be provided include: Swords town centre, Airside Retail Park, Dublin Airport, Metropark, Ballymun Town Centre, Dublin City University, Mater Hospital, Drumcondra high street, Trinity College, Dublin city centre and St. Stephen's Green. Additionally, access will be provided Dublin's wider rail and Luas network, thus opening up similar facilities all over the Greater Dublin Area, such as Dublin Docklands, Harcourt street business area, Dundrum Town Centre, Sandyford Industrial Estate, Heuston Station, Connolly Station and Tallaght Town Centre.

Overall, the proposed scheme will result in positive impacts with respect to access to the key social and community facilities in Dublin and this is a positive impact of high magnitude and High significance.

### **Assisting regeneration and social-improvement activities**

The proposed scheme will greatly assist with the many ongoing regeneration initiatives in proximity the scheme's alignment. The largest regeneration project is Ballymun and this is being managed by Ballymun Regeneration Ltd, a company set up by Dublin City Council to oversee the overall project. The proposed scheme will greatly assist with all of the regeneration and renewal objectives for this area of Dublin which has suffered socially challenging conditions for generations. The proposed scheme will provide the resident population (significant percentages of who are unemployed and with minimal educational qualifications) with direct, high-frequency and regular transport options to the key employment and other landuse areas of the Greater Dublin Area, thereby assisting with the regeneration objectives. The proposed scheme will also greatly assist the development of Ballymun Town Centre through providing direct, high-frequency and regular transport connectivity to the planning and future employment opportunities and town centre landuses. Thus, Ballymun will become a key town centre, underpinning the future vitality and community of Ballymun.

The proposed scheme will also assist with other regeneration and social-improvement programmes. In total, there are five designated RAPID areas, four Integrated Action Plans (under the Urban Renewal Scheme), 16 primary schools and three post-primary schools in the Department of Education and Science's social inclusion programme, 'Delivering Equality of Opportunity in Schools' (DEIS). Many of these are located within the study area, as described in the baseline Socio-economic chapter of this EIS (Volume 1, Chapter 11).

Overall, the proposed scheme will greatly assist with current and future regeneration programmes, a positive impact of high magnitude and High significance.

### **Improved access to employment through commuting improvements**

The proposed scheme will deliver a fast, reliable, regular and efficient transport option through the north of Dublin city and on to Dublin Airport and beyond Swords. The journey time from Dublin Airport to the city centre (St. Stephen's Green) is estimated at approximately 20 minutes and the journey from city centre to the terminus north of Swords is estimated to be approximately 30 - 35 minutes. Annual patronage (total journeys) is estimate to be 34 million, in excess of an average of 93,000 journeys per day. The initial peak service (broadly 0700 - 1000 and 1530 - 1930) is expected to be a 90m LMV every four minutes, providing capacity for 10,000 passengers per direction per hour. The off-peak service will be less frequent and possibly with shorter vehicles (45m). The proposed scheme has been specified to be capable of carrying 20,000 passengers per direction per hour, with LMVs up to 90m long running at frequencies up to every two minutes. The capacity specified is around four times the forecast peak demand on the line when it is expected to open 2014 and around six times the current peak demand on the Luas Green line.

In comparison to the other public transport option, which is primarily bus along the alignment, the proposed scheme will provide substantial improvement in journey frequency and times. Currently, a sample bus journey from Swords to the city centre (bus number 41) takes approximately 75 minutes, with four such services per hour. This is predicted to increase to approximately 91 minutes in 2014 and 100 minutes in 2029, all without the proposed scheme. When operational in 2014, the proposed scheme will provide an average journey time of approximately 30 minutes with up to 15 services per hour during peak periods. In comparison to the current level of bus service, this represents a substantial improvement in the peak commuting journey times. Such bus versus Metro North journey time savings exist along the whole scheme.

Regarding improvements to car-based journeys, Metro North will positively impact on these, thus providing these car-based commuters with reduced journey times and improved quality of life (e.g. shorter and less-stressful commutes). The modal shift from car to Metro improves the average speed across the GDA by 2kmh<sup>-1</sup> and 3kmh<sup>-1</sup> in 2014 and 2029 respectively. Time spent queuing decreases, distance travelled decreases and also time spent travelling decreases. Journey time assessments (MVA, 2007) on key routes further demonstrate the positive nature of the impact as the majority in both 2014 and 2029 show decreases. In both operational years 2014 and 2029 there is a general reduction in journey times on most of the routes assessed.

Journey time reductions of note include on the R132, Ballymun Road, M1, N2, Collins Avenue and Santry Avenue. There is a decrease in journey time of 19.8% on the R132 northbound from the city centre to the airport. There is a decrease in journey time of 17.2% using the Port Tunnel northbound. There is a decrease in journey time of 14.3% using the South Quays – Georges Quay to O’Connell Bridge. There is a reduction in journey time on all routes on the M1 and N2 northbound and southbound from Dublin city centre to Swords and on the M50 in both directions. The most significant increase in journey time is anticipated to be 8.9% on the North Quays – from Heuston to O’Connell Bridge. However the majority of journey times are reduced along the routes. The journey time assessment for the operational years illustrates the significance of the positive impact that the proposed scheme will have on traffic movement particularly in the vicinity of the alignment.

The result of the proposed scheme is that it will provide a significant improvement to transport options and accessibility to a large portion of the population along the alignment. The net result of the proposed scheme is that the quality of life for a large portion of the residents living along the commuting corridor of the proposed scheme will be significantly improved due to significantly reduced journey times, improved journey reliability, frequency, comfort and safety. This represents a positive impact of very high magnitude and Very high significance.

With the provision of three Park & Ride sites as part of the proposed scheme, improvements to the many commuters’ quality of life will be extended to commuters living in the towns and villages of North County Dublin and Counties Louth, Meath Cavan, Westmeath and Longford (i.e. long-distance commuters). The current prevalence of long-distance commuting in the ‘outer’ counties of the Greater Dublin Area (and beyond) can be seen in the average distances of journeys travelled to work data from the 2006 Census. For Dublin City, the greatest percentage of journeys travelled (25.03%) is in the 2-4km distance. For Dun-Laoghaire, the greatest journey to work travelled is in the 5-9km category (25.24%). However, significantly fewer percentages of similar (i.e. shorter) journeys are travelled in the outer counties and proportionally a greater volume of longer journeys (15km+) are undertaken instead. For example, in Kildare and Meath, 15.28% and 17.44% respectively of journeys travelled are 25 - 49km, as against an average for Leinster of 7.4% for the same distance of journey.

While the proposed scheme will not reduce the commuting distances, it will reduce the commuting time and provide a more regular and improved commuting journey, resulting in an overall improvement to many long-distance commuters’ quality of life. Overall, the proposed scheme will result in a positive impact to the quality of life of the commuters along the proposed scheme, and to those from the wider region who will use the Park & Ride sites. This positive impact is of high magnitude and is of High significance.

#### **Direct employment creation**

The proposed scheme will generate direct employment opportunities. RPA estimate that a total of 350 people will be required to operate the service in the first nine years of operation, with approximately 220 staff being employed in the operation of the service (vehicle drivers, customer service staff, Park & Ride attendants, station staff, management etc.) and approximately 130 staff being employed in the maintenance of the system and infrastructure.

The level of direct employment will increase in year 10 due to the increased frequency of service and greater capacity on the system. It is estimated that 420 staff will be directly employed for the operation and maintenance of the proposed scheme after year 10.

It is not possible to estimate where future employees will come from. However, it can be assumed that a portion will be from the proposed schemes catchment area. Given the higher unemployment levels in specific EDs (such as those in Ballymun and the north inner city of Dublin) within the proposed scheme study area, it is likely that employment of residents could be directly boosted in these EDs with some reduction of in unemployment rates.

The creation of this quantum of employment associated with the operation and management of the proposed scheme will also result in indirect socio-economic benefits, through expenditure of salaries by employees of the scheme. Additional job creation will also result. This is difficult to quantify, but it will result in some further socio-economic benefits to the Greater Dublin Area.

It should be noted that these jobs will be new jobs and will not be as a result of displacement of employment from other sectors of public transport. Thus, there will be no impact on existing levels of employment in public transport.

Overall, direct employment from the proposed scheme will result in a positive impact of very low magnitude and, coupled with the very high functional value, this results in a positive impact of Very low significance.

### 3.2.2.2 Localised (MN104) socio-economic impacts

#### Facilitating future development

While the proposed scheme will not directly result in increased population levels proximate to the proposed scheme it will, indirectly, allow the relevant planning authorities to plan for and grant consent for higher residential and employment densities at key locations (in accordance with current and future planning policy), primarily due to the greater public transport capacities provided by the proposed scheme, but also due to some key characteristics of this part of Dublin.

As previously noted in Section 3.2.2.1, Fingal County Council commissioned a report titled 'Economic Development Strategy for the Metro North Economic Corridor (MNEC)' which outlines a long-term development strategy for a period up to 2025/2030. In summary, this Strategy envisages an increase in the MNEC population of over 117%, over 2006 levels by 2025/2030. The basis for this proposed increase in MNEC population is that the attractiveness of the MNEC will be greatly enhanced by the transport advantages provided by the proposed scheme. Additionally, the Strategy is predicting the creation of an additional 37,000 within the MNEC. Regarding MN104, the Strategy recommends that Metropark is one of three specific locations within the MNEC which will be the focus of the majority of overall new development and growth.

The proposed scheme is the key piece of infrastructure which will facilitate the implementation of the Strategy. Without the proposed scheme, many of the elements outlined in the Strategy will not arise.

As noted above, the overall objectives of the MNEC Strategy have been adopted by Fingal County Council, who intend to prepare a number of variations of the Fingal County Development Plan to facilitate implementing the MNEC Strategy. In May 2008, Fingal County Council published a document titled 'Your Swords: An Emerging City - Strategic Vision 2035'. In addition, there are also other Fingal County Council policy documents which accompany the Swords Vision document which support Fingal County Council's acceptance of the MNEC Strategy.

Also of direct importance to Area MN104 will be the implementation of the North Ballymun Local Area Plan, adopted by Fingal County Council in December 2005. The geographic area (approximately 40ha) of the Local Area Plan (LAP) area is contained to the north by the M50, to the south by the boundary with Dublin City Council along St. Margaret's Road, to the east by the Ballymun Road and to the west by Sillogue Lane. The Local Area Plan proposes a 'medium density scenario' development strategy, comprising three main categories of landuse:

- Mixed Use Employment Generating Uses: 65,760 m<sup>2</sup> - 161,520 m<sup>2</sup>;
- Residential: (30% overall development areas) 41,040 m<sup>2</sup> (456 units) - 82,080 m<sup>2</sup> (912 units);
- National Retail: circa 30,000 m<sup>2</sup>.

A range (lower and upper limits) of development densities is proposed in the Local Area Plan.

The MNEC Strategy also notes (p.36) that Fingal County Council intends to prepare and adopt a Local Area Plan for Metropark by 2009.

There are also proposals for additional large, mixed-use developments adjacent to Northwood Stop. This location already has a significant volume of modern, mixed-use development. The location and quantum of existing and future development at this location is strongly influenced by the planned development of the proposed scheme. The proposed scheme is therefore essential for the future development of Northwood and the surrounding areas.

The information presented in the baseline Socio-economics chapter of this EIS (Volume 1, Chapter 11) shows that Area MN104 contains a single ED: Dubber. This ED covers a large geographic area. However, the majority of its population live to the south of this ED and are relatively close to the proposed scheme. Area MN104 has had a population increase of over 347% in the period 2002 - 2006, with its population growing from 838 to 3,747. With the above economic and strategy policy being proposed by Fingal County Council in relation to Metropark, the population of Dubber will significantly increase in future years, in accordance with Fingal County Council's policy which is contingent on the operation of the proposed scheme.

The proposed scheme will facilitate future development and growth of Fingal County Council in a planned and sustainable manner. This is a positive impact of very high magnitude and Very high significance.

### Employment creation

As noted in Section 3.2.2.1, the proposed scheme will facilitate the creation of 37,000 additional jobs in the MNEC, up to the period 2025/2030, representing an increase of 79% over the level of 2006 employment in MNEC. The Strategy predicts that the majority of these jobs will be in the Market Services sector (28,200 additional jobs), followed by Non-Market Services (4,900) and Industrial jobs (3,900).

As noted above, Fingal County Council has accepted the MNEC Strategy and intends to implement it over the coming years. This implementation process is already underway with the publication of the policy document 'Your Swords: An Emerging City - Strategic Vision 2035': published by Fingal County Council in May 2008. Thus, the MNEC Strategy will form the basis and foundation for planning and development policy for the Metropark and North Ballymun areas.

The Strategy identifies the Metropark location as one of the three key growth areas and this has direct relevance for the communities within Area MN104. It is likely that a significant amount of these additional jobs will be located within Area MN104 and the Dubber ED.

Overall, the proposed scheme will, in the long-term, assist and facilitate the creation of a significant amount of the estimated 37,000 additional jobs to be created in the MNEC. This is a positive impact of very high magnitude and Very high significance.

### Improving accessibility to and availability of employment opportunities

In addition to being critical to the creation of jobs within the MNEC over the coming years, the proposed scheme will greatly increase accessibility of residents to employment, both within the MNEC and also across the Greater Dublin Area.

Currently, only 27.6% of residents of MNEC actually work within the corridor. Of the remaining 72.4%, the majority (37%) work in Dublin City centre. However, the MNEC Strategy envisages that approximately 60% of future MNEC residents would also work within the MNEC. A key aspect of this is that the MNEC Strategy recommends the distribution of all types of landuses (residential, employment, recreational, etc) across all of the MNEC with a view to encouraging mixed-use development and lifestyles whilst minimising leakage of skills and out-commuting.

The proposed scheme will result in accessibility improvements through providing easier access to other employment locations (such as Dublin City centre and docklands). The current rate of employment in Area MN104 (Dubber) is high (76.2%) well above the average for Fingal County (64.6%), the average for the State (57.2%) and the Greater Dublin Area (59.9%). Correspondingly, unemployment rates are comparatively low (5.6%). Although the proposed scheme will improve access to employment opportunities across the Greater Dublin Area, it is not anticipated to result in significant reductions in unemployment for Area MN104, given the relatively high rates already found in the area. For Dubber, the proposed scheme is predicted to result in, initial/short-term minor improvements of low magnitude and Low significance.

In the longer-term (to the period 2025/2030 and beyond), the proposed scheme will result in substantially positive impacts regarding employment creation of very high magnitude and Very high significance for Area MN104 through the assistance in the creation of 37,000 additional jobs.

For residents who currently commute by public transport from Ballymun and the surrounding area to Dublin city centre, the proposed scheme will bring about significant improvements in the daily access to employment. It should be noted that the majority of MN104's population lives in the North Ballymun area, hence the proposed scheme will provide a regular and rapid mode of commuting to and from the city centre and other destinations along the proposed scheme. It shall also provide easy access to Dublin's wider rail, Luas and bus network, thus providing easy access to the majority of the Greater Dublin Area. The information presented in the baseline Socio-economics chapter of this EIS (Volume 1, Chapter 11) shows that that Dubber has average to slightly below-average levels of non-car use for commuting to work, school or college. The proposed scheme is predicted to increase the portion of those who will travel to work by non-car modes of transport.

The proposed scheme will provide significant improvements regarding commuting times and journey quality for the residents of Area MN104. Currently an average/sample bus journey from Ballymun to the city centre (bus number 13) takes approximately 56.2 minutes, with four such services per hour. This is predicted to decrease to 54.8 minutes in 2014 but increase to 73.2 minutes in 2029, all without the proposed scheme. When operational in 2014, the proposed scheme will provide an average journey time of approximately 15-18 minutes with approximately 15 services per hour during peak periods. In comparison to the current level of bus service, this represents a substantial improvement in the peak commuting journey, which is an impact of very high magnitude and Very high significance.

Regarding improving transport options for those with no access to a car, the proposed scheme will provide improvements to accessibility for residents of Dubber, where 19.1% of the population has no access to a car. This is above the average for non car access in Fingal (13.9%) and broadly on par with the Greater Dublin Average (22%) and the State average (19.7%).

In relation to improving the type of employment opportunities, the proposed scheme will result in significantly greater access to professional and technical employment for the population of Area MN104, as the ED shows lower than average level of professional (25.3% against a Fingal average of 38.2%) and skilled and semi-skilled occupations (47% against a Fingal average of 42.2%) and higher than average levels of unskilled and other occupations.

Overall, the proposed scheme will increase access to more and better employment opportunities for in Area MN104.

#### **Improving accessibility to community and social facilities**

This section is focusing on the benefits that the proposed scheme will provide in relation to access to community and social facilities, such as typical city and town centre facilities (e.g. banking, post-offices, public sector services, retail, financial and professional services), medical and dental services and educational facilities.

The proposed scheme will provide significantly faster and direct access to some key community and social facilities along the alignment, such as Swords town centre, Airside Retail Park, Dublin Airport, Metropark, Ballymun Town Centre, Dublin City University, Mater Hospital, Drumcondra High Street, Trinity College, Dublin city centre and St. Stephen's Green. Additionally, access will be provided Dublin's wider rail and Luas network, thus opening up similar facilities all over the Greater Dublin Area.

Overall, the proposed scheme will improve access to community services, a positive impact of high magnitude and High significance.

#### **Assisting regeneration and social-improvement activities**

There are no RAPID, Urban Renewal Schemes or DEIS schools located within Area MN104. However the proposed scheme will assist with short-term social-improvements in Dubber.

However, in the longer-term (up to 2025/2030 and beyond), the proposed scheme will facilitate the redevelopment and expansion of the various communities along the MNEC, including the provision of 37,000 additional jobs, the majority of which will be classed as skilled and well-paid employment.

Overall, the proposed scheme will greatly assist with current and future employment development objectives, a positive impact of very high magnitude and Very high significance.

## **3.3 DERIVATION OF MITIGATION MEASURES**

### **3.3.1 Construction phase**

All relevant construction mitigation measures for socio-economic impacts are linked to the general construction measures proposed within this EIS, which outlines a range of measures to minimise environmental impacts which might arise during the construction stage of the project. Access to businesses and key retail, employment and commercial areas will be maintained during the construction phase and the public and local receptors will be fully aware of construction plans in advance.

Appropriate information and management procedures will be introduced before and during the construction phase for the resident, working and visitor populations. This will include traffic management and access measures. A Construction Team representative will be available during the construction phase for consultation with local residents and businesses.

### **3.3.2 Operational phase**

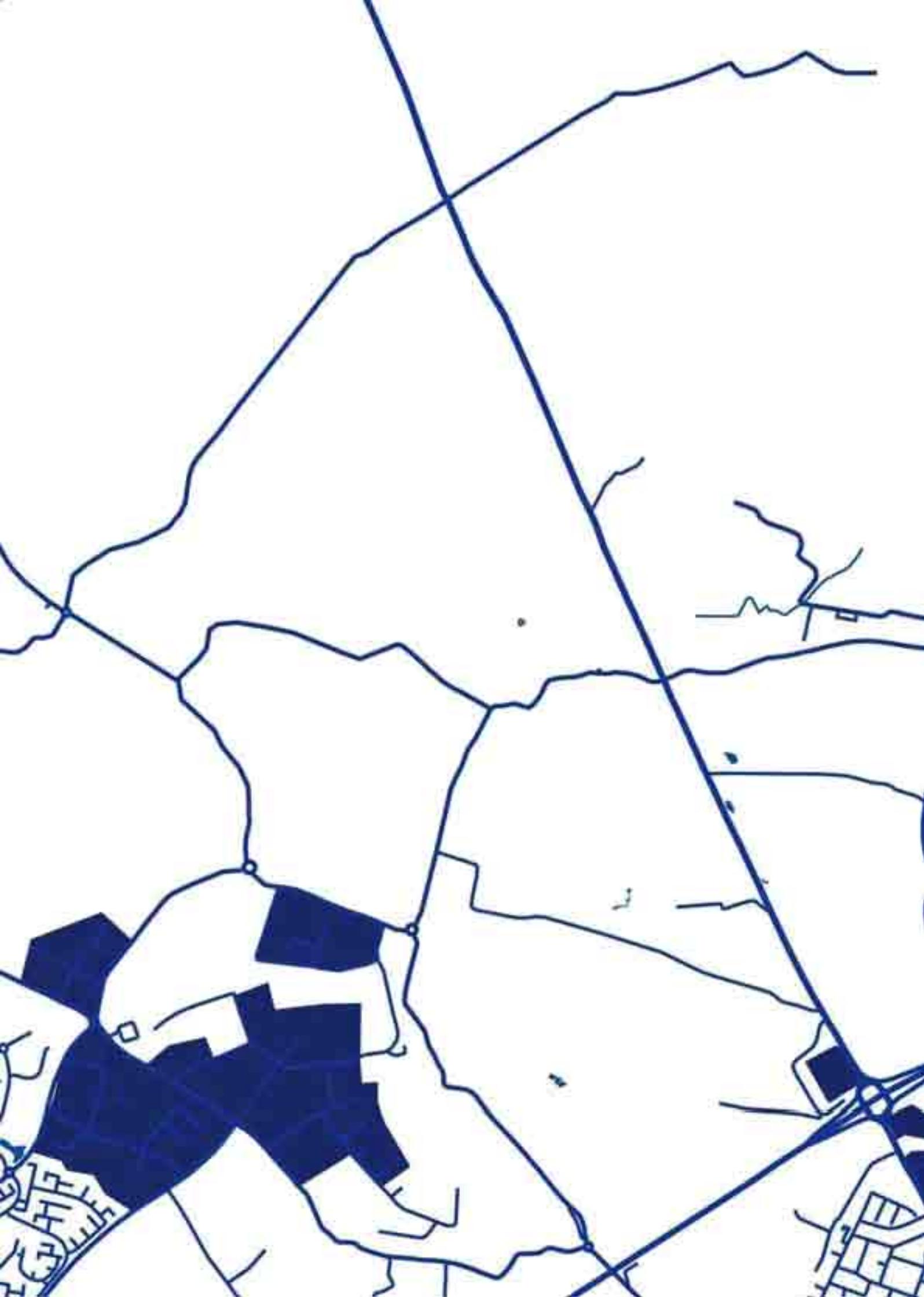
All of the operational impacts are positive and, thus, no mitigation is proposed.

## **3.4 ASSESSMENT OF RESIDUAL IMPACTS**

A summary of the residual impacts associated with the proposed scheme is provided in Table 3.7.

Table 3.7 Summary of residual impacts

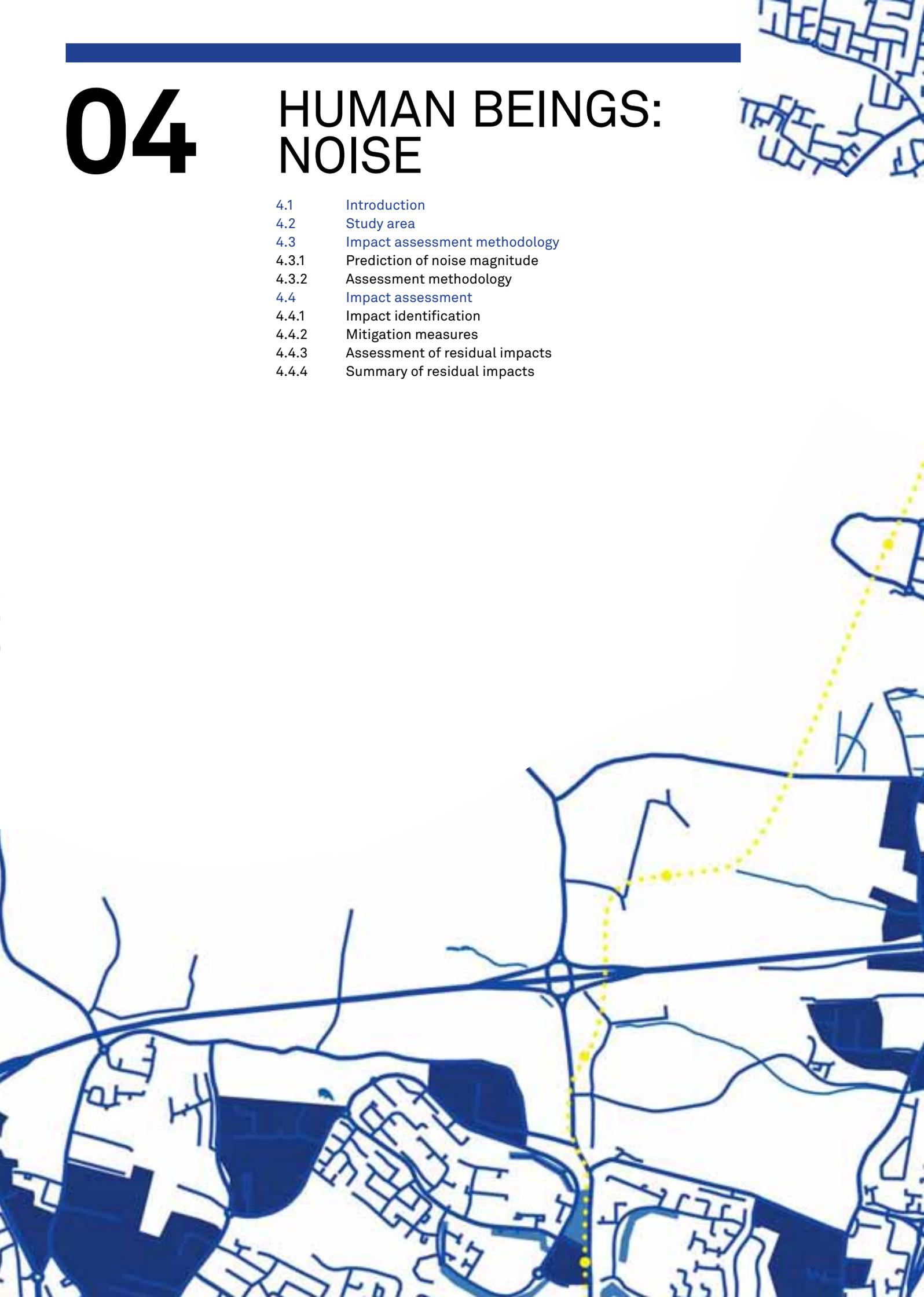
	Magnitude of impact taking into account mitigation	Functional value of area affected	Significance of impact
<b>General/scheme-wide impacts: Construction phase</b>			
Direct economic impacts	very low	very high	Very low
Indirect economic impacts	low	very high	Low
Impacts due to traffic congestion and diversion	high	very high	High
<b>General/scheme-wide impacts: operational phase</b>			
Facilitating future development and employment creation	high	very high	High
Improving accessibility to employment opportunities	high	very high	High
Improving accessibility to community and social facilities	high	very high	High
Assisting regeneration and social-improvement activities	high	very high	High
Improved access to employment through commuting improvements	very high	very high	Very high
Improved commuting journeys for long-distance commuters	high	very high	High
Direct employment creation	very low	very high	Very low
<b>Localised (MN104) impacts: Construction phase</b>			
Refer to respective Landuse and Traffic chapters (Volume 2, Chapters 2 and 7 respectively)			
<b>Localised (MN104) impacts: Operational phase</b>			
Facilitating future development	very high	very high	Very high
Employment creation	very high	very high	Very high
Improving accessibility to and availability of employment opportunities	very high	very high	Very high
Improving accessibility to community and social facilities	high	very high	High
Assisting regeneration and social-improvement activities	very high	very high	Very high



# 04

## HUMAN BEINGS: NOISE

- 4.1 Introduction
- 4.2 Study area
- 4.3 Impact assessment methodology
  - 4.3.1 Prediction of noise magnitude
  - 4.3.2 Assessment methodology
- 4.4 Impact assessment
  - 4.4.1 Impact identification
  - 4.4.2 Mitigation measures
  - 4.4.3 Assessment of residual impacts
  - 4.4.4 Summary of residual impacts





This chapter of the EIS evaluates the potential noise impacts arising from the construction and operation of the proposed scheme in Area MN104.

## 4.1 INTRODUCTION

This chapter of the EIS evaluates the potential noise impacts arising from the construction and operation of the proposed scheme in Area MN104. Groundborne noise and vibration impacts are reported in the Vibration chapter of this EIS (Volume 2, Chapter 5).

## 4.2 STUDY AREA

The study area for this assessment is defined in the baseline chapter and comprises the nearest noise sensitive receptors to the alignment corridor, construction compounds and adjacent roads where traffic flows may be changed up to 500m from the alignment.

## 4.3 IMPACT ASSESSMENT METHODOLOGY

The source and type of all potential impacts is described in Section 4.4.1. Mitigation measures to be put in place are defined in Section 4.4.2. The extent to which mitigation is needed increases as the magnitude of the impact increases. Unmitigated impacts and residual (mitigated) impacts are evaluated in Section 4.4.3. Annex C, Noise Assessment Details (Volume 3, Book 2 of 2), provides details of the noise modeling methods and results, including predicted levels of noise without mitigation for both the construction and operational phases.

### 4.3.1 Prediction of noise magnitude

#### 4.3.1.1 Construction

The magnitude of construction noise impacts is predicted by considering noise emissions data for typical construction equipment based on the expected methods of construction for each phase of work on each worksite. The plant teams used are listed in Section 6 of Annex C Noise Assessment Details (Volume 3, Book 2 of 2). The prediction method follows that recommended in BS 5228 Noise and vibration control on construction and open site, part 1, 2, 3, 1997.

#### 4.3.1.2 Noise from the light metro vehicles (LMVs)

Noise levels associated with the operation of the proposed scheme have been modeled using a 3-dimensional noise model, Soundplan®. Baseline noise levels have been measured directly, as reported in the baseline Noise chapter of this EIS (Volume 1, Chapter 12). The predicted noise levels from the LMVs have been compared to the baseline noise levels to estimate likely changes in noise.

### Noise from road traffic

For road traffic noise on the surrounding roads a similar approach to that described for LMVs is used. Significant changes in road traffic noise have been identified by analysis of the available road traffic modeling results. Changes in noise levels have been predicted using CRTN (Calculation of Road Traffic Noise, UK DoE, 1988) based on the traffic flows, speeds and percentage of the flow which is Heavy Goods Vehicles (HGVs) in the do minimum and do something scenarios for 2014 (year of opening) and 2029 (design year). These have then been compared. Also, where junction realignments take place that will bring road elements closer to receptors and will lead to increases in noise these have been calculated. Where an increase is expected, the functional value of the receptor is considered as described in the following section.

#### 4.3.2 Assessment methodology

##### 4.3.2.1 Construction

The predicted levels are compared to the assessment criteria given in Table 4.1. Any predicted noise levels exceeding the criteria given in Table 4.1 at a noise sensitive receptor are deemed to be an impact, unless they occur for very short periods of time. Where exceptions occur in this regard, they are discussed on a case by case basis.

The National Roads Authority (NRA) has published construction noise targets guidelines for  $L_{Aeq}$  in 'Guidelines for the Treatment of Noise and Vibration in National Roads Schemes'. The NRA guidelines are based on UK guidance which describes daytime noise levels for rural areas or areas away from major roads. These criteria are summarised in Table 4.1. As shown in Table 4.1, the evening targets are taken as 10 dB lower than the daytime levels based on guidance given in BS5228. The daytime criteria given in Table 4.1 may be appropriate for interurban road schemes undertaken by the NRA, but are not necessarily appropriate for the urban situation through which the majority of the proposed scheme is to be constructed. For the urban area, or near to main roads, the 75 dB value is used, taken directly from the UK guidance and common practice.

In addition, a level of 65 dB is used specifically for schools, again drawn from common practice in the UK for urban developments.

The criteria given in Table 4.1 have been applied to all areas with a functional value of  $\geq$  medium. Areas with a functional value of  $<$  medium are not considered to be sensitive to noise.

Table 4.2 defines the impact ratings that are used in this assessment.

Table 4.1 Noise criteria during the construction phase (at 1m from the façade)

Period over which criterion applies	Noise Impact Criterion ( $L_{Aeq}$ , period)
- Monday to Friday:	
- Urban areas or near main roads; Day: 07.00 to 19.00	75 dB
- Rural areas away from main roads Day: 07.00 to 19.00	70 dB
- Monday to Friday: Evening: 19.00 to 22.00	65 dB
- Monday to Friday: Night: 22.00 to 07.00	The higher of 45 dB or the ambient level.
- Saturday: Day: 08.00 to 16.30 (work outside these hours will be subject to Monday to Friday night time noise levels i.e. the higher of 45dB or the ambient level)	65 dB
- Sundays and Bank Holidays: Day: 08.00 to 16.30 (work outside these hours will be subject to Monday to Friday night time noise levels i.e. the higher of 45dB or the ambient level)	60 dB

Table 4.2 Definition of noise magnitude ratings

Extent of Noise Impact (Exceedance of Assessment Criteria)	Noise Impact Magnitude	Magnitude Rating
>10dB	Severe	very high
5 to 10dB	Substantial	high
3 to 5dB	Moderate	medium
1 to 3dB	Slight	low
<1dB	No Impact	very low

#### 4.3.2.2 Operation

When judging noise impact, the functional value of each receptor is considered. In terms of noise assessment, the functional value relates primarily to the noise sensitivity of the activity taking place in the building. Most receptors will fall into two groups: those that are sensitive at all times to noise and those that are only sensitive during the day. However, there are also receptors that have unique sensitivities.

The criteria that are applied are summarised in Table 4.3 and Table 4.4. These criteria are applied to areas with a functional value of  $\geq$  medium. Areas with a functional value of  $<$  medium have not been assessed because they are not considered to be sensitive to noise. The threshold criteria given in Table 4.3 are threshold noise levels below which environmental noise has insignificant effects. The noise levels in Table 4.3 are 'free-field' i.e. away from reflective surfaces. Changes in noise below these thresholds may be noticeable but would not result in significant environmental noise impacts.

Table 4.3 Threshold criteria for assessment of impacts during the operational phase

Area description	Functional value	Noise impact threshold during operation
Locations that are highly sensitive during both night and day: - Residential areas, medical facilities (hospitals, nursing homes etc)	very high	Daytime: 55 dB $L_{Aeq}$ Night-time: 45 dB $L_{Aeq}$
Locations that are only sensitive during the day, where the activities that are carried out require an acceptable noise environment: - Educational/Institutional uses, theatres and religious buildings.	high	Daytime: 55 dB $L_{Aeq}$ Night-time: Not applicable: Locations are not sensitive at night
Locations that are only sensitive during the day and where the activities that are carried out can be carried out in the presence of some noise, but not high levels of noise: - Outdoor recreational areas. - Cinemas. - Offices.	medium	Assessed on a case by case basis, depending on the sensitivity of the specific use and the level of protection that may be afforded by the building.

Where noise from the LMVs is above the threshold values, the impact depends directly on the change in noise levels or the extent to which the noise levels exceed the threshold values. For example, if the ambient noise level is currently high (well above the threshold), a small change in noise levels may be unnoticeable and a larger change may cause disturbance and be significant. In such cases the scale of the impact will depend on the degree of noise change. If the ambient noise level is currently low (below the thresholds) then the scale of the impact is dependent on the extent to which the predicted noise levels exceed the thresholds.

In this way the significance of noise impact has been assessed with reference to both the change in noise and the threshold values previously described. The magnitude ratings used in the assessment are summarised in Table 4.4. 3dB is generally the smallest change in environmental noise that would be noticeable under typical listening conditions. A change of 10dB is generally considered to be a doubling in loudness.

Table 4.4 Definition of noise magnitude ratings

Extent of Noise Impact (Exceedance of Threshold Criteria or Increase in Baseline Levels When Above Threshold)	Noise Impact Magnitude	Magnitude Rating
>10dB	Severe	very high
5 to 10dB	Substantial	high
3 to 5dB	Moderate	medium
1 to 3dB	Slight	low
<1dB	No Impact	very low

Traffic noise impacts are assessed using the same methodology. Noise from fixed plant is considered in the same manner; however, it has been assumed insignificant if noise is less than NC25 inside neighboring buildings at night (to avoid sleep disturbance) or to not exceed the existing  $L_{A90}$  background noise. Noise Criteria (NC) curves are used to specify sound levels across a range of frequencies, and NC25 dB is an acceptable level for internal areas. Since all fixed plant is to be designed to meet these standards, it has not been necessary to define magnitudes of impact since no significant residual effects are expected.

## 4.4 IMPACT ASSESSMENT

### 4.4.1 Impact identification

#### 4.4.1.1 Construction

The key noise sources during construction are likely to be the construction of the at-grade track, M50 bridge, Northwood overbridge and cut and cover tunnel sections along the median of the R108 (Ballymun Road). The Dardistown and Northwood Stops are to be built in this area.

To assess the construction noise impacts in this route section, noise predictions have been carried out at 6 noise sensitive receptors near to the relevant worksites. These receptors are illustrated on maps (Noise Impact) included as Volume 1, Book 1 of 2. Each receptor represents the group of properties most likely to be affected by the works nearby.

#### 4.4.1.2 Operation

During operation of the proposed scheme, noise sources will include LMVs using the above ground sections of the track and traveling through bends, traffic changes in the area of the alignment, park and ride sites, people at metro stops, and ancillary systems such as power supply facilities. There will also be occasional maintenance activities along the route. Although area MN104 contains two tunnel portals at which ventilation fans will be required, they will be either located some distance from receptors or will be located close to roads where ambient noise will be high. Therefore, the impacts are not expected to be significant.

The service levels of the LMVs are also important. For the purpose of this assessment, the following service levels are assumed to be planned:

- From Monday to Thursday, the service starts at 0500 hours and ends at 0030;
- On Fridays the service starts at 0500 hours and ends at 0230 hours;
- On Saturdays the service starts at 0600 hours and ends at 0230 hours;
- On Sunday the service starts at 0700 hours and ends at 2330 hours.

The most intense service frequency during the day occurs from Monday to Friday, and for the night occurs on Friday. These service periods have been assessed in order to consider the highest day and night noise levels and hence a worst case assessment. The noise assessment takes into account noise from all LMVs expected to operate during the full 16 hour daytime period from 0700 to 2300 hours and the full 8 hour night-time period from 2300 to 0700 hours.

At service commencement date train services will operate at 4 minute headways during peak hours. The tendering requirements also include an option to operate services at 3 minute headways during peak service hours. The assessment is based on the likely service patterns that can be foreseen within the period up to 2029 (3 minute headways).

The southbound service headways envisaged for the period up to the year 2029 are:

- 4 minute (2014) and 3 minute (2029) service headways between 07.00 to 10.00 hours and 15.30 to 19.00 hours
- 7.5 minute (2014) and 6 minute (2029) service headways between 05.00 to 07.00 hours, 10.00 to 15.30 hours and 19.00 to 21.00 hours (with the exception of 05.00 and 07.00 hours in 2014 when 10 minute service headways will be operated)
- 10 minute service headways between 21.00 to 00.00 hours.

The northbound service headways are:

- 4 minute (2014) and 3 minute (2029) service headways between 07.30 to 10.30 hours and 16.00 to 19.30 hours
- 7.5 minute (2014) and 6 minute (2029) service headways between 05.00 to 07.30 hours, 10.30 to 16.00 hours and 19.30 to 21.30 hours (with the exception of 05.00 and 07.30 hours in 2014 when 10 minute service headways will be operated)
- 10 minute service headways between 21.30 to 00.30 hours.

On Friday and Saturday nights, services will continue at 20 minute headways until 0200 hours southbound and 0230 hours northbound.

Some LMVs will need to run empty to St. Stephen's Green from the depot in the morning before the service starts (from approximately 0430 to 0500 hours), and back to the depot when the service ends (up to approximately 0300 hours on Friday and Saturday nights). Although out of service LMVs will be empty they will run at the same speed as in service vehicles.

Service levels may be varied on particular occasions, such as during major public events in the city or at Christmas. Noise impacts on these occasions have not been assessed because they will be very infrequent.

Levels of noise from LMV operations have been predicted at 25 locations in this route section. Detailed results are given in Table 7.5 of Annex C Noise Assessment Details (Volume 3, Book 2 of 2).

Noise impacts from traffic may result due to:

- the realignment of the road network thereby moving the road traffic closer to or further away from receptors;
- road closures or the remodeling of junctions to accommodate the LMVs;
- modal shift from the private car may help to reduce the number of vehicles on the highway network;
- traffic that diverts to other routes or accesses the Park & Ride at Belinstown.

It is noted that substantial changes in road traffic flow, speed, and/or composition are required to produce noise changes greater than 3dB.

People at metro stops may cause additional noise, but in general stops with nearby noise sensitive receptors are located in busy areas where ambient noise levels are relatively high, and any such effects will be small.

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#### 4.4.2 Mitigation measures

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##### 4.4.2.1 Construction

Mitigation will include the following measures:

Best practical means will be used to minimise construction noise through implementation of the recommendations set out in BS 5228. In particular, the following noise mitigation measures will be implemented:

- Proper use of plant with respect to minimising noise emissions and regular maintenance will be required. All vehicles and mechanical plant will be fitted with effective exhaust silencers and will be maintained in good efficient order.
- The use of inherently quiet plant where appropriate - all major compressors and generators will be 'sound reduced' models fitted with properly lined and sealed acoustic covers, which will be kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools will be fitted with mufflers or silencers of the type recommended by the manufacturers.
- Machines in intermittent use will be shut down in the intervening periods between work or throttled down to a minimum.
- All ancillary plant such as generators and pumps will be positioned so as to cause minimum noise disturbance, and where necessary, acoustic enclosures will be provided.
- Where practicable the use of noisy plant will be limited to core daytime periods.
- Channels of communication will be established between the contractor/ developer, local authority and residents.
- A site representative will be appointed responsible for matters relating to noise.
- Typical levels of noise will be monitored during critical periods and at sensitive locations.
- A 2m high solid site hoarding along the site boundaries will be erected where practical and feasible.
- Localised noise barriers will be erected as necessary around items such as generators or high duty compressors.

- Construction compounds will be laid out so as to minimise noise impacts to neighboring noise sensitive receptors, by locating noisy operations well away from receptors and using on-site structures and materials to screen noise where practicable and necessary.

Additionally, all contractors will be required to comply with S.I. No 632 of 2001 European Communities (Noise Emission by Equipment for Use Outdoors) Regulations 2001, amended by S.I. No 241 of 2006.

#### 4.4.2.2 Operation

##### LMV Noise

Without mitigation, noise impacts have been predicted at several locations along the route. There are a number of mitigation measures available to reduce noise from new railways, but there is no statutory requirement to apply these measures, nor guidance as to when to apply them.

On 1st May 2008, the Bord Pleanála Inspector's Report for the Luas Line A1 (Belgard to Saggart) Railway Order application was published. The report recommended granting the Order, and, in Schedule 12, attached a condition relating to noise, as follows:

The Operational Noise Level criteria to be applied and the design goals adopted shall be those of the National Roads Authority as published in the document entitled 'Guidelines for the Treatment of Noise and Vibration in National Road Schemes' (Revision 1, October 2004)

**Reason:** To achieve uniform noise criteria in an area where new road proposals are scheduled to be carried out in the same time period and adjacent to the light railway.

The application of the NRA design goal for railway noise from the Luas A1 scheme was linked to the fact that the scheme included road scheme proposals. It could be argued that this is not the case for the entirety of the proposed scheme. However, the majority of the proposed scheme above ground alignment follows road corridors, and it is considered appropriate to adopt the NRA design goal for designing mitigation for noise from the normal running of LMVs, in any case where that noise will be higher than the prevailing traffic noise level.

There are differences in the characteristics of road traffic and railway noise, and it has been shown that railway noise is less disturbing than road traffic noise, at a given level. This effect has been called a railway 'bonus' and is greater at higher noise levels. However, for the purposes of considering the NRA guidance for the proposed scheme the railway bonus has been ignored.

The NRA design goal is stated in the guidance as follows:

- Day-evening-night 60dB  $L_{den}$  (free-field residential facade criterion).

The guidance notes:

Noise and vibration design goals are required in order to ensure that the current roads programme proceeds on a path of sustainable development. Achieving sustainable development in practice requires that economic growth supports social progress and respects the environment, that social policy underpins economic performance and that environmental policy is cost effective. In devising design goals for national roads the Authority has balanced environmental and economic considerations. With this in mind, the Authority acknowledges that it may be appropriate to adopt different design goals for diverse situations, e.g. design goals for existing situations may be different from new situations and there are different design goals for the construction phase of road schemes.

This [operational phase] design goal has been shown to be significantly more onerous than the 68dB(A)  $L_{10}$ (18 hour) value previously employed on national road schemes.

This design goal is applicable to new road schemes only. In EIS terms, this means that it is to be applied to existing sensitive receptors in respect of both the year of opening and the design year (i.e. 15 years after projected year of opening).

Following confirmation of the EIS, the issue of noise mitigation for new receptors is a matter for the Planning Authority within the planning legislation.

The Authority accepts that it may not always be sustainable to provide adequate mitigation in order to achieve the design goal. Therefore, a structured approach should be taken in order to ameliorate as far as practicable road traffic noise through the consideration of measures such as alignment changes, barrier type (e.g. earth mounds), low noise road surfaces etc.

The guidance goes on to give conditions that must be satisfied for mitigation to be considered. In adopting this guidance for the proposed scheme, it is considered only appropriate where ambient noise levels are to be increased by noise from LMVs in operation. It is recognised that the 24 hour distribution of noise from the proposed scheme may be different from traffic noise in the adjacent roads, in particular it may be comparatively noisier at night. Hence, the condition for the design goal to be applied to railway noise shall be that railway noise must be above road traffic noise as measured in any hour of the day or night, in terms of  $L_{Aeq\ 1\ hour}$ . This is the adopted railway noise design goal. In such cases the resultant  $L_{Aeq\ 1\ hour}$  noise level would increase by at least 3dB, and the railway noise  $L_{den}$  would be above 60dB.

The railway noise assessment has therefore computed  $L_{den}$  noise levels, as defined in Annex 1 of EC Directive 2002/49 Relating to the Assessment and Management of Environmental Noise, based on the metro service levels described above.

Above the railway noise design goal mitigation measures are considered to reduce noise impacts as follows.

The railway noise modelling is based on a series of conservative assumptions. These will be revisited at the final design stage (when the exact alignment, track and vehicle type are known) through a further detailed noise modelling study that will determine the exact form of noise mitigation. At this stage a number of measures are possible, as follows.

The noise modelling in this EIS has made a worst case assumption for the basic noise emission level of the LMVs. The metro rolling stock tenderers will be encouraged to provide a quieter LMV within the constraints of the competitive tendering process. It is quite possible the LMVs will be quieter than assumed.

Preferred operating speeds may be lower than assessed herein, which would reduce noise, as could other operational factors. Track design could reduce noise levels. Rail dampers can reduce rail generated noise, and absorptive materials within the trackbed can attenuate noise reflections.

On elevated sections it may be possible to modify the trackbed to include noise screening structures close in to the wheel rail interface, and between the tracks. Such structures would be barely visible from adjacent receptor locations. It is considered essential to minimise the visual impact of the railway viaducts, and in general will not construct highly visible noise barriers on viaducts.

Noise barriers may be considered at ground level but they have a number of dis-benefits that would need to be considered including potential conflicts with road traffic, concerns of track safety, driver sight lines, visual impact, security and crime considerations, and construction and maintenance issues. For these reasons noise barriers will not generally be suitable for built up areas near road traffic and pedestrians. It is likely that noise barriers will be appropriate to mitigate the noise impacts predicted in the area south of the Lissenhall Stop where the alignment is away from roads and pedestrians. Noise barriers incorporating suitable vegetation may be appropriate in this area, so that they appear similar to a hedge, minimising landscape and visual impacts.

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#### 4.4.3 Assessment of residual impacts

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##### 4.4.3.1 Project scenario: construction phase

###### Alignment

The route section comprises above grade and cut-and-cover tunnel elevated sections on embankments and bridge crossings of the M50 and Old Ballymun Roads. The predicted noise levels for

these activities are shown in Table 7.27 of Annex C Noise Assessment Details (Volume 3, Book 2 of 2).

Without mitigation noise impacts of between 6 and 12dB are predicted at the closest receptors. After implementing mitigation, a residual impact of 2dB is predicted at the residential property on Ballymun Road (MN104-C4), producing a Low impact.

###### Structures

A bridge will be constructed to cross the M50. Without mitigation the construction works would result in noise impacts up to 20dB above the assessment criterion at the nearest noise sensitive receptor on the western branch of Santry Lodge (MN104-C3), in the worst case. Residual noise impacts 10dB above the assessment criterion are predicted at this receptor. A Very high impact is predicted as at this receptor. No significant effect is predicted for users of the M50. The works are likely to take place over approximately 11 months, although the period of highest impact will be shorter.

The Northwood overbridge will be constructed close to Northwood Stop. Without mitigation the construction works would result in noise impacts up to 3dB above the assessment criterion at the closest receptor. No significant residual impacts are predicted when noise mitigation is implemented.

###### Stops

The Dardistown Stop is not located close to noise sensitive receptors. Noise from construction of the Northwood Stop will be below the impact assessment criterion at the nearest receptors. No significant residual impacts are predicted.

###### Construction compounds

Construction compound 8 will facilitate the launch and support activities for tunnel boring. However, it is not located close to receptors, and is not expected to result in significant noise impacts. Compound 9 (M50 Viaduct North) is located close to commercial buildings that have been assumed not to be noise sensitive. Construction compounds 8a (Dardistown), 10 (M50 Bridge South) and 10a (M50 Bridge) will also be used in this area. The majority of the activities in these compounds are considered in terms of the structures or stops that are to be served from these sites, and additional activities comprise office and welfare facilities, which are not expected to give rise to significant noise levels. The only additional significant plant will be a concrete batching plant at compound 10a. If plant were located in the closest part of the site to a noise sensitive receptor an unmitigated noise impact would occur 3dB above the impact assessment criterion. It is expected that the plant can be located further away or suitably attenuated. No significant residual impacts are predicted.

###### Dardistown Park & Ride

No noise sensitive receptors are likely to be affected by the proposed Park & Ride. The impact is not significant.

#### 4.4.3.2 Project scenario: operational phase

##### Introduction

South of the airport perimeter road, the route emerges from tunnel and travels on the surface, turning south-west to cross agricultural lands between Dublin Airport and the M50 Motorway. The Dardistown Stop is located on a greenfield site to the north of the M50. The Dardistown surface Park & Ride facility is also located in this area. The Northwood Stop is located immediately south of the M50. South of Northwood Stop, the route descends into a cut and cover tunnel along the median of the R108 (Ballymun Road).

Three noise sensitive locations have been identified adjacent to the elevated and at-grade sections of track around the Northwood Stop. The key noise source are the LMVs running along the alignment at grade and on elevated section.

The key noise sources are:

- the LMVs running on track;
- road traffic noise changes including the Park & Ride.

##### Railway Noise

The Noise levels predicted at the 3 representative receptors in Area MN104 are reported in Tables 7.5 of Annex C Noise Assessment Details (Volume 3, Book 2 of 2). The mitigation measures proposed to address the predicted impacts are described above. Since night-time impacts have the highest magnitude, the residual impacts have been discussed in terms of night-time time only.

On the basis that the LMV are no quieter than modelled at this stage, the locations where mitigation may be needed and the resultant noise impacts expected after mitigation are summarised in Table 4.5.

In all three cases the predicted LMV noise levels are within 3dB  $L_{den}$  60dB design goal. Table 4.5 shows that the mitigation proposed where noise levels are above the  $L_{den}$  60dB design goal will ensure that all impacts with magnitude greater than slight (up to 3dB) are addressed.

##### Maintenance

Maintenance of the wheel and rail surfaces is an important means of avoiding train noise increasing over the years of operation. Much of the maintenance work on the track will be undertaken at night when the railway is not in use. Most maintenance activities are not particularly noisy, but rail grinding may cause some disturbance. Rail grinding in a given location is likely to be required at a frequency measured in years and will deliver long term noise and vibration benefits. Rail grinding in the vicinity of a particular receptor will take only a few hours and would generally be completed over a single night shift.

##### Dardistown Park & Ride

No noise sensitive receptors are likely to be affected by the Park & Ride. The impact magnitude has been classed as very low magnitude and is therefore not significant.

#### 4.4.4 Summary of residual impacts

A summary of the residual impacts associated with this section of the proposed scheme is provided in Table 4.6.

Table 4.5 Residual operational noise impacts MN104

Representative Receptor	Possible Mitigation	Magnitude of Residual Impact
MN104-1 Santry Lodge East	Modified trackform	Slight
MN104-2 Santry Lodge West	Modified trackform	Slight
MN104-3 Santry Lodge South	Modified trackform	Slight

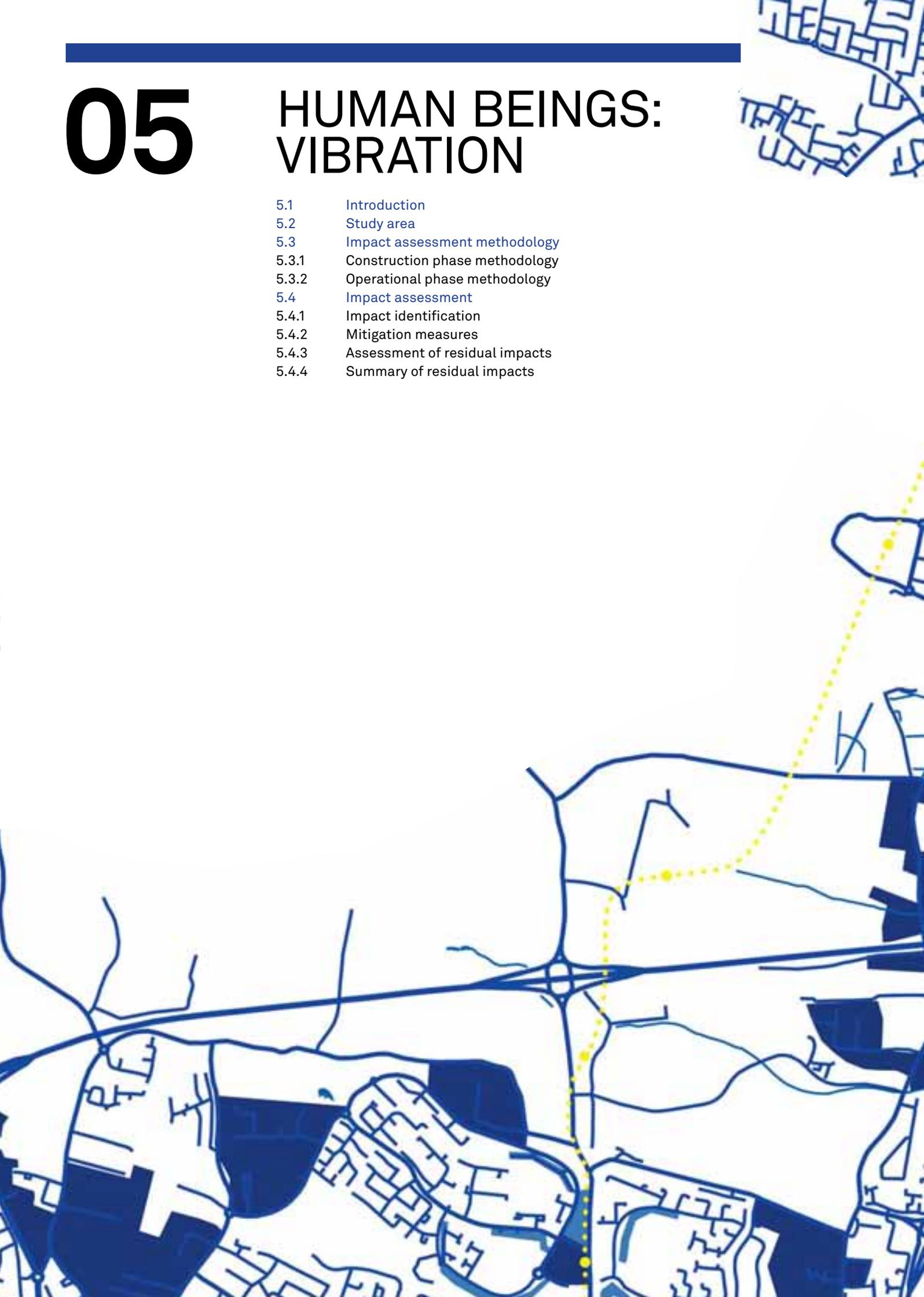
Table 4.6 Summary of residual impacts

	Magnitude of impact taking into account mitigation	Functional value of area affected	Significance of impact
<b>Construction phase</b>			
Construction Noise During Day	Very high Santry Lodge West (MN104-C3)  Other impacts are not significant.	very high	Significant
<b>Operational phase</b>			
Airborne Noise from LMVs	low	very high	Not significant
Effect of Dardistown Park & Ride	very low	very high	Not significant

# 05

## HUMAN BEINGS: VIBRATION

- 5.1 Introduction
- 5.2 Study area
- 5.3 Impact assessment methodology
  - 5.3.1 Construction phase methodology
  - 5.3.2 Operational phase methodology
- 5.4 Impact assessment
  - 5.4.1 Impact identification
  - 5.4.2 Mitigation measures
  - 5.4.3 Assessment of residual impacts
  - 5.4.4 Summary of residual impacts





This chapter of the EIS evaluates the potential vibration impacts arising from the construction and operation of the proposed scheme within Area MN104.

## 5.1 INTRODUCTION

This chapter of the EIS evaluates the potential vibration impacts arising from the construction and operation of the proposed scheme within Area MN104.

## 5.2 STUDY AREA

The study area for this assessment is set out in Table 5.1.

Table 5.1 Study area

Criteria	Width of study area (on both sides of the alignment)
Construction Groundborne Noise – human perception	50m
Construction Groundborne Noise – effects on sensitive faculties	100m
Construction Vibration – building damage	50m
Construction Vibration – human perception	80m
Construction Vibration – effect on sensitive equipment	1,000m
Operational Vibration – human perception	50m
Operational Vibration – effect on sensitive equipment	100m
Operational Groundborne Noise – human perception	50m
Operational Groundborne Noise – effects on sensitive facilities	100m

## 5.3 IMPACT ASSESSMENT METHODOLOGY

### 5.3.1 Construction phase methodology

The source and type of all potential impacts is described in Section 5.4.1. Mitigation measures to be put in place are defined in Section 5.4.2 for any adverse impacts that are deemed to be of Medium or greater significance prior to mitigation. The extent to which mitigation is needed increases as the significance of the impact increases. The residual impact is then evaluated in Section 5.4.3 in terms of magnitude and significance.

#### 5.3.1.1 Magnitude

The criteria used to assess the different impacts associated with this scheme are discussed in this section and summarised in Table 5.2.

#### Groundborne Noise

The metric which is widely used for the assessment of groundborne noise is the maximum A-weighted sound level using 'slow' time response,  $L_{Amax,S}$ .

The symbol 'L' indicates a value expressed in decibels (abbreviated dB). The dB scale measures relative magnitudes of sound power or intensity (sound power per unit area) a property proportional to the mean squared value of the amplitudes of the air pressure oscillations that cause sound. Every doubling of intensity is a 3dB increase and every tenfold increase in intensity is a 10dB increase. A standard reference level (0dB = 20µPa of root mean square sound pressure) is used so that the dB scale can measure absolute levels as well as relative levels. The symbol 'A' signifies that the measured sound pressure has been subjected to frequency weighting using the standard 'A-weighting scale', to approximate the frequency response of the human ear—relatively insensitive at low frequencies and very high frequencies. Every 10dB increase in A-weighted sound level is perceived as approximately a doubling of loudness—slightly more than a doubling for sound of low frequency. The symbol 'S' specifies a method of averaging the oscillating sound pressure, by exponential averaging as defined in IEC 61672 (2002), using the standard 'slow' time constant of one second - the alternative being the 'F' or 'fast' time constant of 1/8 second. 'S' has a greater smoothing effect on sound that varies in level. The symbol 'max' means the highest averaged value reached during an event such as the passage of a train. The value of  $L_{Amax,S}$  nearly equals the value of  $L_{Amax,F}$  for a steady sound that lasts for one second or more, otherwise  $L_{Amax,F}$  levels exceed  $L_{Amax,S}$  levels by an amount dependent on the rapidity and magnitude of the variations. For groundborne noise from a modern underground railway  $L_{Amax,S}$  levels are typically 2dB lower than  $L_{Amax,F}$  levels.  $L_{Amax,S}$  can alternatively be written as  $L_{Asmax}$  and is defined in IEC 61672 (2002).

#### Vibration

The metric which is used for the assessment of vibration is the KB value from DIN 4150-2, which is assessed using three different criteria,  $A_u$ ,  $A_o$  and  $A_r$ . The KB value is a frequency weighted measure of vibration velocity in units of mm/s, using the 'F' time constant, obtained for each 30-second cycle in a sequence of contiguous 30-second cycles.

Two types of parameters are defined based on the KB value:

- $KB_{Fmax}$  the maximum value for the time varying KB value during the evaluation period;
- $KB_{FTr}$  an evaluation parameter that is weighted according to the number of vibration events and the duration of these events during the evaluation period.

For daytime vibration other than blasting, if  $KB_{Fmax}$  is lower than or equal to  $A_u$ , DIN 4150-2 states that 'the requirements of the standard have been met'. If  $KB_{Fmax}$  is greater than  $A_o$ , 'the requirements of the standard have not been met'. In other cases, where the  $KB_{Fmax}$  value is between  $A_u$  and  $A_o$ ,  $KB_{FTr}$  is calculated as the root-mean square of the 30-second KB values, and if it does not exceed  $A_r$ , the 'requirements of the standard have been met'.

For construction vibration three levels are defined by DIN 4150-2:

Level I: With vibration below this level, it can be assumed even without any previous knowledge, that there will be no considerable discomfort.

In this assessment daytime vibration impact above Level I and not above Level II is classed as 'low'.

Level II: Vibration below this level is also not likely to produce considerable discomfort, as long as the measures specified in items a) to e) (and if necessary, item f) of DIN 4150-2 are taken. As this level is exceeded, the probability increases that there will be considerable discomfort. According to DIN 4150-2 'If it is expected that level II will be exceeded, an attempt shall be made to use construction methods that produce less vibration'.

In this assessment daytime vibration impact above Level II and not above Level III is classed as 'high'.

Level III: The effects produced by vibration above this level are unacceptable. In this case, special measures that go beyond those specified in items (a) to (f) of DIN 4150-2 shall be agreed upon.

In this assessment daytime vibration impact above Level III is classed as 'very high'.

For construction vibration at night, the same guideline values used for operational vibration apply. In this context DIN 4150-2 defines criteria for five receptor types and the most stringent criteria have been used to define the 'very low' impact category. The criteria for less sensitive receptors defined in DIN 4150-2 have been used to define the higher impact magnitudes in the absence of other guidance. All impact magnitudes above 'very low' are defined as significant at night.

For assessment of vibration from construction plant the metric conventionally used is peak particle velocity (PPV). The Irish EPA recommends that to avoid any risk of damage to properties in the vicinity of a quarry, the vibration levels from blasting should not exceed a peak particle velocity of 12mm/s as measured at a receiving location when blasting occurs at a frequency of once per week or less. In the rare event of more frequent blasting, the peak particle velocity should not exceed 8mm/s.

DIN 4150-2 uses  $KB_{F_{max}}$  for the assessment of human exposure to vibration from blasting, using only the  $A_o$  values from the set of limits ( $A_o$ ,  $A_u$  and  $A_r$ ) used for general vibration assessment.

For human response, a relationship between PPV and  $KB_{F_{max}}$  is required. The relationship depends on the frequency spectrum and the duration of the blast. The KB frequency weighting is almost flat between 16Hz and 63Hz, between which limits it is effectively an F-weighted exponential average of velocity in mm/s. While blasting vibration can

occur significantly outside this range, often the dominant frequency is between 16Hz and 63Hz. The ratio of PPV to  $KB_{F_{max}}$  in the example given in DIN 4150-2 is 2:1. Based on typical examples from blast monitoring of the Dublin Port Tunnel this would appear to be very conservative, and the ratio may be higher. However, the relationship  $PPV = 2 \times KB_{F_{max}}$  is used in this assessment.

A daytime PPV of 12mm/s, taken as  $A_o = 6$ , is equated in this assessment to the threshold of high impact. The threshold of Medium impact is  $A_o = 5$  and Low impact is  $A_o = 3$ , being the daytime  $A_o$  value given in DIN 4150-2 for the two most sensitive classes, "Buildings which are predominantly or purely residential" and 'Buildings in specially protected areas'.

Vibration from construction plant operating on above-ground worksites is assessed in the same way as vibration from the tunnelling, based on measured PPV levels for the relevant plant, converted to  $KB_{F_{max}}$  using the same ratio of 2:1.

**Table 5.2 Criteria for assessment of impact magnitude during construction**

Criteria	Impact magnitude		
<b>Dwellings, Offices, Hotels, Schools, Colleges, Hospital Wards, Libraries</b>			
Groundborne noise (tunnel boring machine (TBM))	Night $L_{A_{max,S}} > 50\text{dB}$ Day $L_{A_{max,S}} > 55\text{dB}$	very high	
	Night $45\text{dB} > L_{A_{max,S}} \leq 50\text{dB}$ Day $50\text{dB} > L_{A_{max,S}} \leq 55\text{dB}$	high	
	Night $40\text{dB} > L_{A_{max,S}} \leq 45\text{dB}$ Day $45\text{dB} > L_{A_{max,S}} \leq 50\text{dB}$	medium	
	Night $35\text{dB} > L_{A_{max,S}} \leq 40\text{dB}$ Day $40\text{dB} > L_{A_{max,S}} \leq 45\text{dB}$	low	
	Night $L_{A_{max,S}} \leq 35\text{dB}$ Day $L_{A_{max,S}} \leq 40\text{dB}$	very low	
	Vibration effect on people (construction plant)	Night $A_u > 0.2, A_o > 0.4, A_r > 0.1$ Day $A_u > 1.6, A_o > 5, A_r > 1.2$	very high
		Night $A_u \leq 0.2, A_o \leq 0.4, A_r \leq 0.1$ Day $A_u \leq 1.6, A_o \leq 5, A_r \leq 1.2$	high
		Night $A_u \leq 0.15, A_o \leq 0.3, A_r \leq 0.07$ Day $A_u \leq 1.2, A_o \leq 5, A_r \leq 0.8$	medium
Night $A_u \leq 0.1, A_o \leq 0.2, A_r \leq 0.05$ Day $A_u \leq 0.8, A_o \leq 5, A_r \leq 0.4$		low	
Night $A_u \leq 0.1, A_o \leq 0.15, A_r \leq 0.05$ Day $A_u \leq 0.4, A_o \leq 3, A_r \leq 0.2$		very low	

Criteria		Impact magnitude
Vibration effect on people (blasting)	Night $A_o > 0.4$	very high
	Day $A_o > 6$	
	Night $A_o \leq 0.4$	high
	Day $A_o \leq 6$	
	Night $A_o \leq 0.3$	medium
	Day $A_o \leq 5$	
	Night $A_o \leq 0.2$	low
	Day $A_o \leq 3$	
Vibration – building damage	Night $A_o \leq 0.15$	very low
	Day $A_o \leq 2$	
	$>50\text{mm/s ppv}$	very high
	$\leq 50\text{mm/s ppv}$	high
	$\leq 12\text{mm/s ppv}$	medium
	$\leq 5\text{mm/s ppv}$	low
	$\leq 3\text{mm/s ppv}$	very low

### 5.3.1.2 Significance

The significance of all impacts is assessed by considering the magnitude of the impact and the functional value of the area upon which the impact has an effect. The functional value of the receptor relates to its sensitivity which has been taken account of in the assessment criteria that have been adopted.

## 5.3.2 Operational phase methodology

### 5.3.2.1 Magnitude

The criteria used to assess the different impacts associated with the operation of the proposed scheme are shown in Table 5.3.

### 5.3.2.2 Significance

The significance of all impacts is assessed by considering the magnitude of the impact and the functional value of the area upon which the impact has an effect. The functional value of the receptor relates to its sensitivity which has been taken account of in the assessment criteria that have been adopted.

## 5.4 IMPACT ASSESSMENT

### 5.4.1 Impact identification

#### 5.4.1.1 Construction phase

Most construction plant is not likely to generate vibration that will be perceptible at off-site locations. Therefore, vibration impacts have been considered from the particular plant items that have the potential to generate perceptible levels of vibration. The activity that is most likely to fall into this category is bored piling. Vibration from bored piling is unlikely to take place outside of daytime working hours.

The vibration levels from bored piling typically decay rapidly and meet the DIN standards for construction within about 10m (resulting in Low or Very low impacts beyond this point). The assessment criteria that have been adopted apply to construction work carried out for up to 26 days. However, piling is not likely to be sustained throughout the scheduled construction period and is likely to be limited to periods of less than this in a given location.

Table 5.3 Criteria for assessment of impact magnitude during operation

Criteria	Impact magnitude	
<b>Dwellings, Offices, Hotels, Schools, Colleges, Hospital Wards, Libraries</b>		
Groundborne noise	$L_{A_{max,S}} > 45\text{dB}$	very high
	$40\text{dB} > L_{A_{max,S}} \leq 45\text{dB}$	high
	$35\text{dB} > L_{A_{max,S}} \leq 40\text{dB}$	medium
	$30\text{dB} > L_{A_{max,S}} \leq 35\text{dB}$	low
	$L_{A_{max,S}} \leq 30\text{dB}$	very low
Vibration	Night $A_u = <0.2, A_o = <0.4, A_r = >0.1$	very high
	Day $A_u = 0.4, A_o = 6, A_r = 0.2$	
	Night $A_u = 0.2, A_o = 0.4, A_r = 0.1$	high
	Day $A_u = 0.3, A_o = 6, A_r = 0.15$	
	Night $A_u = 0.15, A_o = 0.3, A_r = 0.07$	medium
	Day $A_u = 0.2, A_o = 5, A_r = 0.1$	
	Night $A_u = 0.15, A_o = 0.2, A_r = 0.05$	low
	Day $A_u = 0.15, A_o = 3, A_r = 0.07$	
Night $A_u = 0.1, A_o = 0.15, A_r = 0.05$	very low	
Day $A_u = 0.1, A_o = 3, A_r = 0.05$		

#### 5.4.1.2 Operational phase

Vibration and groundborne noise are aspects of the same phenomenon, perceived differently or in different media. Vibration is movement of a surface or structure perceived by humans by the tactile sense or which directly affects the function of an item of equipment such as an electron microscope. Groundborne noise is vibration of a surface or structure perceived by humans by the sense of hearing, or by equipment such as microphones in, for example, recording studios, as a result of radiation of the vibration into air between the surface and the ear, causing sound.

Sources of vibration and groundborne noise in the operation of the proposed scheme are:

- Wheel/rail interaction during the movement of LMVs:
  - over plain line
  - over switches and crossings
- Operation of equipment such as escalators and mechanical services plant at stops

Escalators and mechanical services plant will be designed to ensure that they do not give rise to significant effects at offsite receptors. This will involve ensuring that mitigation will be incorporated to avoid exceeding significant impact levels as defined above. Mitigation measures will include well established techniques such as vibration isolating bearings to control vibration from this type of source if required. Therefore, it has not been necessary to consider these in detail in this assessment.

#### 5.4.2 Mitigation measures

##### 5.4.2.1 Construction

Bored piling has been identified as the plant most likely to create vibration impacts in the form of disturbance to the occupiers of adjacent properties. Bored piling is a low vibration piling method, so where piling is necessary there may be limited scope to use alternative methods. Vibration levels will be monitored and advanced warning of the relevant works will be given.

##### 5.4.2.2 Operation

A particular feature of the operation of a newly designed railway is that the incorporation of resilient rail support and the use of welded rail have the result that significant effects due to vibration and groundborne noise are completely avoided provided that the appropriate form of track support is selected, and an adequate maintenance regime is followed. Resilient rail support has been established as the standard trackform for non-ballasted track on Luas and is the normal method of standard rail support for modern urban underground railways throughout the world. While resiliently embedded rail is used for street-running, resilient baseplates or other rail support systems, or booted blocks are typical modern designs.

The assessment of vibration and groundborne noise from a new railway therefore consists entirely of a consideration of the likely nature of incorporated mitigation in the design and operation (including maintenance) of the system. A floating trackbed system will be provided in the twin bore running tunnels between St. Stephen's Green and Albert College Park.

It is assumed that the following specification will be imposed:

- (a) To ensure that noise disturbance during operation of Metro North is minimised, InfraCo shall ensure that the maximum permissible level of groundborne noise that may be generated during operation does not exceed 40dB  $L_{Amax,S}$  determined near the centre of any occupied sensitive room of an inhabited building, except at the following locations:
  - (i) Between Parnell Street and Albert College Park the maximum permissible Groundborne noise that may be generated during operation does not exceed 25dB  $L_{Amax,S}$  determined near the centre of any occupied sensitive room of an inhabited building.
- (b) An inhabited building is a building which is in whole or in part lawfully used either temporarily or permanently as a dwelling, hospital, hostel or hotel. An occupied sensitive room is a room in an inhabited building that is a hospital ward, living room, or bedroom which is not a kitchen, bathroom, WC or circulation space that is in use as a living room or bedroom at the time the works are being carried out.

Mitigation measures primarily consist of the design of the track support system, and the choices available broadly fall into two categories, namely resilient rail support and floating slab track. Generally speaking, the parameter that controls the isolation performance of the system is the mass-spring natural frequency of the effective mass of the rail plus bogie unsprung mass on the spring provided by the resilience of the support system below the rail. Limitations on allowable dynamic rail deflection place a lower bound on the achievable dynamic stiffness of the support.

Resilient rail support means support of the rail from the second stage concrete by a system with a vertical dynamic stiffness below about 20MN/m (systems are available with vertical dynamic stiffnesses as low as 7MN/m). This may be in the form of a resilient baseplate supporting the rail foot, a resilient support for the rail web instead of the rail foot, or the provision of a resilient boot to a concrete block to which the rail is fastened.

Floating slab track (FST) means the support of the rail from a concrete slab which is mounted on resilient bearings. FST achieves greater isolation of vibration and groundborne noise largely because the mass of the concrete slab enables a lower natural frequency to be achieved without excessive dynamic deflection. Some of the vibration is also stored and dissipated in the slab and components above the slab.

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### 5.4.3 Assessment of residual impacts

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#### 5.4.3.1 Project scenario: construction phase

The results of this assessment are as follows. For each group of receptors the potential impact with no mitigation has been predicted. The extent of committed mitigation is described and the resultant residual impact expected with that mitigation adopted is reported.

South of Northwood Stop, the route descends into a cut and cover tunnel along the median of the R108 (Ballymun Road) passing 21m from the nearest house in Coultry Road. Low vibration impacts are likely from the excavation of the cut-and-cover tunnel unless boulders are encountered requiring percussive or explosive techniques to remove them. This is not likely, and therefore is not assumed in this assessment.

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#### 5.4.3.2 Project scenario: operational phase

For the purposes of this assessment the vibration performance of the track and vehicles have been assessed by numerical modelling. For track laid without rail joints (except at switches and crossings) and with modern standards of rail alignment, groundborne noise is the determining impact, and tactile vibration is normally at levels below the threshold of human perception. Vibration only requires special consideration in the case of highly sensitive equipment as explained further in this section.

For the standard case of resilient rail support, three generic models have been created, one for the case of the tunnel in limestone with glacial till (boulder clay) above, one for the case of the tunnel in the clay above the limestone and one for cut-and-cover tunnel sections. The basic models are unbounded, and a further model was created including a ground surface to determine the effect of multiple reflections between the ground surface and the limestone rockhead. This was found to increase dB(A) levels by an average of 5dB(A), and this has been added to the unbounded results. The results are speed dependent at the rate of approximately 1dB per 8% change in speed. It is noted that the highest levels are not directly above the tunnel.

Because it will be for the appointed contractor to select the trackform at a future stage in the programme, and the procurement process for the LMVs will take place after the writing of this Environmental Impact Statement, it is not possible to model the performance of the actual track and LMVs. The approach that has been taken is to model the rail support dynamic stiffnesses for resiliently supported rail as 13MN/m per metre run of rail, to yield the likely significant effect of the scheme. The vehicle characteristics used have been those for the vehicle with the highest unsprung mass among those likely to be offered by the contractor, and an allowance of 5dB(A) for vehicle and rail support stiffness uncertainty has been added to the results.

The results of the modelling are shown in Figure 5.1 to Figure 5.3. These figures illustrate that generally the groundborne noise will reduce for higher depths of ground cover. They also show that the groundborne noise is dependent on transverse distance from the tunnel, and that it does not follow a simple linear decay.

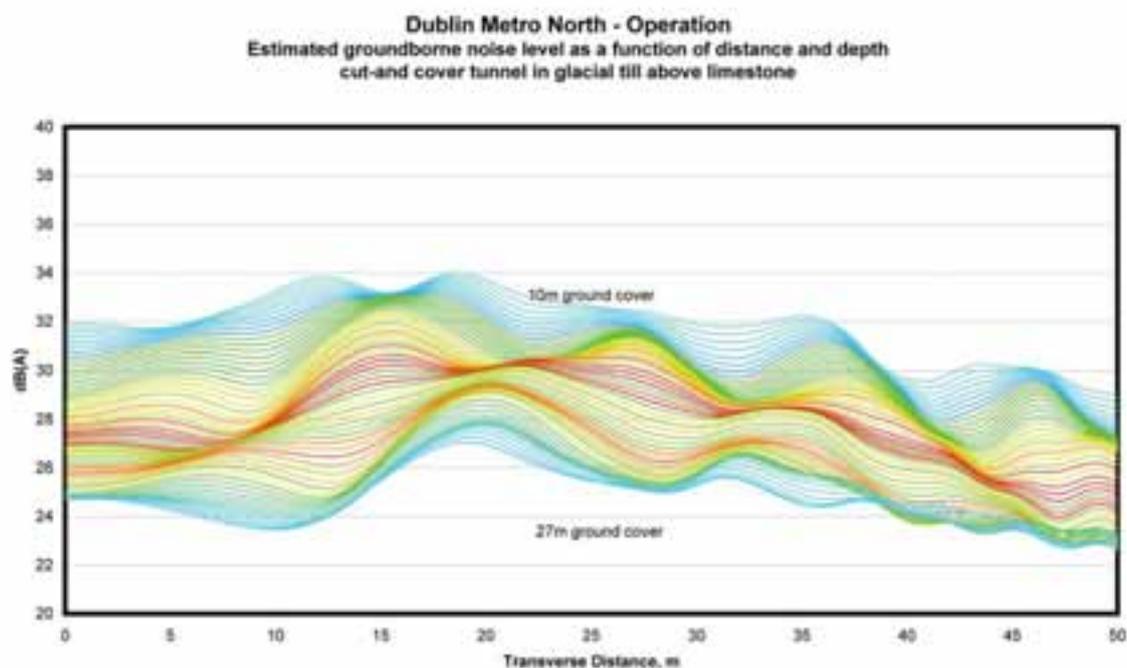


Figure 5.1 Groundborne noise from LMVs in bored tunnel in glacial till above limestone

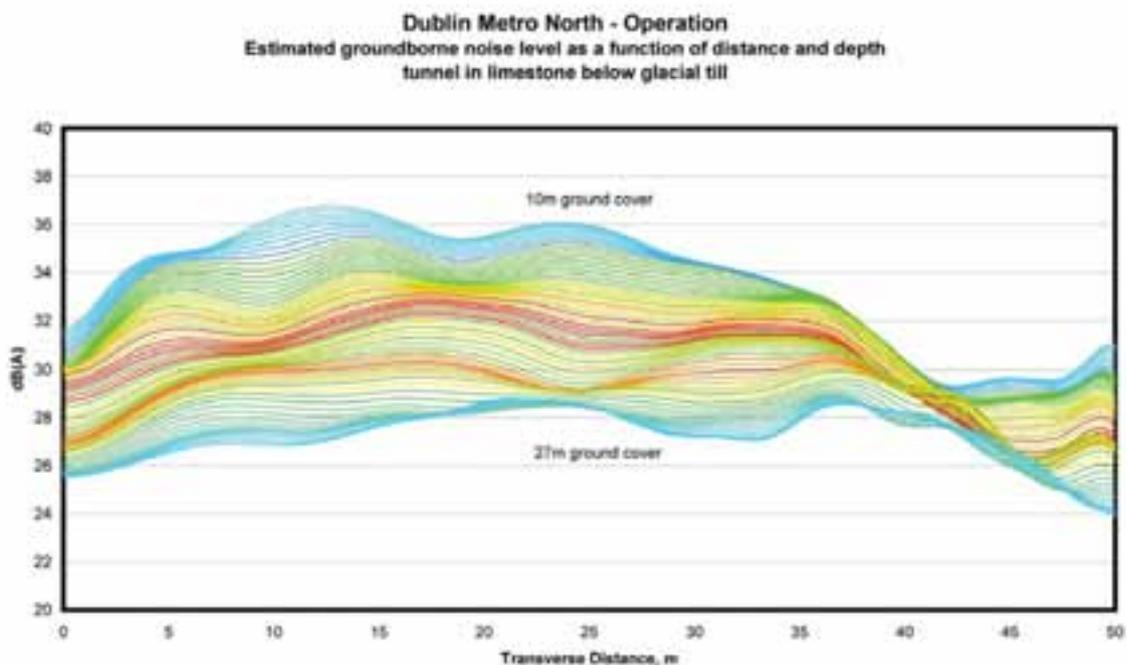
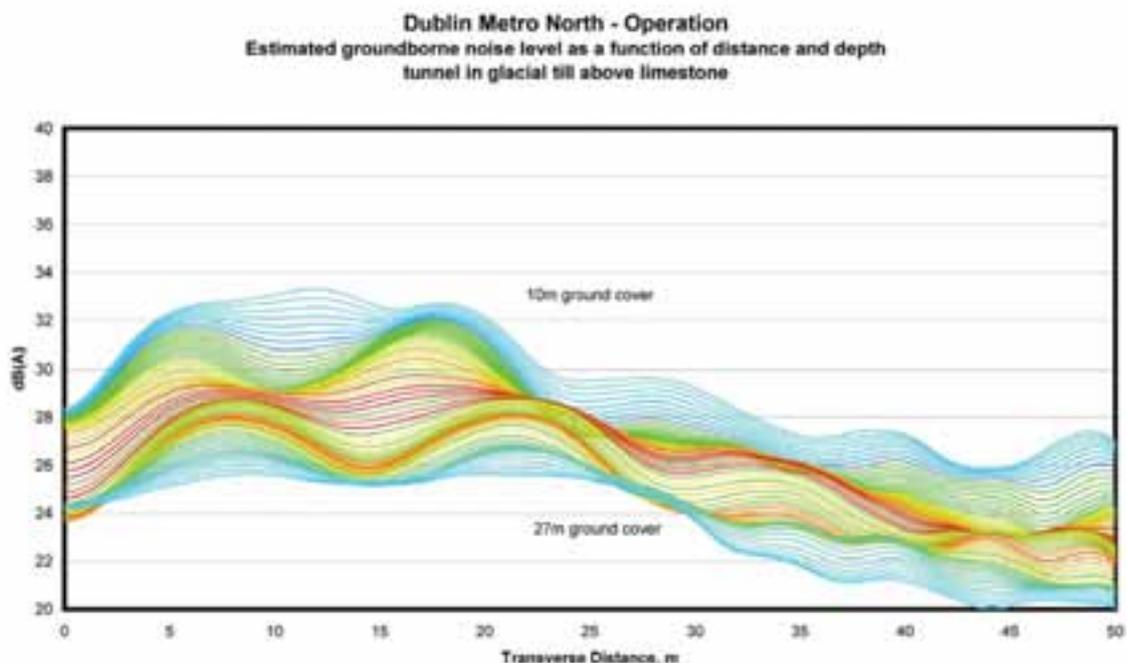


Figure 5.2 Groundborne noise from LMVs in bored tunnel in limestone below glacial till

Figure 5.3  
Groundborne  
noise from LMVs  
in cut-and-  
cover tunnel in  
glacial till above  
limestone



In any case where either a Medium, High or Very high significant impacts for groundborne noise are identified in this way, or where 'not to exceed' limits for sensitive equipment would be exceeded, incorporated mitigation in the form of floating slab track is assumed.

South of Northwood Stop, the route descends into a cut and cover tunnel along the median of the R108 (Ballymun Road) passing 21m from the nearest house in Coultry Road. Low vibration or groundborne noise impacts are likely with standard resilient rail support.

#### 5.4.4 Summary of residual impacts

The potential noise and vibration effects from construction and operation of the scheme have been assessed. An assessment of the requirements for mitigation has been undertaken. A summary of the residual impacts associated with the proposed scheme is provided in Table 5.4.

Table 5.4 Summary of residual impacts

	Magnitude of impact taking into account mitigation	Functional value of area affected	Significance of impact
<b>Construction phase</b>			
Groundborne noise	low	very high	Not significant
Vibration affecting humans	low	very high	Not significant
Vibration affecting buildings	low	very high	Not significant
Vibration affecting sensitive equipment	low	very high	Not significant
<b>Operational phase</b>			
Groundborne noise	low	very high	Not significant
Vibration affecting humans	very low	very high	Not significant
Vibration affecting sensitive equipment	very low	very high	Not significant

