
ENVIRONMENTAL IMPACT STATEMENT – METRO NORTH

BELINSTOWN TO ST. STEPHEN'S GREEN

VOLUME 1 – BOOK 1 OF 1

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:

VOLUME 1

Introduction to the scheme and a description of the receiving environment

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

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

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

VOLUME 3

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

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.

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

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)

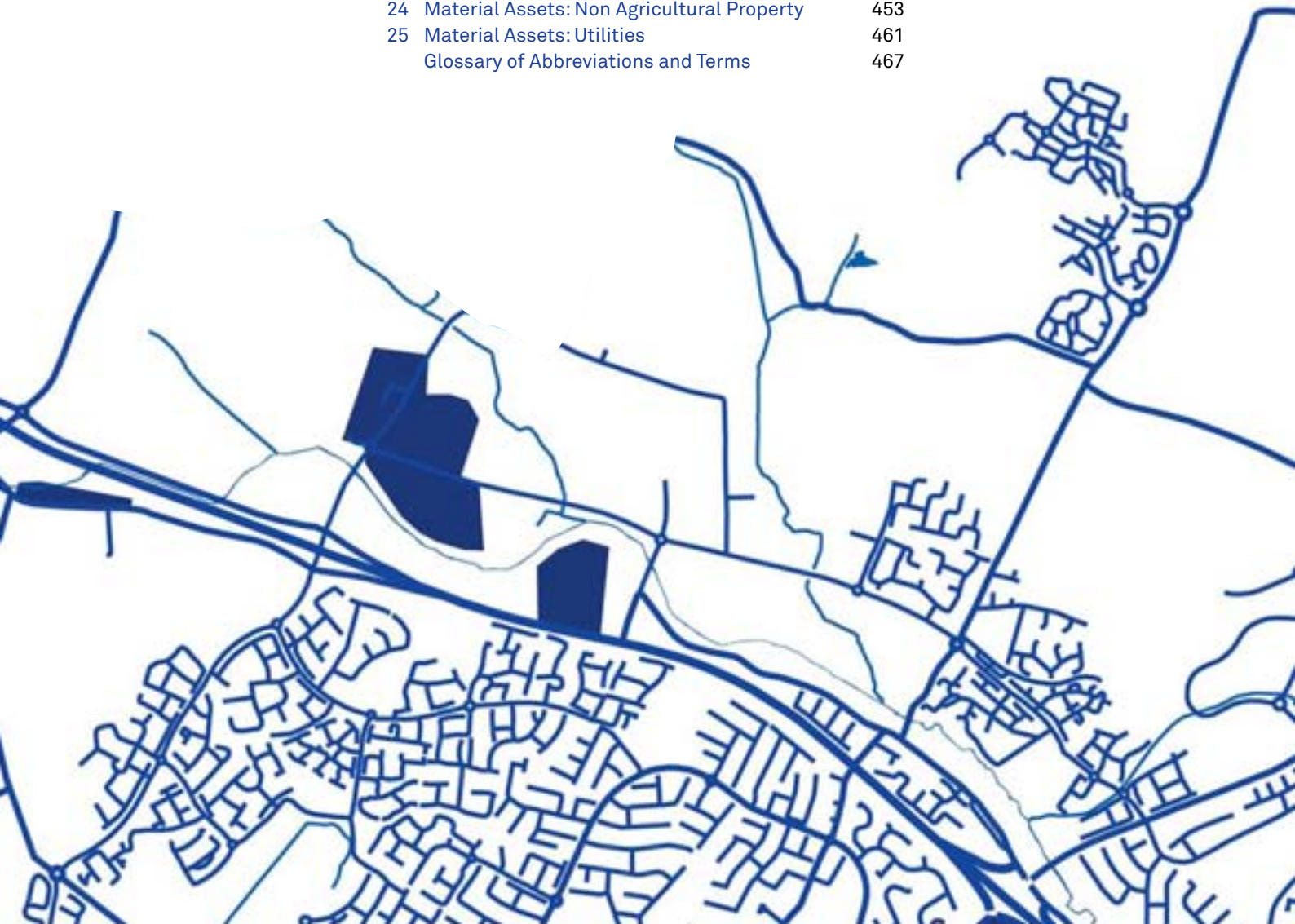
The EIS can also be purchased as individual books e.g:

- 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.

CONTENTS

01	Introduction	01
02	Need and Objectives	09
03	Legislation	13
04	Planning and Policy Context	17
05	Alternatives	39
06	Description of the Scheme	69
07	Consultation	97
08	Human Health	109
09	Difficulties Encountered	131
10	Human Beings: Landuse	135
11	Human Beings: Socio-economics	169
12	Human Beings: Noise	219
13	Human Beings: Vibration	229
14	Human Beings: Radiation and Stray Current	237
15	Human Beings: Traffic	247
16	Flora and Fauna	275
17	Soil and Geology	309
18	Groundwater	319
19	Surface Water	333
20	Air and Climatic Factors	347
21	Landscape and Visual	359
22	Material Assets: Agronomy	387
23	Material Assets: Archaeology, Architectural Heritage and Cultural Heritage	397
24	Material Assets: Non Agricultural Property	453
25	Material Assets: Utilities	461
	Glossary of Abbreviations and Terms	467





01

INTRODUCTION

- 1.1 Introduction
- 1.2 EIS study team
- 1.3 Methodology
 - 1.3.1 Introduction
 - 1.3.2 Definition of the study area
 - 1.3.3 Data collection and description
 - 1.3.4 Baseline description and categorisation
 - 1.3.5 Impact identification
 - 1.3.6 Impact categorisation
 - 1.3.7 Do minimum scenario
 - 1.3.8 Derivation of mitigation measures
 - 1.3.9 Assessment of residual impacts
 - 1.3.10 Interrelationships, interactions and cumulative impacts
- 1.4 Data limitations and difficulties encountered
- 1.5 Oral hearing
- 1.6 Availability of EIS



This Environmental Impact Statement (EIS) has been prepared to accompany the Railway Order Application for Metro North (Belinstown to St. Stephen's Green).

1.1 INTRODUCTION

This EIS presents the results of an Environmental Impact Assessment (EIA) undertaken to inform the decision-making process. The objectives of the EIS are summarised as follows:

- To identify the likely significant environmental impacts of the proposed scheme during the construction and operational phases having regard to the characteristics of the local environment.
- To evaluate the magnitude and significance of likely impacts and to propose appropriate measures to mitigate potential adverse impacts.

1.2 EIS STUDY TEAM

Environmental Resources Management (Ireland) Ltd ('ERM') was commissioned by the Railway Procurement Agency ('RPA') as lead consultant with overall responsibility for preparing an EIA for Metro North (referred to as the proposed scheme from here on). A number of specialists contributed to the preparation of the EIS. A summary of all contributors is provided in Table 1.1.

Table 1.1 Environmental topics and contributors

Input	Contributor
EIS management and compilation	ERM and RPA
Human Health	EHA Consulting Group
Human Beings: Landuse	ERM
Human Beings: Socio-economics	ERM
Human Beings: Noise	ERM
Human Beings: Vibration	Rupert Taylor F.I.O.A and ERM
Human Beings: Radiation and Stray Current	ERM
Human Beings: Traffic	MVA Consulting
Flora and Fauna	ERM
Soil and Geology	ERM and Jacobs Engineering Ireland Ltd.
Groundwater	AWN Consulting
Surface water	AWN Consulting
Air and Climatic Factors	ERM
Landscape and Visual	ERM and Digitech
Material Assets: Agronomy	Curtin Agricultural Consultants
Material Assets: Archaeology, Architectural Heritage and Cultural Heritage	CRDS Ltd.
Material Assets: Non Agricultural Property	ERM and RPA
Material Assets: Utilities	ERM and RPA
Interrelationships, Interactions and Cumulative Impacts	ERM

1.3 METHODOLOGY

1.3.1 Introduction

This chapter sets out the framework principles of the methodology that have been applied during the EIA process. The framework methodology that is used to evaluate the baseline environment and evaluate impacts is generally consistent across all chapters. This approach has been adopted and adhered to as much as possible, in order to ensure that the methodology is as transparent as possible and can be effectively communicated and understood by all stakeholders including the general public.

The general principles set out in this chapter have been developed to a level of greater detail by each of the environmental specialists. For this reason, more detailed topic-specific methodologies are outlined for each environmental topic in the EIS.

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

- Definition of the study area;
- Data collection and description;
- Baseline description and categorisation;
- 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 proposed scheme.

1.3.2 Definition of the study area

A study area has been defined for each baseline chapter. This study area encompasses all areas that may potentially be impacted upon by the proposed scheme. Impacts may occur during the construction phase or the operational phase (or both) and may be temporary or permanent. They may also be positive or negative. All types of impact are considered when defining the study area.

For linear schemes such as the proposed scheme, the study area typically encompasses an area of between 100m and 500m to both sides of the central line of the alignment. Depending on the local situation these dimensions may be increased (e.g. for long range impacts such as traffic, which may spread along a highway network, impacts on landscape views or ecological corridors). The dimensions may also be decreased (e.g. in the case of point features such as archaeological features, which will typically only be affected if they are in direct proximity to the alignment).

The dimensions of the study area are clearly described in each individual chapter. And the reasons behind the choice of dimensions are also explained in each case.

1.3.3 Data collection and description

All of the data collected as part of the EIA is relevant to the specific study area defined in each chapter. The data requirements of each individual chapter have been determined by the specialists involved in the compilation of each chapter and are driven by relevant legislation, guidelines and policy requirements.

Desktop reviews of existing information have been carried out for all environmental topics. These desktop reviews have been supplemented by specialised field studies and consultation with interested parties, statutory bodies and local authorities. The data sources for all information are clearly set out in each individual chapter.

1.3.4 Baseline description and categorisation

The baseline is evaluated by means of qualitative and/or quantitative criteria relating to the importance and sensitivity of the environment as well as any existing adverse effects that may impact the baseline environment.

A feature of the environment is deemed to be important if it performs a function that supports a specific environmental objective for the area. Specific environmental objectives are defined for each chapter and these objectives may be derived from legislation, policy documents or, in cases where legislation and policy are insufficient, guidelines or professional judgements.

A feature of the environment is deemed to be sensitive if it cannot accept change of a particular type and scale without unacceptable adverse effects on its function. Sensitive features of the environment are often quite rare and more stringent protection is often needed. These often also perform an important function. For example, the protection of sensitive ecological resources helps ensure that biodiversity is maintained.

In some cases, the quality of an important and/or sensitive environmental feature may be diminished by existing adverse effects. For example, one important function of a residential area is that it provides a place for human beings to sleep. However, the extent to which the area performs this function may be diminished if there are existing very high levels of noise.

Criteria have been defined by each environmental specialist to evaluate the importance and sensitivity and any existing adverse effects affecting each specific environmental topic. These criteria are used to categorise features of the environment in terms of their 'functional value'. The term functional value is used to express the combined consideration of importance, sensitivity and existing adverse effects. The quantitative scale used in this EIS to describe functional value is an ordinal scale and ranges from (I) to (V) with (I) indicating a Very low functional value and (V) indicating a Very high functional value.



Typical Light Metro Vehicle (LMV)

1.3.5 Impact identification

Sources of impact

A description of the different features of the proposed scheme is provided in the project description. Not all of the different features of the proposed scheme are relevant to all of the environmental topics. For example, platform lighting that is used on the proposed scheme is not a source of impact for soil.

In each individual chapter the methodology section sets out the individual features of the proposed scheme that are relevant to each of the environmental topics.

Potential types of impact

Potential types of impact have been identified through efficient and effective scoping procedures. Consultation with stakeholders, interested parties and the public has been carried out on an ongoing basis. A summary of the measures carried out is provided in the Consultation chapter (Volume 1, Chapter 7). Each individual specialist has reviewed the engineering plans and identified the potential impacts based on their technical experience and expertise.

The impact assessment process is an iterative process that occurs at all stages of project development and delivery. The proposed scheme has the potential to impact on the environment during:

- The construction phase;
- The operational phase.

For this reason, the assessment of the impacts of the proposed scheme is differentiated into construction and operational impacts.

The current baseline is described with respect to each individual environmental topic. The construction period for the proposed scheme (including enabling works, testing and commissioning) will be approximately 5 years. For the purpose of this EIS, the construction impacts that are assessed relate to 2011 as it is anticipated that construction impacts will be at their worst during this period. 2011 is therefore referred to as the 'horizon year of construction'.

It must be recognised that the existing environmental baseline, as assessed in 2007/8, will change in the future even if the proposed scheme does not take place. **The baseline that would exist in the future in the absence of the proposed scheme is known as the 'do minimum' baseline.** The assumptions that relate to the 'do minimum' baseline are set out in this EIS.

Construction impacts that will occur during the horizon year of construction (2011) are assessed against the 'do minimum' scenario for 2011. Operation impacts that will occur during the horizon year of operation (2029) are assessed against the 'do minimum' scenario for 2029. The year 2029 has been chosen as the horizon year of operation because a fifteen year horizon reflects best practice for traffic forecast modelling.

1.3.6 Impact categorisation

For each individual environmental topic, the relevant impacts that are identified are described in detail and assessed in terms of:

- Magnitude;
- Significance.

Magnitude

The magnitude of the impact takes into account the quality, type and range of impact that will occur as well as the duration over which the impact will occur. Five categories are typically used to express the magnitude of the impact:

- Very low (I);
- Low (II);
- Medium (III);
- High (IV);
- Very high (V).

Topic-specific criteria are defined in each environmental topic in order to evaluate the magnitude of impacts into the five categories that are shown above. **These criteria take into account** Irish legislation, international standards, accepted technical and good practice guidelines and the results of the scoping process. Quantitative criteria are used in cases where this is possible. In the case of non-quantifiable impacts such as landscape impacts, the criteria that are defined are described qualitatively.

Significance

The significance of the impact is defined by evaluating the magnitude of the impact relative to the functional value of the baseline environment. The assessment of significance is ultimately considered to be topic-specific and is carried out by the environmental specialist in light of experience and expertise.

1.3.7 Do minimum scenario

One element of the EIA process is to determine what will happen to the environment in the absence of the proposed scheme. In the case of the proposed scheme, evaluating this 'do minimum scenario' involves determining how the study area would develop in the absence of Metro North. Many significant developments are already planned for the areas between Lissenhall and St. Stephen's Green. These developments are described in the Human Beings: Landuse chapter (Volume 1, Chapter 10) of this EIS. A key objective of Fingal County Council and Dublin City Council for this area is the improvement of public transport routes and increased accessibility to those developments. In the absence of the proposed scheme, public transport opportunities would be severely restricted and the continued reliance on private car-based transport to access the major commercial and residential areas would continue. There would potentially be an increase in bus traffic along the alignment in an attempt to serve public transport requirements in the absence of the proposed scheme.

Three 'do minimum' scenario models have been developed as part of this EIA. These scenarios are primarily based on calculations of future year traffic conditions which would exist in the future if the proposed scheme was not implemented. These scenarios are prepared in order that such changes to the baseline environment can be taken into account when carrying out the impact assessment. Do minimum scenarios have been developed for the following future years and further details are provided in relevant chapters of this EIS (where appropriate):

- 2011 (forecast construction year);
- 2014 (forecast opening operation year);
- 2029 (forecast horizon operation year).

The following section provides a summary of the developments that have been taken into account when modelling the do minimum scenarios:

- Changes in do minimum landuse characteristics and associated trip demand. This is estimated based on population and employment forecasts given in the Regional Planning Guidelines population and employment forecasts;
- Infrastructure developments included in Transport 21 such as: Luas extensions and future Luas lines; upgrades to heavy rail services and road schemes including upgrading of the M50;

- Schemes that are being implemented to enhance the Quality Bus Network;
- The bus interchange proposed at Strand Street, adjacent to the Jervis Street Luas stop;
- Transport infrastructural schemes for which committed lines of funding have been established or which the relevant local authority has indicated will be completed at a certain point in the future. Further details are provided in the Traffic chapter (Volume 1, Chapter 15) of this EIS;
- Other future developments which have been granted planning permission or are in the early stages of planning or comprise strategic objectives of the current development plan. A summary of significant planned developments taken into account along the Metro North Alignment include (but are not limited to):
 - Swords and Lissenhall are earmarked for general development, to provide for a much-expanded civic, cultural, retail, commercial and employment base at a level appropriate for a vibrant major town;
 - The Dublin Airport Local Area Plan makes provision for the development of Terminal 2 by 2009. To cater for the increase in patronage at this airport, there will be increased car parking facilities, improved pedestrian and cycle facilities and enhanced bus services;
 - The Santry Demesne Parkland, located between the R108 and R132 and to the south of the M50 is currently being developed as a mixed use development;
 - An Bord Pleanála and Fingal County Council have granted permission to IKEA to build an outlet on 12.6 hectares to the southwest of the M50 Ballymun interchange. Car parking will be provided as will a fully wheelchair accessible bus service between the development and Ballymun Town Centre. This area will undergo significant development over the coming years;
 - A number of developments are planned for the Phibsboro/Drumcondra area including the former Smurfit printwork site, Dalymount Park and Phibsboro shopping centre, the Mountjoy Prison site and the extension of the existing Mater Hospital. These developments include residential, commercial, retail, social and hotel uses;
 - Within the city centre there are two significant proposals the expansion of the Arnotts stores and the redevelopment of the Carlton site.

1.3.8 Derivation of mitigation measures

Mitigation measures can be classified into three types of mitigation:

- Avoidance of impacts;
- Reduction of impacts;
- Remedy of impacts.

Substantial mitigation by avoidance and reduction has been achieved through the consideration of alternatives during the design process. As part of this process, options were considered at a local level and this exercise provided opportunities for mitigation to occur while the project was in the conceptual and design stages. The manner in which alternatives were considered is described in the Alternatives chapter of this EIS (Volume 1, Chapter 5).

In a number of cases, impacts of the proposed scheme cannot be completely mitigated by avoidance and reduction through the consideration of alternatives. These impacts require additional mitigation by remedy and the extent of mitigation required is typically linked to the significance of the impact that is predicted to occur. Impacts of high significance are of particular concern when defining the final mitigation measures. The mitigation measures that are to be put in place are set out in each chapter. These mitigation measures relate to both the construction and operational phases of the proposed scheme and will be implemented by all relevant contractors involved in the proposed scheme.

1.3.9 Assessment of residual impacts

This section describes any residual impacts that continue to exist when the mitigation measures have been put in place. These residual impacts are summarised in tables within each chapter that detail the functional value of the receiving environment, the magnitude and significance of the impact.

1.3.10 Interrelationships, interactions and cumulative impacts

An EIA must identify, describe and assess potential direct and indirect impacts on individual environmental topics such as air or water. Furthermore, an EIA must identify, describe and assess any potential for impacts on any one environmental topic to have an effect on other environmental topics due to interaction between the two topics.

An EIA must also identify, describe and assess the potential for many small impacts to have a cumulative impact on the environment i.e. to create one larger more significant impact. These are dealt with in the Interrelationships, Interactions and Cumulative Impacts chapters of this EIS (Volume 2, Chapter 18).

1.4 DATA LIMITATIONS AND DIFFICULTIES ENCOUNTERED

Any data limitations or technical difficulties associated with the completion of specialist assessments and the compilation of this EIS are detailed within relevant chapters and summarised in the Difficulties Encountered chapter of this EIS (Volume 1, Chapter 10).

1.5 ORAL HEARING

Under Section 42(1) of the Transport (Railway Infrastructure) Act, 2001 (as amended by the 2006 Act), it is at the discretion of An Bord Pleanála to hold an oral hearing regarding the Railway Order Application for the proposed scheme.

1.6 AVAILABILITY OF EIS

This EIS is available for inspection and purchase at the following location:-

Railway Procurement Agency (RPA)
Parkgate Business Centre
Parkgate Street
Dublin 8

Copies of the EIS can be purchased at the above locations and the Non-Technical Summary is also available.

The EIS and Non-Technical Summary are available to download for free at www.rpa.ie.

02

NEED AND OBJECTIVES

- 2.1 Need
- 2.2 Objectives





This chapter provides evidence of the need for Metro North and details the objectives that the Railway Procurement Agency (RPA) has set out in relation to the proposed scheme.

2.1 NEED

Metro North will connect the Fingal County town of Swords and the townland of Belinstown to Dublin's City centre. The selected route for the proposed scheme serves a number of key destinations including Dublin Airport, hospitals, universities and retail centres as well as high density residential and employment districts. Transport, economic, environmental protection and urban planning considerations all justify the need for the proposed scheme.

Metro North is a key element in the creation of a fully integrated public transport network as envisaged in Transport 21. It will interchange with existing Luas Green Line services at St. Stephen's Green and Red Line services at O'Connell Street. It will also interchange with DART (Dublin Area Rapid Transit) and suburban rail services at St. Stephen's Green (via the proposed rail interconnector) and at Drumcondra following the electrification of the suburban rail line. 2,600 Park & Ride spaces will be provided at key locations along the route so the proposed scheme will benefit people from far beyond its immediate catchment area. The proposed scheme will also have excellent interchange with local and regional bus services, with bus interchange facilities being provided at most stops.

The National Development Plan supports the integration of bus and rail networks as a means of underpinning economic growth. The overall aim of the Dublin Transportation Office (DTO) strategy set out in A Platform for Change is to provide an integrated transport network, with sufficient capacity to meet the transportation requirements well beyond the 2016 horizon of the strategy. The Regional Planning Guidelines for the Greater Dublin Area (GDA) support the infrastructure and service improvements that are proposed by the DTO in A Platform for Change. The Guidelines emphasise the need to improve the international, national and local accessibility of the GDA and settlements within this area.

The proposed scheme will have significant reserve capacity to grow to meet Dublin's long term transport needs. When it opens, the proposed scheme will carry around 80,000 passengers per day. This is forecast to grow significantly over time. The proposed scheme will have an ultimate capacity in excess of 40,000 passengers per hour (20,000 in each direction). This is beyond the capacity of an on-street rail system, but will easily be accommodated on MetroNorth, which can accommodate longer Light Metro Vehicles (LMVs) operating at a higher frequency. The DTO supports proposals for a metro system as it is anticipated that the demand for travel in the GDA will increase significantly in the future.

With its dedicated track, the proposed scheme will offer a frequent, fast and reliable service for commuters. The journey time from Swords to the city centre will be about 26 minutes, less than half the time of the same journey by car at peak rush hour. As with Luas, Metro North passengers will not have to worry about timetables. Peak time services will run every 4 minutes, and more frequently as passenger numbers grow. The proposed scheme is expected to carry some 35 million passengers a year once it is operational.

Dramatic growth is forecast for Dublin Airport. Currently carrying over 20 million passengers each year, this is expected to grow to over 30 million by 2015 - 2016 as detailed in the Inspector's Report 1, An Bord Pleanála, PL 06F. The proposed scheme offers a journey time of less than 20 minutes to the city centre and will become the preferred transport mode for many people travelling to and from Dublin Airport. The Dublin Airport Masterplan (2006) states that 'greatly enhanced public transport provision will be paramount to the success and sustainability of Dublin Airport'. The Dublin Airport Authority (DAA) views the proposed scheme as a crucial means of enhancing the public transport provisions for Dublin Airport.

The proposed scheme represents more than just an airport link or a new public transport line. It can be a catalyst for urban and suburban regeneration. Investment will be attracted into the areas served by the proposed scheme and new commercial and service facilities will be developed. The construction of the proposed scheme can contribute to the renewal of local areas through careful integration of the proposed scheme infrastructure with the local environment and high quality landscaping. The National Development Plan recognises that public transport projects such as Metro North are needed because they help Dublin enhance its competitiveness and ensure its position as a leading international urban metropolis. According to the Plan, transport infrastructure programmes are an economic priority. The Plan states that the provision of public transport and investment in public transport are viewed as a means of supporting sustainable development.

The National Development Plan states that modal shift from private vehicles to public transport is necessary in order to promote efficiency, quality of life, competitiveness and environmental sustainability. The Regional Planning Guidelines also support the view that increasing population levels and significant housing demand have put the existing transport and service infrastructure of the GDA under increased pressure and recommend that public transportation and other sustainable modes should be given precedence over the requirements of the private car in all relevant policy and decision-making. The proposed scheme is forecast to remove over 115 million vehicle kilometres from Dublin's roads every year (RPA transport model run, 2008). Park & Ride sites at strategic locations will encourage car drivers from beyond the proposed scheme catchment area to transfer to Metro North for a fast journey onwards to the city.

The proposed scheme will not only be used by people living and working along the alignment, but also those commuting from outlying towns who will make use of it. It will be used by people from all regions of the country travelling to Dublin Airport, since the proposed scheme will be connected with the two main intercity railway stations via the Luas Red Line and the proposed Interconnector, and will provide a gateway to Ireland for tourists.

Metro North is a key objective of the Government transport strategy Transport 21.

2.2 OBJECTIVES

RPA is a state agency that was established in December 2001 under the Transport (Railway Infrastructure) Act 2001. RPA is responsible for the implementation of Metro North and has devised a number of objectives for the proposed scheme in consideration of the Government's objectives set out in Transport 21 and the DTO objectives set out in A Platform for Change. They include:

- Minimising environmental impacts including congestion and associated pollution problems;
- Generating social and economic benefits;
- Delivering good quality transport integration.

The objectives that are given above are to be delivered:

- In a manner that is compliant with transport and landuse strategy;
- While optimising capital and operating costs;
- In a safe and operationally efficient manner;
- Efficiently and minimising risk during construction.

All of the objectives detailed above have been used as criteria to evaluate the various route options for Metro North as detailed in the Alternatives chapter of this EIS (Volume 1, Chapter 5).

03

LEGISLATION

- 3.1 Introduction
- 3.2 Railway Order application process
- 3.3 Legislative requirements of the EIS





This chapter presents a summary of the planning legislation that is relevant to the Railway Order application for the proposed scheme.

3.1 INTRODUCTION

A Railway Order is the legal authority required to construct, operate and maintain a metro or light railway. The Railway Procurement Agency (RPA) must therefore apply for a Railway Order in order to implement the proposed scheme. The application for a Railway Order is made to An Bord Pleanála (ABP) and among the documents which must accompany the application is an Environmental Impact Statement (EIS) drafted in accordance with the provisions of Section 39 of the Transport (Railway Infrastructure) Act, 2001.

The 2001 Act was significantly amended by Section 49 of the Planning and Development (Strategic Infrastructure) Act 2006. The main body of the legislation sets up a new division in ABP mandated to deal with planning applications for strategic infrastructure development. Section 49 then amended the process whereby applications for Railway Orders are processed. Instead of an application to the Minister for Transport, the application is now made to ABP, to the same division that deals with other developments of strategic importance.

The Transport (Railway Infrastructure) Act, 2001 as amended by Section 49 of the Planning and Development (Strategic Infrastructure) Act 2006 is referred to within this EIS as 'the 2001 Act'.

3.2 RAILWAY ORDER APPLICATION PROCESS

The Railway Order application process is set out in Sections 37 to 47 of the 2001 Act. The applicant must engage in pre-application consultation with ABP prior to submitting an application. When this process is complete, the applicant must place the Railway Order application documents on display at locations agreed with ABP for a period of six weeks. During that time, any party may lodge written submissions with regards to the proposed scheme with ABP for its consideration.

The application documents comprise a draft of the proposed Railway Order, a plan of the proposed railway works, a plan of any proposed commercial development of land adjacent to the proposed railway works, a Book of Reference and an EIS.

When the six week display period has expired, there is an eighteen week period within which ABP aspires to reach a decision as to whether to grant a Railway Order. During this time, ABP may at its discretion, choose to hold an oral hearing into the application for a Railway Order.

In reaching its decision as to whether to grant a Railway Order, ABP is obliged to have regard, among other things, to the Railway Order application documents, the report of any oral hearing held, any relevant submissions made to it, any additional information furnished to it and proper planning and sustainable development for the area in which the project is proposed.

3.3 LEGISLATIVE REQUIREMENTS OF THE EIS

The EIS is produced as part of the Environmental Impact Assessment ('EIA') process. The EIA process is governed by 'The EIA Directive' (EU Directive 85/337/EEC as amended by Directive 97/11/EC) which has been adopted into Irish legislation principally via the Planning Acts and in relation to railways, via the 2001 Act.

Section 39 of the 2001 Act specifies the information that must be provided in the EIS that accompanies a Railway Order application. This section reflects the provisions of the EIA Directive and provides as follows:

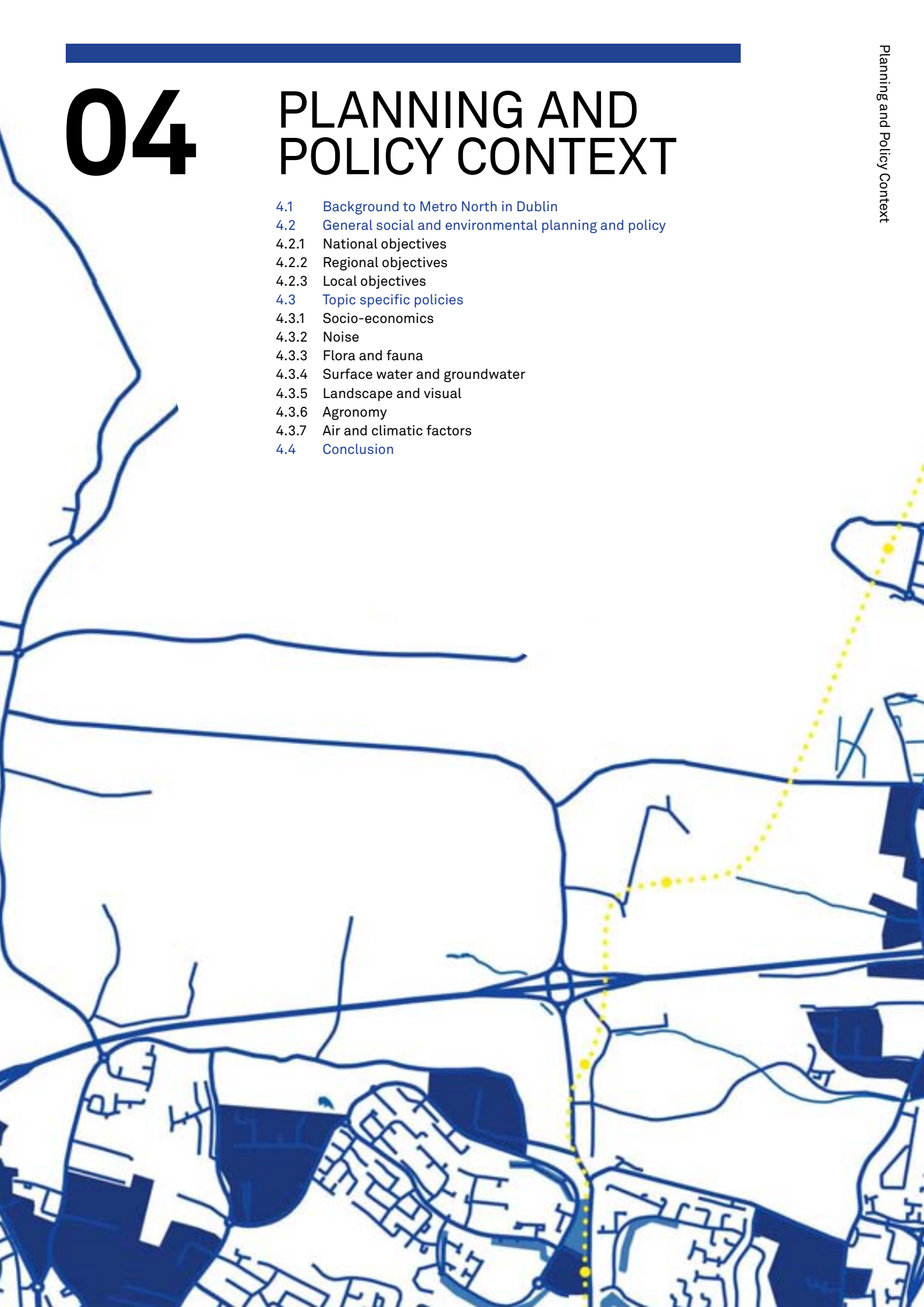
'(1) An environmental impact statement shall contain the following specified information:

- (a) a description of the proposed railway works comprising information on the site, design and size of the proposed railway works,
 - (b) a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects,
 - (c) the data required to identify and assess the main effects which the proposed railway works are likely to have on the environment,
 - (d) an outline of the main alternatives studied by the applicant and an indication of the main reasons for its choice, taking into account the environmental effects, and
 - (e) a summary in non-technical language of the above information.
- (2) An environmental impact statement shall, in addition to and by way of explanation or amplification of the specified information referred to in subsection (1), contain further information on the following matters—
- (a) (i) a description of the physical characteristics of the whole proposed railway works and the landuse requirements during the construction and operational phases,
 - (ii) an estimate, by type and quantity, of the expected residues and emissions (including water, air and soil pollution, noise, vibration, light, heat and radiation) resulting from the operation of the proposed railway works;
 - (b) a description of the aspects of the environment likely to be significantly affected by the proposed railway works, including in particular—
 - (i) human beings, fauna and flora,
 - (ii) soil, water, air, climatic factors and the landscape,
 - (iii) material assets, including the architectural and archaeological heritage, and the cultural heritage,
 - (iv) the inter-relationship between the matters referred to in this paragraph;
 - (c) a description of the likely significant effects (including direct, indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative) of the proposed railway works on the environment resulting from—
 - (i) the existence of the proposed railway works,
 - (ii) the use of natural resources,
 - (iii) the emission of pollutants, the creation of nuisances and the elimination of waste,
 and a description of the forecasting methods used to assess the effects on the environment;
 - (d) an indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information;
 - (e) a summary in non-technical language of the above information, to the extent that such information is relevant to a given stage of the consent procedure and to the specific characteristics of the railway works or type of railway works concerned, and of the environmental features likely to be affected, and the applicant may reasonably be required to compile such information having regard, inter alia, to current knowledge and methods of assessment.'

04

PLANNING AND POLICY CONTEXT

- 4.1 Background to Metro North in Dublin
- 4.2 General social and environmental planning and policy
 - 4.2.1 National objectives
 - 4.2.2 Regional objectives
 - 4.2.3 Local objectives
- 4.3 Topic specific policies
 - 4.3.1 Socio-economics
 - 4.3.2 Noise
 - 4.3.3 Flora and fauna
 - 4.3.4 Surface water and groundwater
 - 4.3.5 Landscape and visual
 - 4.3.6 Agronomy
 - 4.3.7 Air and climatic factors
- 4.4 Conclusion





The purpose of this chapter is to set out the relevant planning and transport policy context for the proposed scheme.

4.1 BACKGROUND TO METRO NORTH IN DUBLIN

DTO Strategy – ‘A Platform for Change’

In October 2000 the Dublin Transportation Office (DTO) published ‘A Platform for Change - Outline of an integrated transportation strategy for the Greater Dublin Area - 2000 to 2016’. The strategy set out a vision of an integrated multi-modal transportation strategy for the Dublin area. This vision was to be delivered over the subsequent 15 years.

The DTO provides transport and landuse advice to organisations operating in the Greater Dublin Area. These organisations include Dublin City Council, Fingal County Council, South Dublin County Council, Dun Laoghaire Rathdown County Council and the local authorities of Kildare, Meath and Wicklow. ‘A Platform for Change’ represents the DTO’s strategy for 2000 – 2016. The strategy has two interdependent elements:

- Infrastructure and service improvements: to increase the supply of transport including a substantial expansion of the public transport network, some strategic road construction and traffic management;
- Demand management: to reduce the growth in travel through the application of landuse and other policies while maintaining economic progress. To encourage a transfer of trips, especially at peak periods, from the private car to more sustainable modes of transport (such as public transport, cycling and walking).

The strategy identifies a metro system as a key element of the transport network. Among the principal components of the DTO’s integrated transport strategy is a series of public transport objectives that relate to the proposed scheme:

- an extension of the on-street, light rail network (Luas);
- the development of a higher capacity, segregated, light rail network (Metro).

The strategy provides further detail on the Luas and Metro networks referred to in the above paragraph. In relation to the proposed scheme, the strategy states that the system will have a spine from Swords (north of Dublin Airport) to Shanganagh (north of Bray in Co. Wicklow). This line will run via Dublin Airport, Finglas, Broadstone, the city centre (this alignment is similar to the Metro North west route option that was considered during the feasibility study), Ranelagh, Sandyford and Cherrywood. An orbital line will be formed from a spur off the Swords-Shanganagh spine route at Finglas via Blanchardstown and Clondalkin to Tallaght.

Figure 4.1 is an extract from ‘A Platform for Change’ and illustrates DTO’s Metro Network.

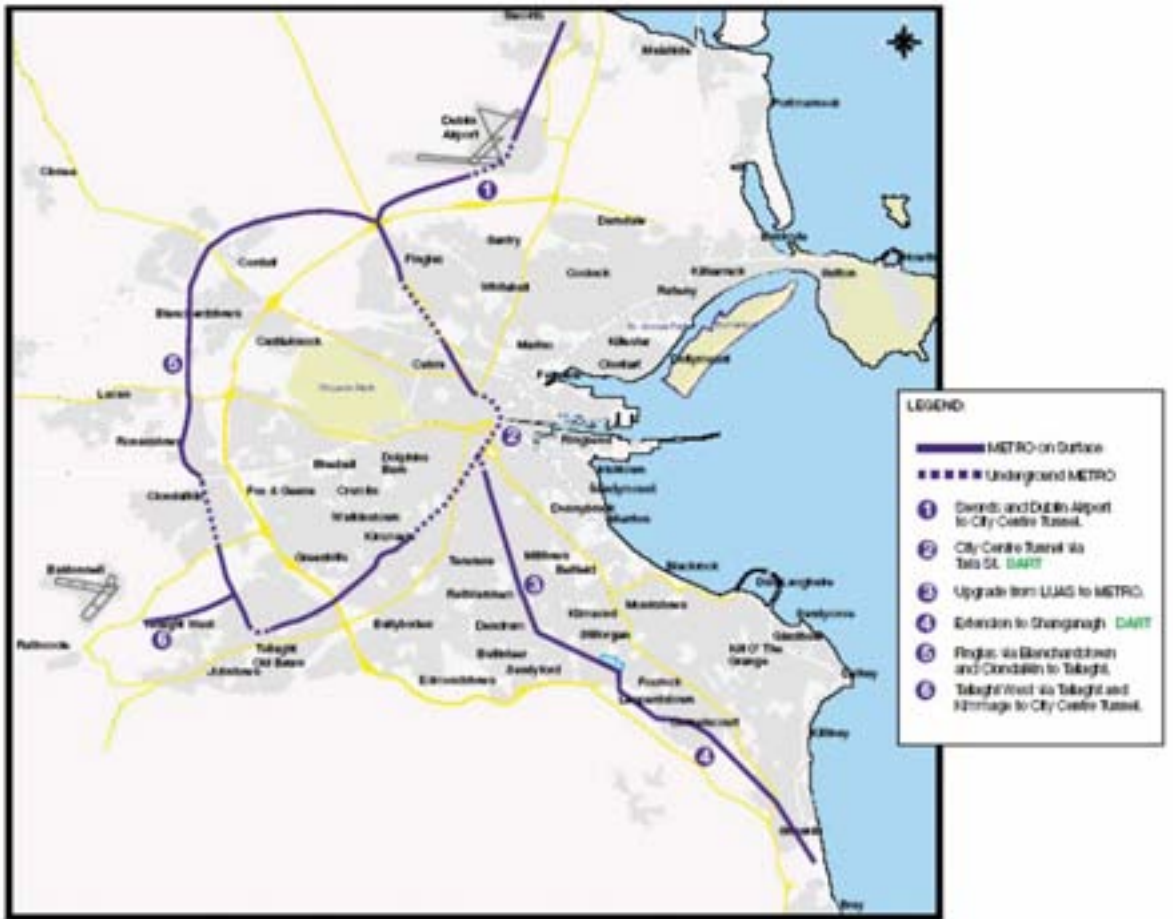


Figure 4.1
Extract from
'A Platform
for Change'
illustrating DTO's
Metro Network

Source: A Platform
For Change (2001)

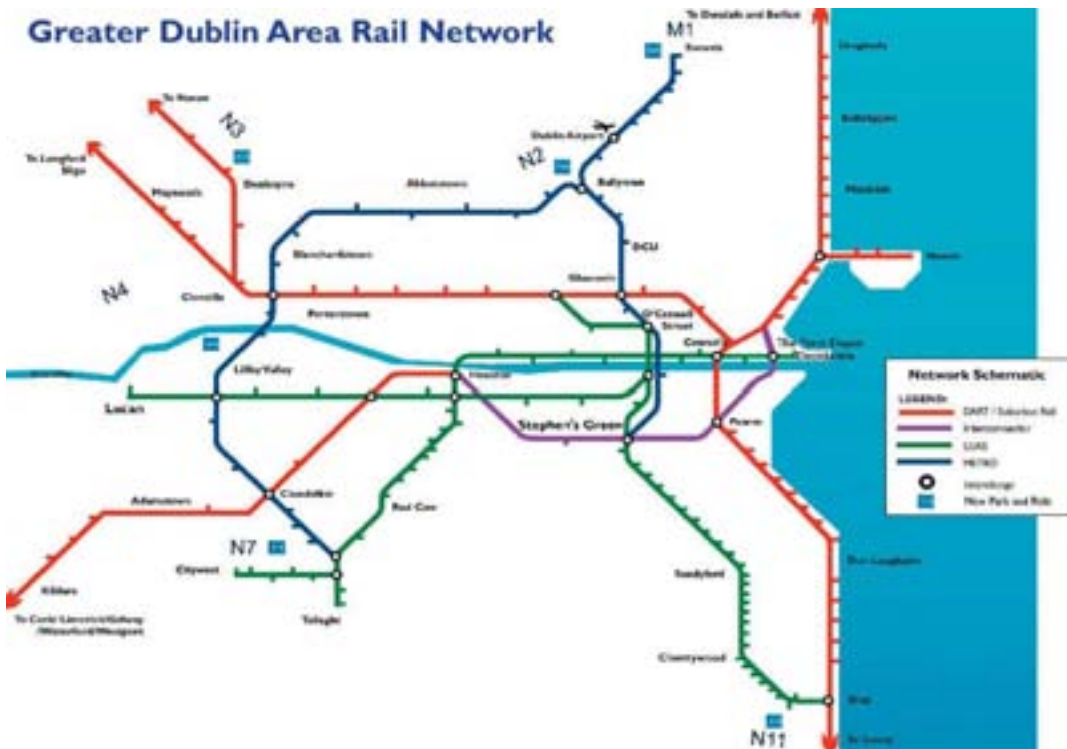


Figure 4.2
Proposed Rail
Network

Source:
Transport 21 (2005)

The proposed scheme complies with the broad principles of the 'Platform for Change' document. The document envisages a link from Dublin City Centre to Swords via Dublin Airport. However, this link is different to the route of the proposed scheme. The key difference is that the scheme proposed in 'A Platform For Change' passes through the Finglas area of Dublin, whereas the proposed scheme passes through Ballymun and then to the airport and Swords.

RPA prepared a route evaluation report in 2006 which compared four alternative routes for Metro North (including the route in 'A Platform For Change' and the route that is currently proposed for Metro North). This feasibility study concluded that the proposed route is the most preferable option when evaluated in terms of the project objectives.

Transport 21 (2005)

Transport 21 was announced in November 2005 and details the Government's capital investment framework for rail infrastructure in the Greater Dublin Area.

Specific reference is made to Metro North and Metro West and according to Transport 21, Metro North will begin at St. Stephen's Green and potentially serve DCU, Ballymun and Dublin Airport before terminating at Swords. Transport 21 describes Metro West as an orbital line, comprising a spur off the Metro North line at Ballymun and travelling eastwards (outside the M50 Motorway) to link into the Luas Red Line close to Tallaght. Metro West will potentially serve Clondalkin, Liffey Valley and Blanchardstown. This is illustrated in Figure 4.2.

Figure 4.2 is an extract from Transport 21 and shows the proposed Greater Dublin Area rail network. Metro North is an essential part of Transport 21 and is in compliance with the scheme as envisaged in Transport 21.

The projects and programmes that make up Transport 21 are set out in the Department of Transport's website for Transport 21. According to the website, these projects and programmes 'aim to:

- increase accessibility;
- ensure sustainability;
- expand capacity;
- increase use;
- enhance quality.'

Increasing accessibility is about making it easier for everybody to get to and from work, school, college, shopping, business and social activities. It is also about making it easier for industry and business to access raw materials, workers and, above all, markets.

Ensuring sustainability recognises that a modern transport system must be sustainable from an economic, social and environmental perspective. The transport sector is the fastest growing contributor to our national greenhouse gas emissions. The Department of Transport has outlined in its statement of strategy, its commitment to tackling the adverse environmental impacts of the transport sector while maximising efficiency and increasing the mobility of goods and people on the transport network.

Expanding capacity has two important dimensions:

- Existing capacity deficiencies which arise from past underinvestment and from the sheer pace of economic growth over the past decade must be addressed;
- Appropriate provision for future growth must be made.

Expanding capacity can no longer be based on just a 'predict and provide' strategy of predicting traffic growth and providing the infrastructure to meet it.

Use of our transport network needs to be improved by managing the network itself and making the best possible use of existing infrastructure before new infrastructure is built.

All trips made have an impact on other transport users, particularly when there is congestion on the transport network. With this in mind, Transport 21 seeks to increase the use of public transport, particularly in urban areas. Transport 21 seeks to facilitate better management of the use of the transport network so as to maximise its capacity to move people and goods, as distinct from just vehicles.

Enhancing the quality of the transport system has a number of dimensions:

- It is about the physical quality of the network, ensuring that it is well constructed, maintained and operated;
- It concerns the speed, reliability and comfort of a journey;
- It relates to integration and ensuring that the journey is as seamless as possible;
- It concerns making sure that the transport network is safe to use;
- It is about the physical accessibility of our transport network for people with mobility, sensory and cognitive impairments.

Section 49 Contributions

Both Dublin City Council and Fingal County Council have adopted supplementary development contribution schemes for Metro North under Section 49 of the Planning and Development Act 2000. The purpose of these contribution schemes is to facilitate financial contributions from new developments (residential, retail and commercial). These contributions are made to the proposed scheme developers (RPA) and help cover the capital cost of Metro North.

The basis for seeking such development contributions is that these new developments will benefit financially (in terms of asset value) from the provision of the proposed scheme. Any developments located within approximately 1 km on either side of the proposed scheme may be covered under the terms of the contribution schemes. The schemes are currently proposed to apply for 30 years from 2007.

4.2 GENERAL SOCIAL AND ENVIRONMENTAL PLANNING AND POLICY

Landuse planning is governed by a hierarchy of policy documents that provide a background for the proposed scheme ranging from national to local level. An outline of some of the main relevant provisions of these policy documents are set out in this section.

4.2.1 National objectives

Department of Transport Statement of Strategy 2005 – 2007 (DoT)

The overriding objective of the Department's strategy as embraced in the Mission Statement is '...to underpin Ireland's economic growth and competitiveness and contribute to social development through the efficient and effective delivery of an appropriately regulated sustainable, safe and integrated transport system'. The means by which this objective is to be attained is set out in what the strategy describes as its six 'high level goals': integration; investment; safety; competition; regulation and reform; and delivery.

The strategic objectives of the department set out how these high level goals are to be achieved and for public transport these are defined as:

- the provision of a well functioning, integrated public transport system which enhances competitiveness, sustains economic progress and contributes to social cohesion;
- the provision of a defined standard of public transport, at reasonable cost to the customer and taxpayer;
- the timely and cost-effective delivery of the accelerated investment in infrastructure and facilities necessary to ensure improved public transport provision.

Specifically, the department seeks to increase the number of people using public transport; to increase the modal share of public transport; and to adopt an integrated approach to public transport provision.

The proposed scheme conforms to the above objectives and provides for an appropriately regulated sustainable, safe and integrated transport system.

National Spatial Strategy 2002-2020

The National Spatial Strategy for Ireland (NSS) was published by the Department of the Environment and Local Government in 2002. The strategy is a twenty-year planning framework designed to achieve a better balance of social, economic, physical development and population growth between regions. Core aims of the NSS are to assist in the promotion of:

- A better quality of life for people;
- A strong, competitive economic position;
- An environment of the highest quality.

Section 3.7 of the NSS notes that 'achieving spatial balance by developing the potential of areas will depend on enhancing capacity for the movement of people, goods, energy and information between different places. Improvements in terms of time and cost can reduce the disadvantages of distance. Physical networks of infrastructure such as roads, public transport, energy and communications are of particular relevance to the NSS, since they themselves have a spatial impact and also influence the location, timing and extent of development'.

Section 3.7.1 of the NSS states that Ireland's transport network should enhance international access to all parts of the country. It will do so by facilitating effective interchange possibilities between the national transport network and international airports and sea ports and address congestion in major urban areas by increasing the use of public transport.

With regard to public transportation in the Greater Dublin Area (GDA), the NSS states:

'The physical consolidation of Dublin, supported by effective landuse policies for the urban area itself, is an essential requirement for a competitive Dublin. Consolidation is also required for the public transport to function effectively. In turn, investment in public transport will assist in promoting a more efficient and competitive Greater Dublin Area'.

The proposed scheme therefore supports and facilitates the achievement of the goals of the NSS.

National Development Plan 2007 – 2013 (2007)

The National Development Plan (NDP) was published by the Irish Government in 2007. The plan sets out the economic, infrastructural and social investment priorities of the State. The NDP provides for a total investment over the period 2007 - 2013 of some €183.7 billion at 2007 prices. This is broken down under the following priority headings:

- Economic Infrastructure (approx. € 54.7 BN);
- Enterprise, Science and Innovation (approx. €20.0 BN);
- Human Capital (approx. €25.8 BN);
- Social Infrastructure (approx. €33.6 BN);
- Social Inclusion (approx. €49.6 BN).

The priority of direct relevance to Metro North is 'Economic Infrastructure'. One of the key objectives under this priority is 'to deliver a radically upgraded public transport system in line with the timetable in Transport 21, especially in the Greater Dublin Area (GDA)'.

The NDP further notes that 'over the Plan period 2007 - 2013, the following projects will be advanced in line with the timetable in Transport 21' and the projects that are listed include the 'completion of Metro North line from city centre to Swords via Dublin Airport'. The proposed scheme therefore fully complies with this policy document and is supported by it.

Sustainable Development - A Strategy for Ireland (1997)

The sustainable development strategy for Ireland was published by the Department of the Environment, Heritage and Local Government in 1997. The strategy seeks to ensure that sustainable development is addressed in all areas of Government policy. Sustainable development must also be considered if any economic and societal activity has the potential to have an impact on the environment. The strategy seeks to re-orientate policies where necessary in order to ensure that the strong growth Ireland currently enjoys and seeks to maintain is environmentally sustainable.

The overall aim of the strategy is to ensure that the economy and society in Ireland can develop to their full potential within a well-protected environment without compromising the quality of that environment and having regard for present and future generations as well as the wider international community.

This strategy sets out an agenda to render Irish transport more environmentally acceptable and to 'improve public transport systems and infrastructure with a view to increasing their market share'. The strategy states that funding for improvements in rolling stock, signalling and track network will further encourage commuters to switch from road to rail.

The Government is committed to renewing the strategy under the terms of the current Social Partnership Agreement. The strategy is currently being reviewed and is at the public consultation stage of the review process. It is due to be published by the Department of the Environment, Heritage and Local Government in Summer 2008. The proposed scheme supports the broad principles of this policy document by encouraging modal shift to a more sustainable form of transport.

Ten-Year Framework Social Partnership Draft Agreement 2006 – 2015 (2006)

The National Development Agreement between key members of Ireland's workforce is a 10-Year Framework Social Partnership Agreement. It was published by the Department of the Taoiseach in June 2006. The agreed objectives of the Agreement are:

- Nurturing the complementary relationship between social policy and economic prosperity;
- Developing a vibrant, knowledge-based economy and stimulating enterprise and productivity;
- Re-inventing and repositioning Ireland's social policies;
- Integrating an island-of-Ireland economy;
- Deepening capabilities, achieving higher social and economic participation rates and handling diversity, including immigration, more successfully.

In relation to infrastructure and planning, Paragraph 2.28 of the agreement states that 'the overall policy focus is to prioritise investment in public and social infrastructure within a strategic and long-term framework that plans for accelerating regional population and employment growth'. Paragraphs 2.39 to 2.44 provide a summary of the main objectives of Transport 21. This is part of an overall macroeconomic policy of building a strong economy and society by maintaining a supportive macroeconomic policy framework in order to enhance productivity and competitiveness.

The design of the proposed scheme is supported by the principles that are set out in this agreement. This is reflected in a number of the chapters of the EIS including Human Beings: Socio-economics (Volume 1, Chapter 11).

National Action Plan for Social Inclusion 2007-2016: Building an Inclusive Society (2007)

The National Action Plan (NAP) was published by the Irish Government in 2007. The plan details the wide ranging and comprehensive programme of action to address the socio-economic issues of poverty and social exclusion. It states that 'every family should have access to health and social care, affordable accommodation appropriate to their needs and a well functioning public transport system'. It also highlights the public transport needs of various communities including the disabled and the elderly.

The design of Metro North is supported by the principles that are set out in this plan. This is reflected in a number of the chapters of the EIS including Human Beings: Socio-economics (Volume 1, Chapter 11).

National Heritage Plan (2002)

The National Heritage Plan (NHP) was published by the Department of Arts, Heritage, Gaeltacht and the Islands in 2002. It is an objective of the Government to ensure the protection of Ireland's heritage and to promote its enjoyment by all.

According to the plan, in seeking to meet this objective, the Government will:

- place the protection and enjoyment of heritage at the heart of public life;
- promote the measures required for the protection of our heritage;
- encourage the accumulation of the knowledge necessary to protect our heritage;
- promote awareness and enjoyment of our heritage;
- play an active role in heritage protection in a cross-border and international context.

Chapter 2 of the National Heritage Plan highlights of the fact that the '...establishment of the protected areas networks as a fundamental step for the conservation of the natural heritage'. Action 9 of the plan states that the conservation of networks of protected areas for the natural heritage at the national, European and international levels of importance needs to be completed and ensured.

The NHP notes that 'the protection of heritage represents an ongoing commitment by the people of Ireland' and that the planning code and the EIA process are valuable tools that can be used to protect national heritage. The design for Metro North takes into consideration the principles that are set out in the National Heritage Plan. This is reflected in a number of the chapters of the EIS including Flora and Fauna, Landscape and Visual and Archaeology, Architectural Heritage and Cultural Heritage (Volume 1, Chapters 16, 21, 23 respectively).

National Climate Change Strategy 2007 – 2012 (2007)

The National Climate Change Strategy (NCCS) 2007 - 2012 was published by the Department of the Environment, Heritage and Local Government in 2007 and follows on from the original NCCS, which was published by the Government in 2000. The 2007 NCCS outlines the measures by which Ireland will meet its commitment to limit its greenhouse gas emissions over the 2008 - 2012 period to 13% above 1990 levels.

Ireland is addressing this issue through a variety of domestic measures to reduce emissions throughout the economy. These measures include participation in the EU Emissions Trading Scheme by all large and/or energy producing industries. Through the flexible mechanisms in the Kyoto Protocol, Government purchases of carbon allowances will supplement these measures.

Central to the NCCS 2007, is the transport sector and its greenhouse gas emissions. The EPA's 'Environment In Focus' publication (2006) noted that the transport sector is the fastest growing contributor to national greenhouse gas emissions and accounts for 18.4% of national emissions. Between 1990 and 2005, transport emissions increased by 160%, with road transport accounting for the vast majority of that growth.

The NCCS recognises that one of the key ways of reducing transport-based greenhouse gas emissions is encouraging a modal-shift away from private car use and towards public transport systems. The NCCS 2007 notes that 'the provision of infrastructure through the continued implementation of Transport 21...will result in a switch from private to public forms of transport'. It further notes that 'preliminary modelling of the reduction in emissions from implementation of Transport 21 suggests a potential annual average reduction of almost 0.51 million tonnes of CO₂ in 2010'.

Metro North supports the broad principles of the NCCS by encouraging modal shift to a form of public transport that is associated with less emissions/capita than private car use. The NCCS also supports Metro North indirectly in that it supports the broad principles of Transport 21.

National Biodiversity Plan (2002)

The National Biodiversity Plan (NBP) was published by the Department of Arts, Gaeltacht, Heritage and the Islands in 2002. The overall objective of the NBP is to secure the conservation, enhancement and sustainable use of biological diversity in Ireland and to contribute to the conservation and sustainable use of biodiversity globally.

The objectives of the NBP are to:

- Conserve habitat diversity, including all sites of special biodiversity importance;
- Conserve species diversity;
- Conserve genetic diversity, both wild and domesticated;
- Contribute to the conservation and sustainable use of biodiversity and to advancing other obligations of the Convention on Biodiversity in the EU, regionally and internationally.

The National Biodiversity Plan supports the extension of woodlands through afforestation with native broadleaved tree species, sustainable farming methods, improvement of water quality and protection of sensitive habitats supporting rare species and high species diversity. The design for Metro North takes into consideration the principles that are set out in the National Biodiversity Plan. This is reflected in a number of the chapters of the EIS including Flora and Fauna.

4.2.2 Regional objectives

Regional Planning Guidelines for the Greater Dublin Area, 2004-2016

The Dublin Regional Authority and Mid-East Regional Authority published the Regional Planning Guidelines for the Greater Dublin Area 2004-2016 (RPGs) in July 2004. The Greater Dublin Area comprises the geographical area of Dublin, Kildare, Meath and Wicklow. The strategy distinguishes between the Metropolitan Area and the Hinterland Area and proposes policy directions for both.

The key objectives of the RPGs relate to consolidation of the urban centres located within the Metropolitan Area based on provision and facilitation of an integrated public transport system. The RPGs also promote greater use of sustainable transport modes through the integration of landuse and transport planning.

The RPGs support the projects proposed in the DTO Strategy 'A Platform for Change'.

A number of the stated goals of the RPGs are relevant to Metro North. These goals are:

- to create a robust strategic framework for the Greater Dublin Area consistent with the National Spatial Strategy;
- to create a region which functions well with regards to sustainability, attractiveness and quality of life, accessibility, and cost-effectiveness (in physical, economic, social and cultural dimensions);
- to provide sustainable infrastructure corridors.

The Regional Planning Guidelines for the Greater Dublin Area 2004-2016 contain a number of recommendations which are of relevance to the proposed development.

Recommendation 7.1 provides: 'In the Metropolitan Area, public transportation and other sustainable modes should be given precedence over the requirements of the private car in all relevant policy and decision making...In the Metropolitan Area, the intention is to create and sustain conditions suitable for major enhancement of the existing public transport system'.

Recommendation 8.2 provides: 'The priority to be accorded to the measures and projects included in the Dublin Transportation Office (DTO) Platform for Change and its review in 2004 should be confirmed by the relevant authorities and the resources necessary to give effect to the proposals, without any delay and should be secured and allocated, where this has not already been done.'

The strategy assumes that all of the transportation measures and projects, as amended/updated by Platform for Change, are implemented. Some of these projects have been subject to considerable delay and it is critical that no further delays are encountered in the realisation of these and other proposals'.

Recommendation 8.4 provides: 'The review of the DTO Platform for Change should consider, inter alia, the projects for both the Metropolitan and Hinterland Areas outlined below, with a further review or reviews as the strategy is implemented. Appropriate priority and resources should be allocated to avoid unnecessary delays. The future population and household growth can only be accommodated if the provision of transport infrastructure, particularly in respect of public transport facilities, is maintained beyond the implementation of the DTO Platform for Change measures. In addition to the measures listed in relation to Recommendation 5, other measures and actions required include...4. Investigate possible extension to Luas and Metro systems within and beyond proposals of Platform for Change'.

Objective 4.3 is also relevant and is: 'to create the conditions for improving equality of life chances, particularly (a) access to education and other critical services; (b) access to employment: The key objective is to reduce remoteness or isolation of communities by improving universal opportunities to access educational facilities and employment opportunities by improving public transport and by reducing the costs of transport including congestion'.

The proposed scheme facilitates the objectives of the RPGs by the provision of an integrated public transport service to provide better access to education and employment and encourages a modal shift to public transport.

Fingal County Development Plan 2005 – 2011 (2005)

This plan sets out Fingal County Council's policies and objectives for the development of the county from 2005 to 2011. The principal aim of the plan is 'to plan for and support the sustainable development of Fingal as an integrated network of vibrant socially and economically successful settlements, separated by Greenbelt areas, supporting and contributing to the economic development of the County, of its neighbouring authorities and of the Region'.

The current and future landuse in the Fingal area is illustrated in the zoning maps of the plan. The plan states on Page 19 that 'zoning aspires to promoting the orderly development of the County by eliminating potential conflicts between incompatible landuses and by establishing an efficient basis of investment in public infrastructure facilities'.

A number of specific policies in the plan relate to the Metro North scheme. Policy TP7 will safeguard the future Metro route through the county. An alignment is shown on the various maps which are part of the Fingal Development Plan. The alignment shown largely corresponds with the Central Route Option that was considered as part of the feasibility study and which includes the underground airport station option.

Policy TP 7 : 'to prioritise public transport by safeguarding future METRO, other rail and bus routes; promoting and facilitating the provision of new Metro and other rail facilities, rail and bus routes...'

Policy TP12: 'to facilitate and promote 'the development of a new and improved rail-based transport system including, a Metro link, from the city [Dublin] to Swords via the airport'.

Policy TO25: 'to promote the development of economic activities and employment generation, strictly in association with the provisions of the Metro, of lands to the south of the airport identified in the South Fingal Planning Study as being suitable for such uses'.

In addition to the policies that are directly related to Metro North, a number of general traffic and transport policies are important and are taken into consideration:

- as far as is practicable health, community and educational facilities should be accessible by means of public transport;
- the Council is strongly committed to the promotion of sustainable means of travel including public transport, walking and cycling, and the encouragement of modal change from private car use to these means.

The Fingal County Development Plan 2005 is the current policy document relating to the future development of Swords town. The plan identifies a number of objectives relating to the Swords area including 'to promote the development of Swords as a multi-modal transport hub' and to actively promote the Metro North link.

The Fingal County Development supports the broad principle of a Metro North and recognises the important role that Metro North will play in supporting the development of Fingal County.

Dublin City Development Plan 2005-2011 (2005)

The Dublin City Development Plan 2005-2011 was adopted by Dublin City Council and came into effect in March 2005. The overall vision for the city as outlined in the plan is to enhance the quality of life and experience of the city for the residents, workers, commuters and visitors and to consolidate the urban form of the city. The plan looks at the need 'to integrate an economic, cultural and social vision, while achieving necessary and sustainable densities within co-ordinating development frameworks'. This is to be done in conjunction with improvements to the public transport network.

Chapter 7 addresses transportation issues within the plan area. Policy T1 states that it is the 'policy of Dublin City Council to support the sustainability principles set out in the National Spatial Strategy, Dublin Transportation Office's 'A Platform For Change' and the Regional Planning Guidelines for the Greater Dublin Area' and that 'Dublin City Council commits itself to the objective of identifying the specific lands required or likely to be required for the transportation and related infrastructure needs of the city (including but not limited to lands required or likely to be required for new or modified bus routes, cycle lanes, paths, roads, bridges, parking facilities, Park & Ride infrastructure, light rail, rail and metro links) during the period of the next Development Plan from 2011 – 2017'.

Policy T2 supports a shift from private car usage towards increased use of public transport, non-motorised means of transport and car-sharing and pooling.

Paragraph 7.4.0 states 'Dublin City Council support the measures currently being implemented or proposed by the Railway Procurement Agency, Iarnród Éireann, Dublin Transportation Office and other agencies to enhance capacity on existing lines/services and provide new infrastructure including...provision of Metro. Dublin City Council supports a City Centre Rail connection to Dublin International Airport with a preference for stops at Dublin City University and Ballymun'. Specific reference is made to the support of Dublin City Council for a 'City Centre rail connection to Dublin International Airport with a preference for stops at Dublin City University and Ballymun'.

In addition to the policies that are directly related to Metro North, a number of general traffic and transport policies are important and are taken into consideration:

- The traffic management policy recognises the varying needs of the city through the day such as commuter peaks, shopping and business, service and delivery etc.
- In assessing priority, account will be taken of the number of people and not exclusively the number of vehicle movements;
- It is the policy of Dublin City Council to improve the management and control of traffic in the city to increase accessibility, and to tackle the adverse road safety and environmental impacts of the transport system.
- The imposition of increased restrictions on the use of road space, for road works or general construction, [should be undertaken] in acceptance with the 'Directions for the control and management of road works'

The proposed scheme complies with and supports the policies detailed in Dublin City Council's Development Plan 2005 - 2011.

Strategy for Economic, Social and Cultural Development of Fingal 2002-2011 (2002)

This strategy for economic, social and cultural development has been prepared by the Fingal County Development Board. The strategy identifies transportation as an issue that affects the quality of life for those who live and work in Fingal. It recognises the inextricable link between transportation and land use and their importance in a holistic approach to developing sustainable communities. It lists the facilitation of sustainable transport, the linking of transportation services at public transport interchange points and the development of a vastly improved rail service in Fingal among its goals. The overall vision is that 'Fingal will have a modern, integrated and accessible transportation system'. Metro North supports this overall vision.

Dublin – A City of Possibilities; Economic, Social and Cultural Strategy 2002-2012 (2002)

This strategy for economic, social and cultural development was prepared by Dublin City Development Board. The strategy that has been prepared is a ten year strategy and provides a framework for guiding all public services and development activities within the administrative area of Dublin City Council. Its vision is that Dublin city is accessible to all by transport systems that are efficient, safe, affordable, accessible, integrated and that maximise sustainable social and economic development and minimise negative environmental impacts. The Dublin City Development Board supports the DTO's policy document 'A Platform for Change' and therefore indirectly supports the broad principle of Metro North. Metro North is recognised as having an important role to play with regards to the future economic development of Dublin.

Fingal Heritage Plan 2005-2010 (2005)

The Fingal Heritage Plan was published by Fingal County Council in 2005. This Plan provides for practical action based on partnership to manage the heritage of the region. It states that planning for our heritage should be integrated with planning for our future so that we can protect and manage our heritage in a sustainable manner. Fingal County Council's Transportation Department played an active role in developing this heritage plan. The plan sets out a series of 73 actions to be implemented over the period 2005-2010. While none of these actions directly impact on transportation systems, they can have indirect effects on future transportation projects such as Metro North. The design for Metro North takes into consideration the principles that are set out in this heritage plan. This is reflected in a number of the chapters of the EIS including Archaeology, Architectural Heritage and Cultural Heritage.

Dublin City Heritage Plan 2002-2006 (2002)

The Dublin City Heritage Plan was published by Dublin City Council in 2002. The purpose of this Plan was to enhance the understanding of the valuable heritage resources of Dublin city. The Plan provided an opportunity to increase knowledge, raise awareness, create partnerships, establish best practices and launch key projects. Although it makes no direct reference to issues of transport in Dublin many of its objectives had indirect influence on the subsequent development of transport systems in the city. For example, the provision of accessible, comprehensive and consistent inventories of architectural heritage has influenced and is taken into consideration by the proposed scheme. An updated plan is due to be published in 2009.

Dublin City Biodiversity Action Plan 2007-2010 (2007)

The Dublin City Biodiversity Action Plan has been published by Dublin City Council. This plan recognises that development patterns and traditional land uses dictate the distribution of biodiversity. The Plan's overall aim is to incorporate more wildlife-friendly elements into the urban environment and into the planning processes, including the transport planning processes. The Plan also states that Dublin City Council seeks to develop policies and mechanisms to protect the natural habitat of the city and that it is particularly focused on the city parks and open spaces including St. Stephen's Green. Metro North passes through parts of the area covered by this plan. The design for the proposed scheme is supported by the principles that are set out in this heritage plan. This is reflected in a number of the chapters of the EIS including Flora and Fauna.

4.2.3 Local objectives

Nevinstown ST1 Local Area Plan (2002)

This Local Area Plan (LAP) has been published by Fingal County Council and makes provisions for a range of different land uses in the Nevinstown area. The lands adjoin the Airside Retail Park to the east of the alignment. The plan allows for mixed uses, hotels, medium technology and logistics and science and technology developments. Provisions are also made for a residential component and open space within this area. The area is currently being developed in accordance with a design brief. As detailed above, Metro North passes through the Nevinstown area and therefore the content of the LAP has been taken into account in all relevant chapters of the EIS.

Nevinstown – Residential Action Area Plan (2001)

This Area Action Plan (AAP) has been published by Fingal County Council and provides for residential and community development. The plan allows for forty dwellings per hectare or sixteen dwellings per acre giving an approximate total of 1,100 units. The AAP also provides for a primary school, urban parks and details urban design objectives that apply to the entire area. Metro North passes through the Nevinstown area and therefore the content of the LAP has been taken into account in all relevant chapters of the EIS.

Swords Local Area Plan (Pre-draft)

A Swords Local Area Plan is currently at a Pre-Consultation Draft Stage. The closing date for initial submissions from the public was the 11th of December 2007. A draft LAP is currently being prepared and will be made available for public comment in March/April 2008. The strategic vision of the plan aims to examine how Swords will cater for future growth as a 'major transport hub with an integrated public transport system, exploiting the opportunities of Metro North'. The plan also aims to promote 'high density and people intensive uses in the immediate vicinity of Metro North' while also considering sustainable development principles. Metro North passes through the Swords area and therefore the objectives and strategic vision of the LAP are taken into account in all relevant chapters of the EIS.

Dublin Airport Masterplan (2006)

The Dublin Airport Masterplan was published by Fingal County Council in March 2006 and adopted in June 2006. It outlines the optimal future development strategy for the designated airport area, whilst ensuring the efficient and effective operation of the airport. The masterplan is used as the principal development control tool for the area and specifies the long-term disposition and mix of uses within the designated area together with the infrastructural development necessary to support these uses.

There are seven overall landuse zonings within the masterplan, one of which is the Core Aviation Related Development Zone (which is sited around the current terminal and car parking areas). Under this zoning, it is proposed to promote a Ground Transportation Centre, including a public transport interchange, and that the proposed Metro will be integrated into this Ground Transportation Centre.

The masterplan notes that 'greatly enhanced public transport provision will be paramount to the success and sustainability of Dublin Airport' and lists the Metro (connecting the city centre and Swords via the airport) as one of the main public transport measures proposed as part of the Dublin Airport Masterplan. A Ground Transportation Centre is proposed on the Eastern Campus, directly adjacent to the main terminal buildings and short-term car parking facility. This centre will be designed to cater for a Metro stop as well as bus and coach handling.

The following public transport objectives are stated in the masterplan:

- 'to encourage and facilitate the provision of an integrated public transport network to serve Dublin Airport';
- 'to provide for the development of a transport interchange including a Metro Station at the centre of the airport campus, in accordance with the development of Metro North by 2012 under the Government's Transport 21 proposals';
- 'to ensure that the development of a Metro Station in the airport campus is undertaken to best international standards for public transport interchanges';
- 'to investigate and provide for connection/links from the western campus (new terminal area) to the recently approved Metro North'.

The proposed scheme supports the objectives of the Dublin Airport Masterplan.

Airport Local Area Plan (2006)

This LAP is a six year statutory planning document for the 1,084 hectares that are zoned DA (Designated Airport) in the current Fingal County Development Plan (2005). The LAP provides a strategy for the development of Dublin Airport whilst ensuring the efficient and effective operation of the airport. The plan states that 'it is the priority of the Council to facilitate the Metro North proposal'. There are a number of policies within the Dublin Airport LAP that relate to Metro North, including:

- Policy PT1 'to encourage and facilitate the provision of an integrated public transport network to serve Dublin Airport';
- Policy PT2 'to provide for the development of a transport interchange including a Metro Station at the centre of the airport campus, in accordance with the implementation of Metro North by 2012 under the Government's Transport 21 proposals';
- Policy PT3 'to ensure that the development of a Metro Station in the airport campus is undertaken to best international standards for public transport interchanges'.

Metro North is therefore recognised as having a role to play in supporting the redevelopment of this area.

Dublin Airport Public Safety Zone Study, (ERM on behalf of Department of Transport and the Department of Environment, Heritage and Local Government, 2005)

A Public Safety Zone study commissioned by the Department of Transport (DoT) and the Department of Environment, Heritage and Local Government (DoEHLG) in 2005 identifies areas where development should be considered to be restricted because of issues relating to public safety. These so-called 'public safety zones' are divided into two categories: inner and outer. The study includes recommendations for each category:

- Inner Public Safety Zones (PSZs) – 'prevent further development within inner PSZs, but allow existing developments to remain'.
- Outer Public Safety Zones – 'allow existing developments to remain within the outer PSZs, but prevent high density housing development and the building of schools, hospitals and facilities attracting large numbers of people'.

The proposed scheme passes underground through the public safety zones therefore, principles and recommendations of this policy document were considered when designing relevant sections and elements of the proposed scheme.

Masterplan for the new Ballymun, (Ballymun Regeneration Ltd. 1998 – 2004 - as amended)

The Ballymun Masterplan is a detailed urban design proposal for the future development of approximately 198 hectares (490 acres) of Dublin City suburban development lands. The development comprises regeneration of a primarily public housing area into a Prime Urban Centre (P.U.C.). This PUC comprises residential, commercial, retail, amenity, parks and industrial land use zonings. The masterplan supports the proposal for a Metro/Luas/Luas-type development to the airport and supports the expansion of public transport in general. The Masterplan also supports the development of 'heavy rail'. On Page 21 of the plan, it is stated that 'any proposed routing of a line at grade across the study area lands would be vigorously opposed'. The study area lands are mapped out in the Masterplan maps. Metro North is underground through Ballymun and therefore is not at-grade in any area. The Masterplan is currently being implemented and much of the Ballymun area is under construction.

North Ballymun Local Area Plan (2005)

The North Ballymun LAP represents a modification of the existing North Ballymun Area Action Plan (2000). The Local Area Plan (LAP) was adopted in December 2005. The North Ballymun lands comprise an 'L-shaped' area of approximately forty hectares of land. This land is bounded by Ballymun Road to the east and the M50 (between the Ballymun Roundabout and Sillogue Lane) to the north. The Ballymun LAP represents a modification of the existing North Ballymun Area Action Plan (2000).

The overall development strategy for the LAP is 'to contribute to the social, economic and environmental regeneration of Ballymun by setting the framework for a sustainable and dynamic mixed use, employment-generating area in a high quality and attractive urban environment'.

A number of policies in the LAP cover transportation. The introduction to the transportation section of the LAP notes that 'the proposed Metro line from the city centre to Swords via the airport and the proposed station on the eastern edge of the site is very important to the future development of the LAP area'. Policy T02 seeks 'to accommodate a Metro Station/Public Transportation hub at the eastern edge of the site'. The sub-text to the policy notes that 'the location of the proposed Metro station affords the opportunity of providing an integrated public transportation hub, involving Metro, bus services and cycling facilities. It is noted in the LAP that the integrated public transportation hub will be developed 'in consultation with the RPA and other appropriate agencies as part of the planning process for Metro North in accordance with Transport 21'. The plan also states that:

- Cycle and pedestrian routes will be provided through the LAP area along desired lines;
- Development phasing will be controlled to ensure that no unacceptable traffic impacts occur.

Metro North passes through the Ballymun area and therefore the specific objectives detailed in the LAP are taken into account in all chapters of the EIS.

Balcurris/Balbutcher Action Area Plan (2000)

This area action plan relates to the land zoned as ST1 (Science and Technology) to the west of the alignment. The area is largely undeveloped and is currently publicly-owned. The bulk of the area adjoining the proposed scheme is amenity and/or unmanaged grassland and disturbed ground to the west.

Richmond Road Area Action Plan (2007)

Richmond Road is currently undergoing significant redevelopment. The Area Action Plan, published by Dublin City Council in April 2007 provides a framework for the future development of the area. The relevant objectives of this AAP have been taken into account in this EIS.

Phibsborough/Mountjoy Local Area Plan (Pre-draft)

Phibsborough/Mountjoy Draft Local Area Plan (LAP) was published by Dublin City Council for public consultation in March 2008. The proposed scheme passes through the area and therefore the specific objectives detailed in the LAP have been taken into account, in all relevant chapters of the EIS.

The proposed scheme is noted as an important piece of infrastructure for the future planning and development of this part of north Dublin.

**Framework Plan for Parnell Square
(Howley Harrington Architects in collaboration
with Dublin City Council and Alan Sherwood
(The Tourism Co.), 2005)**

This Framework Plan for Parnell Square proposes an overall masterplan for the creation of a 'cultural quarter and improving the social and economic balance of the area'. The plan includes redevelopment or design of various commercial, cultural and civic uses in the area such as: the Garden of Remembrance, the Abbey Presbyterian Church, the Ambassador Theatre, Rotunda Hospital and areas within and around Parnell Square. The plan is outlined as a phased project with preliminary costs identified to implement the proposals. A Metro North stop is to be located in the area of Parnell Square so the objectives and plans of this framework plan were considered when designing the stop at this location.

4.3 TOPIC SPECIFIC POLICIES

All of the policies described in Section 4.2 relate to the Metro North scheme in a general way and were considered by all members of the environmental team while carrying out the EIA. In addition to the above, a number of environmental specialists had to consider detailed, topic-specific policies contained in a subset of policy documents. These topic-specific policies are set out in this section and have been adhered to in the design and relevant chapters of the EIS.

4.3.1 Socio-economics

Metro North has the potential to have socio-economic impacts. The proposed scheme will provide improved accessibility by public transport to areas where it will support industry, enterprise and economic development. The proposed scheme also has the potential to help enhance connectivity between people, communities, resources and services and therefore can help tackle social exclusion in the areas through which it passes. The proposed alignment passes through a number of areas that have specific policies relating to the above socio-economic issues. These policies have been adhered to in the design of the proposed scheme and are contained in the relevant chapters of the EIS and are summarised in this section.

Dublin City Council Development Plan 2005 – 2011

- Policy E2: 'It is the policy of Dublin City Council in conjunction with the Dublin City Development Board to pursue a vision of the city where enterprise is encouraged, valued and fostered, where sustainable indigenous industries are nurtured and the benefits of economic success are shared'.
- Policy E3: 'It is the policy of Dublin City Council to promote economic development without compromising high environmental standards or the principles of sustainable development thereby creating an environment in the Dublin City Council area, which is conducive to investment and employment creation'.

Swords Stop



Fingal County Council

Development Plan 2005 – 2011

- Policy US5: 'to create communities and ensure a combination of attractive social and cultural facilities for both people and business.'
- Policy US6: 'to reduce the demand for travel and consequently support centres well served by local transport services across their catchment areas.'
- Policy SIP1: 'to tackle social exclusion, inequality, disadvantage and poverty in rural and urban communities throughout the County by promoting equality, involving the full integration into society of women, elderly, people with disabilities, the Travelling Community and ethnic minority groups.'
- Policy SIP3: 'to provide more effective responses to the needs of those in our community who are socially excluded or who are experiencing barriers to their full participations in society.'
- Policy SIP5: 'to ensure delivery of positive and inclusive outcomes to neighbourhoods and communities at risk of disadvantage.'

County Development Boards – County Strategies

- Dublin City and Fingal Development Boards have prepared individual County Strategies for economic, social and cultural development. These strategies set policies with respect to the provision of public services and permitting of development activities; in effect bringing more coherence to the planning and delivery of services at local level. There is an emphasis on counteracting social exclusion as well as on economic and cultural development.
- Dublin City Development Board's economic, social and cultural strategy for the city is entitled 'Dublin – A City of Possibilities, 2002-2012'. This strategy was reviewed in 2006 and updated strategic priorities were defined for 2006 -2008. The strategies relate to the following topics: Social Inclusion; Enterprise and Economy; Family and Children; Neighbourhoods; Building Communities; Migrant New Communities; and Active Citizenship.
- Fingal Development Board's 'Strategy for Economic, Social and Cultural Development of Fingal, 2002-2011', was published in May 2002. This strategy was reviewed in 2006 leading to a focus on 16 specific actions for the period 2006 – 2008. These actions relate to a range of topics including transport, enterprise development, education, health and public safety, social integration and inclusiveness.
- Both strategy documents stress the importance of social and economic integration. Social Inclusion Monitoring Committees (SIMCs) have been established for both Development Boards.

4.3.2 Noise

The proposed alignment passes through areas that have specific policies relating to noise. These policies are summarised in this section.

Fingal Development Plan 2005 – 2011, Airport Area

- The Fingal Development Plan 2005 – 2011 defines an 'Inner' and 'Outer' noise zone around the airport. The inner noise zone has been defined as that area within the 63dB $L_{Aeq-16hr}$ contour i.e. those areas where the average noise level is greater than or equal to 63dBA, and the outer noise zone is that area between the 63dB $L_{Aeq-16hr}$ contour and the 57dB $L_{Aeq-16hr}$ contour. These contours act as a guide for future development within the area and are based upon predicted growth levels and expansion of Dublin Airport. Fingal has an established policy in relation to development in the area:
 - Policy DAP11: 'to strictly control inappropriate development and to require noise insulation where appropriate within the Outer Noise Zone, and to resist new provision for residential development and other noise sensitive uses within the Inner Noise Zone.'
 - Strategy DAS3: 'to promote appropriate landuse patterns in the vicinity of the Airport and of the flight paths serving the Airport, having regard to the existing and anticipated noise, safety and environmental impacts of aircraft movements.'

Dublin City Development Plan 2005 – 2011

- Policy 15.38.0: 'Where it is considered that a proposed development is likely to create disturbance due to noise, a condition may be imposed by the planning authority on any planning permission limiting the hours of operation and level of noise generation.'

These policies have been considered in the design of the proposed scheme and are reflected in the relevant Noise chapters of this EIS.

4.3.3 Flora and fauna

Metro North passes through or near a number of ecologically sensitive areas, natural heritage areas and areas of high or sensitive biodiversity. Relevant administrative bodies have defined policies that aim to protect the ecological environment and control development in these areas. These policies are summarised in this section.

Fingal County Development Plan 2005-2011

Part VIII of the Fingal County Development Plan sets out Fingal County Council's policies and objectives for the development and conservation of the County's Natural Heritage. Fingal County Heritage Plan draws up actions in relation to the natural heritage of Fingal. The following objectives have been identified for the study area and are based on the Fingal Development Plan 2005-2011 and Fingal Heritage Plan 2005-2010:

- Policy HP24: 'to protect, conserve and enhance the County's natural heritage including its biodiversity, landscapes and geological heritage';
- Policy HP27: 'to protect natural heritage sites designated in European legislation, or in other relevant International Conventions, Agreements and Processes. This includes sites proposed to be designated or designated as: Ramsar Sites, Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Natural Heritage Areas (NHAs), Nature Reserves, and Refuges for Flora and Fauna';
- Policy HP28: 'to assess all proposed developments which are likely to impact on designated natural heritage sites or those sites proposed to be designated';
- Policy HP32: 'to ensure that development does not have a significant adverse impact, that cannot be satisfactorily mitigated against, on plant, animal or bird species protected by law';
- Policy HP43: 'to ensure that proposals for development include measures to protect and enhance biodiversity, wherever possible, by minimising adverse impacts on existing habitats and by including mitigation and/or compensation measures, as appropriate, which ensure that biodiversity and landscape character is enhanced';
- Policy HP44: 'to protect and enhance wildlife habitats in the County's greenbelts';
- Policy HP45: 'to protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value';
- Policy HP46: 'to seek, where appropriate and feasible, the extension of existing woodlands and/or creation of new woodlands based on a planned planting and management scheme. The use of native species will be favoured to the maximum possible extent';

- Policy HP49: 'to protect rivers, streams and other watercourses and, wherever possible, to maintain them in an open state capable of providing suitable habitat for fauna and flora';
- Policy HP50: 'to protect and enhance the natural heritage and landscape character of river and stream corridors and valleys and ensure they remain free from inappropriate development';
- Policy HP53: 'to ensure that the County's floodplains and wetlands are retained for their biodiversity and flood protection values';
- Policy HP55: 'to ensure that good ecological and chemical status of rivers is achieved in all water courses'.

In addition, the Fingal County Development Plan commits the Council to prepare and implement a County Heritage Plan and a Local Biodiversity Action Plan.

Dublin City Development Plan 2005-2011

Ecological objectives identified in Chapter 10 of the Dublin City Development Plan 2005-2011 comprise the following policies and objectives:

- Policy H41: 'to seek the conservation and management of areas of natural environmental value';
- Policy H42: 'to protect flora, fauna and habitats which have been identified by the Habitats Directive, Birds Directive, Wildlife Act and Flora Protection Order';
- Policy H43: 'to maintain the conservation value of all Natural Heritage Areas, Special Areas of Conservation, Special Protection Areas identified and designated by the Department of the Environment, Heritage and Local Government';
- Policy H46: 'to protect the unique natural amenities of all rivers within and forming boundaries to the administrative area of Dublin City Council';
- Policy H26: 'to enhance the amenities of the river valleys of the Santry and Mayne rivers'.

Dublin City Heritage Plan 2002-2006

The overall aim for Dublin City outlined within the City's Heritage Plan 2002-2006 is the conservation, advance and protection of the living environment of Dublin City. The Natural Environment Working Group Position Paper identifies the following objectives, targets and actions related to the natural environment:

- Target 4b: 'Increase of wildlife areas within parks';
- Target 4c: 'Connect parks through corridors';
- 'Investigate potential for habitat creation in greenfield and brownfield sites';
- 'Highlight the potential of front & back gardens as wildlife corridors'.

Fingal Heritage Plan 2005-2010

The Fingal Heritage Plan identifies actions related to the conservation and management of the County's natural resources. It supports the protection, conservation and enhancement of Fingal's ecological network. This network is defined as '...a network of sites consisting of core areas of high biodiversity value and ecological corridors such as hedgerows and watercourses or stepping stones such as small wetlands which are linkages between them, and which support the movement of species and sustain the ecological processes and functions necessary to maintain biodiversity'. Further key initiatives comprise the protection of significant mature trees including champion trees and significant woodlands in Fingal.

Dublin City Biodiversity Action Plan 2007-2010

The following actions relating to species, habitats and designated areas have been defined in order to protect and enhance biological diversity in Dublin City:

- Bats: Carry out bat surveys of vulnerable areas and those identified for development, maintain population and present range of all bat species;
- Otter: Incorporate in risk assessment of proposed riverbank works, propose habitat enhancement possibilities along waterways including the Dodder and Tolka Rivers as part of proposed developments;
- Badger: No specific projects planned to date;
- Atlantic salmon: incorporate fish passes and reduce barriers to fish, open culverts;
- Common frog: Encourage wetland and waterbody creation;
- Priority plant species as listed on Appendix 4 of the Dublin City Biodiversity Action Plan. Protect vulnerable populations and link with National Plant Conservation Strategy;
- Trees: Protect vulnerable trees;
- Waders and wildfowl: Identify key roosts and feeding sites outside designated sites;
- Urban birds: Encourage retaining and planting of shrubs and wild areas for song birds, provide demonstration areas and interpretation in parks for wild areas to provide cover and feeding for birds.

These policies have been considered in the design of the proposed scheme and are reflected in the relevant Flora and Flora chapters of this EIS.

4.3.4 Surface water and groundwater

The proposed scheme passes over, under and near a number of surface water bodies. Tunnelled sections of the alignment penetrate the ground and therefore have the potential to have an influence on groundwater resources. Relevant administrative bodies and Government bodies have defined policies that aim to protect the aquatic environment and aquatic resources by controlling development in their area. These policies are summarised in this section and have been adhered to in the design of the proposed scheme. The policies are reflected in the relevant Surface Water and Groundwater chapters of this EIS.

Dublin City Council Development Plan 2006 to 2011

Water resources will be protected and managed in a sustainable manner in accordance with the following policies:

- Policy RO8: 'to protect, maintain, improve and enhance the natural and organic character of the watercourses in the city, and to promote access, walkways and other recreational uses of their associated public open space, subject to a defined strategy of nature conservation and flood protection';
- Policy RO9: 'to seek the continued improvement of water quality, bathing facilities and other recreational opportunities in the coastal, estuarine and surface waters in the city';
- Policy U14: 'to implement the recommendations, as appropriate, of the Greater Dublin Strategic Drainage Study and the Dublin Coastal Flooding Protection Project, subject to funding being available';
- Policy U15: 'to introduce Flood Risk Management in all areas which have either been flooded in recent years or which are assessed as being at risk of flooding';
- Policy U20: 'to put in place adequate measures to facilitate the proper control of surface waters arising from developments both within the city and in the neighbouring local authorities which impact on the city and to implement a Storm Water Management Policy in order to ensure that ongoing development does not increase the risk of flooding';
- Policy U30: 'to control development in the natural flood plain of a river and to develop guidelines, in co-operation with the adjoining local authorities, for permitted development in the different flood risk category areas';
- Policy U31: 'to require all significant developments impacting on flood risk areas to provide a Flood Impact Assessment, to identify potential loss of flood plain storage and how it would be offset in order to minimize impact on the river flood regime'.

Fingal County Council Development Plan 2005-2011:

Water resources will be protected and managed in a sustainable manner in accordance with the following policies:

- Policy HP13: 'to protect the original structures of the Royal Canal in association with Waterways Ireland and to ensure that development along its banks does not have a detrimental affect on the character of the canal';
- Policy HP49: 'to protect rivers, streams and other watercourses and, wherever possible, to maintain them in an open state capable of providing suitable habitat for fauna and flora';
- Policy HP50: 'to protect and enhance the natural heritage and landscape character of river and stream corridors and valleys to maintain them free from inappropriate development, and to provide for public access where feasible and appropriate';
- Policy HP52: 'to ensure that, wherever possible, local rivers, streams and watercourses provide amenity and recreational benefits for the local community';
- Policy HP53: 'to ensure that the County's floodplains and wetlands are retained for their biodiversity and flood protection values';
- Policy HP54: 'to ensure that where flood alleviation works take place the natural heritage and landscape character of rivers, streams and watercourses are protected and enhanced to the greatest extent possible';
- Policy HP56: 'to develop flood impact assessments for the minor rivers of Fingal County Council Development Plan including the Matt (Balbriggan), Ward (Swords), Sluice (Kinsealy & Baldoyle) and Mayne (Baldoyle) and for the Donabate Peninsula';
- Policy HP57: 'to help ensure that proposed developments do not adversely affect groundwater resources';
- Policy UTP3: 'to ensure 'good status' of groundwater';
- Policy UTP8: 'to ensure that, in all new developments, separate foul and surface water drainage systems are provided and, where feasible in redevelopment schemes, existing combined drainage systems are separated';
- Objective WD036: 'to require that, prior to the commencement of all major developments details of a Sediment and Water Pollution Control Plan be submitted for the agreement of the Water Services Department';

Dublin Airport Local Action Area Plan (LAAP):

The Dublin Airport LAAP states that any further development located within or next to the catchments of the Sluice River, the Ward River; the Mayne River and the Santry River will have regard to the Greater Dublin Strategic Drainage Study (GDSDS) and will require attenuation to Greenfield standards and the implementation of Sustainable Urban Drainage Systems (SUDS).

Water resources will be managed in the area under the following policies:

- SW4: 'to develop and implement a stormwater management system following the principle of Sustainable Urban Drainage and in compliance with the recommendations of the Greater Dublin Strategic Drainage Study in respect of new development and re-development of 'brownfield' sites, to inter alia attenuate runoff to pre-development green field rates';
- SW8: 'to secure the implementation of pollution control measures in respect of oil and fuel storage and handling';
- SW9: 'to secure the implementation of a long term surface water quality monitoring system as part of an environmental management system';
- SW10: 'to secure the implementation of a pollution contingency plan as part of an environmental management system';
- SW11: 'to require, prior to the commencement of all development, that a Sediment and Water Pollution Control Plan be submitted, in compliance with Objective WD036 of the Fingal Development Plan 2005-2011'.

Objectives of the LAP relating to groundwater resources are as follows:

- 'to quantify potentially significant impacts relating to the aquifers and the identification and implementation of mitigation measures for existing and proposed development';
- 'to secure the implementation of long -term groundwater quality monitoring as part of an environmental management system for both construction and operational phases of development'.

North Ballymun LAP

The LAP states that surface water drainage methods will take account of quality, quantity and amenity issues Sustainable urban drainage systems (SUDS) will: protect/enhance water quality; be sympathetic to the environmental setting and the needs of the local community; provide a habitat for wildlife in the area; and encourage natural groundwater recharge (where appropriate).

The following objectives are defined for surface water:

- SU01: 'to approve the development of a drainage plan for the area by providing surface water drainage systems utilising sustainable drainage techniques in accordance with International Best Practice';
- SU03: 'to approve the development of a drainage plan for the area by developing a stormwater management system by restricting the maximum permitted surface water outflow from any new development to that for Greenfield/brownfield site, before the proposed development takes place';
- SU04: 'to approve the development of a drainage plan for the area by developing a stormwater management system by promoting treatment of diffuse pollution in surface runoff within sites and to ensure the risk of pollution to watercourses is no worse than at present'.

The North Ballymun LAP encourages natural groundwater recharge to aquifers where appropriate.

Regional Planning Guidelines for the Greater Dublin Area 2004-2016

These guidelines contain the general objective to improve current surface water quality and maintain current groundwater quality.

Sustainable Development. - A Strategy for Ireland

The objectives of this strategy for Irish water resources in general are to:

- protect and improve their quality;
- reverse and minimise slight and moderate pollution;
- quantify and establish the current quality status of groundwater resources;
- ensure that groundwaters may be used, as required, as sources of drinking water supplies and for other beneficial uses;
- manage groundwater resources effectively, allowing beneficial development and use compatible with preservation of good quality;
- The achievement and maintenance of full compliance with statutory water quality objectives and standards for groundwater by public authorities, particularly through legal enforcement.

Greater Dublin Strategic Drainage Study (2005)

The Greater Dublin Strategic Drainage Study (GDSDS) aims to improve drainage infrastructure to allow future development while protecting the water quality of rivers and Dublin Bay. This document highlights the importance of considering flood risk when designing developments and putting measures in place to ensure that any water quality problems issues can be addressed.

Groundwater Protection Scheme Guidelines (DoEHLG, EPA & GSI, 1999)

These guidelines broadly state that all groundwater resources are important and should be protected. According to the guidelines, adverse impacts on regionally or locally important aquifers, in particular, need to be avoided because of their potential use as a water supply.

4.3.5 Landscape and visual

The proposed alignment passes through a number of high value landscape areas. Relevant administrative bodies have defined policies that aim to protect the natural and built landscape by controlling development. These policies are summarised in this section and are adhered to in the design of the proposed scheme. The policies are reflected in the relevant Landscape and Visual chapters of this EIS.

Fingal County Development Plan 2005-2011

Statutory designations mentioned in the plan comprise: high amenity areas; sensitive landscapes; protected views; and trees, woodlands and hedgerows designated for protection. Policies relating to features of archaeological, architectural or cultural importance are considered in the Landscape and Visual chapter of this EIS (Volume 1, Chapter 21) if the features strongly influence the character of the landscape around them or if their existing landscape setting is important. The plan contains a number of objectives that relate to different types of landscape:

Lands are designated as Public Open Spaces (OS) in order 'to preserve and provide for open space and recreational amenities'. Specific policies relating to this zoning comprise:

- Policy OSP1: 'to encourage a higher standard and more sustainable use of residential zoned land through the provision of higher quality public and communal open spaces'.
- Policy OSP3: to provide (where practicable) for the location of Class 1 public open space within the area zoned GB. These areas should be located within an acceptable distance of the area that it serves, in particular where it forms part of a larger proposed park which would facilitate the development'.

Lands are designed as Greenbelts (GB) in order 'to protect and provide for a greenbelt to demarcate the urban and rural area and provide for agriculture and amenity in a manner that protects the physical and visual amenity of the area'. Specific policies relating to this zoning comprise:

- Objective GB01: 'to ensure that the open character of greenbelt lands is maintained and to prevent development which contravenes the role of the greenbelt'.

Lands are zoned as High Amenity Areas (HA) in order 'to protect and improve High Amenity Areas'. Specific policies relating to this zoning comprise:

- Policy HP1: 'to protect archaeological sites, monuments (including their setting) that are of relevance to the landscape and objects within the jurisdiction of Fingal County Council, including those that visual assessment are listed in the Record of Monuments and Places or newly discovered sub – surface archaeological remains';
- Policy HP35: 'to protect High Amenity Areas from inappropriate development and to reinforce their character, distinctiveness and sense of place'.
- Policy HP 36: 'to protect sensitive landscapes identified on the development plan maps from inappropriate development and to reinforce their character, distinctiveness and sense of place'.
- Policy HP 38: 'to protect from inappropriate development the views identified on the Landscape Character Map and the prospects listed'.
- Policy HP45: 'to protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character, and to ensure that proper provision is made for their protection and management, when undertaking, approving or authorising development'.
- Policy HP50: 'to protect and enhance the natural heritage and landscape character of river and stream corridors and valleys to maintain them free from inappropriate development, and to provide for public access where feasible and appropriate'.
- Policy HP57: relates specifically to the Royal Canal in terms of the protection and enhancement of the built and natural heritage associated with it.

Lands are zoned for Residential Development (RD) in order 'to provide for residential development and to protect and improve residential amenity'. The purpose of the zoning is to ensure that any new development in existing areas has minimal impact on existing residential amenity.

Lands are zoned for Rural Areas (RU) in order 'to protect and provide for the development of agriculture and rural amenity'. This zoning objective seeks to protect agricultural areas by ensuring that new development is functionally related to agriculture and that developments fit into the landscape sensitively'.

County Landscape Character Assessment – Policies for Development

A county landscape character assessment has been developed for the County of Fingal and is included in the current development plan. The county is subdivided into discrete landscape character areas each of which is described in terms of physical characteristics. Policies for development are outlined for each character area and these are identified below for four areas relevant to the baseline study:

- 'Estuary: Trees on the north side of Swords/ Malahide Estuary should be retained and managed. Estuary margins and any hedgerows along the margins must not be disturbed. The horizon is a strong feature which should be protected. Sensitive estuary habitats must be protected in compliance with the 1997 Habitats Regulations. Development at the Burrow should be confined to single storey. House sites throughout the Burrow should be 0.5 acres minimum in area, have an independent road frontage of 20 metres minimum and should be capable of being drained satisfactorily'.
- 'Rolling Hills: The skyline within this rolling landform should be protected. Existing tree belts should be retained and managed and older stands of trees restocked. Roadside hedging should be retained and managed. Proposals necessitating the removal of extensive field and roadside hedgerows will not be permitted. The river corridors should be protected and improved by leaving a minimum 10 metre wide margin undeveloped and encouraging planting where appropriate, to enhance the landscape and habitat value of these corridors'.
- 'Low Lying Areas: Sites with natural boundaries should be chosen, rather than open parts of larger fields. New development should be located close to existing trees and field hedgerows. Houses should be located further back from roads in order to reduce the scale of development as seen from the road and so minimise visual impact. Sites necessitating the removal of excessive hedgerows or trees are not suitable. Strong planting schemes using native species, to integrate development into these open landscapes, will be required. Clustering with existing farmhouse and/or farm buildings is generally preferable to stand-alone locations'.
- 'Airport and Swords':
No further information specified.

Dublin City Development Plan 2005-2011

Designated areas include Landscape Conservation Areas; trees, woodlands and hedgerows to be protected and Protected Views. Policies relating to features of archaeological, architectural or cultural importance are considered in the Landscape and Visual chapter of this EIS (Volume 1, Chapter 21) if the features strongly influence the character of the landscape around them or if their existing landscape setting is important.



Parnell Square Stop
(platform level)

Policies in regard to public open spaces comprise;

- Policy R01: 'It is the policy of Dublin City Council to continue to manage and protect public open spaces to meet the social, recreational, conservational and ecological needs of the city, and to consider the development of appropriate complimentary facilities, which do not detract from the amenities of spaces'.
- Policy R06: street and roadside trees will be managed 'in an environmentally sensitive and arboriculturally appropriate manner'. In addition to the provision to make tree preservation orders, this policy asks for appropriate replacement planting to take place where the removal of street or roadside trees is necessary.

Policies that relate to high amenity areas and that are of relevance to the landscape and visual assessment are listed as follows:

- Policy H17: 'It is the policy of Dublin City Council to preserve and protect the special interest and character of Architectural Conservation Areas'.
- 'Policy H45: 'It is policy of Dublin City Council to protect the special character of Landscape Conservation Areas'.
- Policy H2: 'It is the policy of Dublin City Council to protect the curtilage of protected structures or proposed protected structures from any works which would cause loss of or damage to the special character of the protected structure and loss of or damage to, any structures of heritage value within the curtilage of the protected structure'.
- Policy H46: 'It is the policy of Dublin City Council to protect the unique natural amenities of all rivers within and forming boundaries to the administrative area of Dublin City Council'.

Specific relevant zoning objectives mapped in the City Development Plan maps comprise:

- Z9: 'to preserve, provide and improve recreational amenity and open space'.
- Z1: 'to protect, provide and improve residential amenities'.
- Z2: 'to protect and or improve the amenities of residential conservation areas'.
- Z5: 'to consolidate and facilitate the development of the central area, and to identify, reinforce and strengthen and protect its civic design character and dignity'.
- Z8: 'to protect the existing architectural and civic design character, to allow only for limited expansion consistent with the conservation objective. To allow primarily residential and compatible office and institutional uses'.
- Z11: 'to protect and improve canal, coastal and river amenities'.
- Z12: 'to ensure that existing environmental amenities are protected in any future use of lands'.

4.3.6 Agronomy

The proposed alignment passes through agricultural areas. Relevant administrative bodies have defined policies that recognise the importance of agronomy and aim to protect agricultural areas by controlling development in this regard. These policies are summarised in this section and are adhered to in the design of the proposed scheme. The policies are reflected in the relevant Agronomy chapters of this EIS.

Fingal County Development Plan 2005 – 2011

Section 5.4 of Fingal County Development Plan states that there is a strong and vibrant agricultural and horticultural sector within the rural area of Fingal which provides significant direct and indirect employment. The horticultural sector in particular is recognised to be a cornerstone of the national production with its strong links to the Dublin markets. The plan also recognises the amenity value of agricultural and horticultural lands and states that the Council will seek to provide opportunities for allotments within greenbelts surrounding built up areas.

The specific objectives of the Council are:

- Policy RE01: 'to support the maximum number of viable farms in Fingal';
- Policy RE07: 'to look favourably on developments functionally related to farming and to resist the location of non agricultural developments in proximity to agricultural and horticultural enterprises where such developments may have a negative effect on the existing enterprises';
- Policy RAP5: 'to actively protect and ensure the continuing viability of agriculture and horticulture within rural areas and sustain the rural character of the countryside as a valuable resource'.

4.3.7 Air and climatic factors

The proposed alignment passes through a number of administrative areas where policies relating to air pollution are defined. These policies are summarised in this section and are adhered to in the design of the proposed scheme. The policies are reflected in the relevant Air and Climatic Factors chapters of this EIS.

Fingal Development Plan 2005 – 2011

The following policies are relevant to the topic of air and climatic factors:

- Policy DAP13: 'to ensure that every development proposal in the environs of the airport take account of current and predicted changes in air quality and local environmental conditions';
- Policy UTP60: 'to implement the provisions of national policy and air pollution legislation, in conjunction with other agencies as appropriate';
- Part XI Strategic Assessment, stated objective of the plan: 'Improvement of air quality, minimise greenhouse gas emissions'.

Dublin City Development Plan 2005 – 2011

The following policies are relevant to the topic of air and climatic factors:

- Appendix 23: SEA of the Development Plan: The SEA assessed the plan with reference to a number of criteria including the following objectives:
 - C1 - maintain/promote the improvement of air quality;
 - C2 - promote the minimisation of greenhouse gas emissions to the atmosphere;
 - C3 - reduce trip generation, trip length and the need for motorised transport;
 - C4 - promote public transport and the attraction of cycling/walking.

Ballymun Masterplan 1998 – 2004 & North Ballymun Local Area Plan (2005)

- Objective ENV 02: 'That developments proposed along the M50 and adjacent to the Ballymun M50 interchange, demonstrate how they will implement adequate mitigation measures to protect occupiers and visitors from the negative effects of noise and air emissions related to road and air traffic'.

Dublin Regional Air Quality Management Plan 2002

- Defines limit values for pollutants in-line with applicable legislation;
- It is the stated policy of the Local Authorities to encourage a modal change from private car use towards other types of travel and to promote the use of public transport.

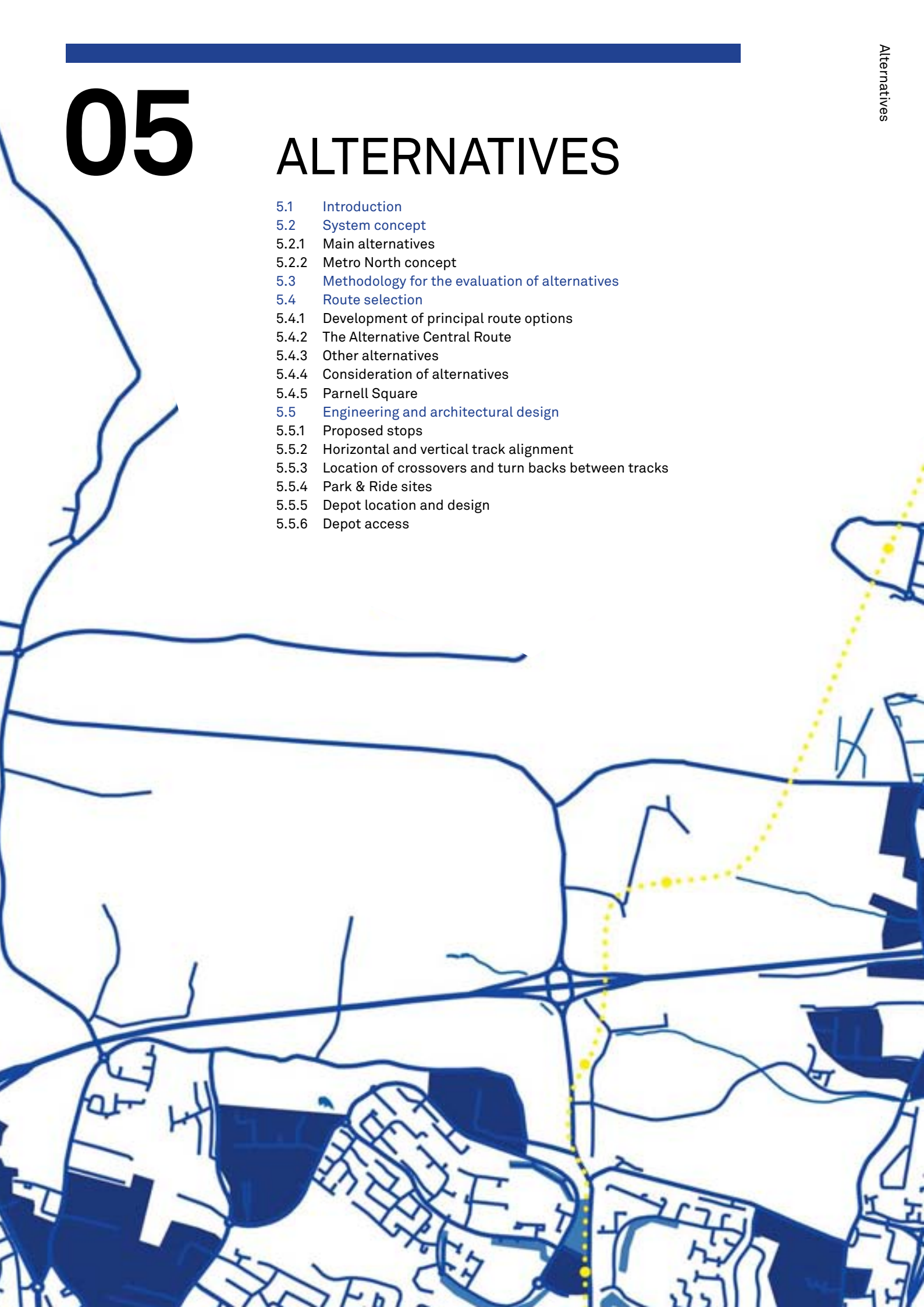
4.4 CONCLUSION

Taking into account the policies identified in this chapter and the findings of the impact assessment, the proposed scheme conforms to the objectives of local, regional and national planning policy and to the objectives of social and environmental policy documents pertaining to the area. The proposed scheme will allow for greater sustainable development and social inclusion through the provision of a safe and integrated transport system.

05

ALTERNATIVES

- 5.1 Introduction
- 5.2 System concept
 - 5.2.1 Main alternatives
 - 5.2.2 Metro North concept
- 5.3 Methodology for the evaluation of alternatives
- 5.4 Route selection
 - 5.4.1 Development of principal route options
 - 5.4.2 The Alternative Central Route
 - 5.4.3 Other alternatives
 - 5.4.4 Consideration of alternatives
 - 5.4.5 Parnell Square
- 5.5 Engineering and architectural design
 - 5.5.1 Proposed stops
 - 5.5.2 Horizontal and vertical track alignment
 - 5.5.3 Location of crossovers and turn backs between tracks
 - 5.5.4 Park & Ride sites
 - 5.5.5 Depot location and design
 - 5.5.6 Depot access





Section 39(1) (d) of the 2001 Act, requires that an EIS contains an outline of the main alternatives studied by the applicant and an indication of the main reasons for its chosen option, taking into account the environmental effects. This chapter outlines the main alternatives considered and the reasons for choosing the metro concept.

5.1 INTRODUCTION

This chapter describes the methodology used for evaluating the principal alternatives identified during the route selection and subsequently during engineering and architectural design; and then outlines the principal alternatives studied during those phases and the main reasons for the chosen options.

During the development of the Metro North scheme prior to the announcement of Transport 21 a number of fundamentally different system concepts were examined and rejected in favour of the metro concept, which is explained in this chapter. The principal alternatives which have been studied and the reasons for rejecting them in each case are as follows:

a) Iarnród Éireann Link

Prior to the approval of Transport 21, the Department of Transport considered the alternative of a link to the airport from the Iarnród Éireann network. This was not approved as it failed to achieve the Government's objectives for the Metro North project. In particular the Iarnród Éireann Link would not serve as a commuter system for north Dublin city and county and would only serve people wishing to make direct connections between the city centre and the airport.

The link would necessarily have to use either the existing northern suburban rail line or the Maynooth suburban rail line to access the city centre. This would negatively impact on the existing capacity of whichever line is used.

5.2 SYSTEM CONCEPT

5.2.1 Main alternatives

The proposed scheme has been planned as a metro similar to the metro networks found in many European cities of similar size to Dublin. It is fully segregated along the busiest sections of the route between the city centre and Swords and has a limited number of road crossings in the outer suburban areas north of Swords.

An underground railway line to the city centre built to Iarnród Éireann track gauge and structure gauge would avoid the need to use existing lines and could serve communities along the route. Such a line would incur significantly higher infrastructure costs due to the increased clearance envelope, higher structural loading and design standards required. It would be extremely difficult to apply to the proposed tightly curved route through the city centre and would be impossible to ever integrate with Luas. It would be difficult to adapt to serve the closely spaced city centre stops, which are proposed for Metro North.

b) Pre-Metro

As part of its submission to Government setting out the case for Metro North, RPA studied the alternative of building a Pre-Metro system. A Pre-Metro would be more similar in concept to the existing Luas with a high degree of unsegregated street running. Importantly, it would be capable of future segregation through alterations to the infrastructure.

While the Pre-Metro concept has significant advantages in terms of initial capital cost, the overall investment to bring it up to metro standard in the future is likely to exceed the capital cost of building to metro standard from the outset. The future upgrade would be very disruptive, involving for example the replacement of street running sections with elevated tracks, and is likely to require long term interruptions to the metro service while it is implemented. For these reasons, the Pre-Metro alternative was rejected.

c) Fully Automated Metro

A fully automated railway like the French VAL, Paris Meteor, Canadian Skytrain or the Copenhagen Metro would enable trains to be operated without a driver. Such systems require very high levels of security and intruder detection and are only generally used for highly concentrated routes, which can justify the higher capital costs involved. Although the scheme could be upgraded to be a fully automated railway at a significant cost, this would be a major constraint to the development of Metro West and to any future extensions of Metro North. This approach would not be compatible with Luas integration and the future extension of Metro North to link with the Luas Green Line. In addition, the technology involved can only be procured from two or three sources internationally and once selected would have to be applied to all future extensions. Competition at that stage would be very limited. For these reasons, a fully automated metro concept was rejected.

d) Maglev

During the feasibility study for the Metro North scheme, RPA were invited to consider a magnetically levitated guided system (Maglev) by a manufacturer of these systems. Since it was first introduced into commercial service at Birmingham Airport about 20 years ago this technology has been developed in Germany and Japan primarily for very high-speed long distance travel. Maglev would be very expensive to implement, has a slow and complex track switching mechanism, would represent a significant technical risk and would not meet the need for relatively short distance travel within the airport corridor or the requirement for further extensions. A Maglev system would be impossible to ever integrate with Luas. For these reasons, a Maglev concept was rejected.

5.2.2 Metro North concept

The proposed scheme is a high performance state of the art metro system designed to combine good accessibility and competitive journey times with high levels of productivity and relatively low unit operation costs. This will be achieved by good design, careful specification and the use of modern equipment and systems.

Metros are high capacity urban transport rail-based systems. Historically, these systems are completely segregated from road traffic running in tunnels, on viaducts or in fully fenced corridors at ground level and passengers accessing the system are not allowed to cross any of the tracks. These systems are operated using a railway type signalling system to control movement by either giving indications to the driver when it is safe to proceed or by directly controlling the vehicle.

Light rail systems were developed to achieve the benefits of a metro system at much lower costs. These involve line of sight driving but on special tram lanes in a manner similar to bus lanes with priority at traffic lights. The principle of a line of sight system is that the speed of movement is controlled by the driver such that one can stop within the distance that one can see is safe. This is the manner that a car drives on a public road. Such systems often have some of the characteristics of a metro in that they operate in tunnels or viaducts for part of their length.

There is no exact definition of when a system is a metro or a light railway. Increasingly, modern metro systems are incorporating key elements of light rail systems. Examples of this are the Midland Metro in Birmingham, the Manchester Metrolink and Oporto Metro which all have street running sections.

The vast majority of the route is fully segregated, including the entire route from the city centre to Swords. North of Swords there is one at grade crossing of a public road, and provision for additional crossings which will be integrated into the streetscape of the planned new town centre at Lissenhall. The design caters economically for the forecast passenger flows which are typical of a low to medium density city such as Dublin.

Metro North is designed to operate using both a railway type signalling system and a line of sight system.

The proposed scheme will provide a frequent service which will be attractive for relatively short journeys within the urban area, including those which involve changing from other modes at Park & Ride car parks or bus interchanges. The maintenance of close headways to minimise passenger waiting times has been key to the success of Luas and is an important part of the system concept for the proposed scheme. The emphasis is on operating frequent services using trainsets of moderate length rather than long trains at relatively infrequent intervals. Capacity will be increased over time by increasing the peak service frequency progressively from four minutes to two minutes.

The proposed scheme will play a key role in a fully integrated public transport system for Dublin. Integration will include:

- the backbone of an urban network which incorporates the proposed Metro West line and the future integration of Metro and Luas services which will make use of the tunnel section in the future
- provision for transfer to and from domestic and international air services at the Airport
- the location and design of stops to facilitate transfer between metro, light rail, suburban rail, bus services, private car and bicycles together with good access on foot
- full provision in the design of the stops for Integrated multi-modal ticketing

5.3 METHODOLOGY FOR THE EVALUATION OF ALTERNATIVES

The main alternatives considered for the proposed scheme were evaluated using a multi-criteria analysis. This approach is recognised by the Department of Transport and is consistent with the methodology used for Luas lines. It is also considered best practice worldwide or similar projects.

RPA's objectives with respect to the proposed scheme are:

- Compliance with transport and landuse strategy;
- Minimising environmental impacts including congestion and associated pollution problems;
- Generating social and economic benefits;
- Delivering good quality transport integration;
- Optimising capital and operating costs;
- Delivering a safe and operationally efficient system;
- Achieving efficiency and minimising risk during construction.

It was considered that these were of a generally equal importance and therefore all weighted equally.

To meet the objective of minimising the environmental impact associated with the principal alternatives considered, all were evaluated against the same environmental performance measurements. A railway scheme such as Metro North by its very nature is likely to result in certain positive and negative impacts during its construction and operation. Construction impacts are of a comparatively short term and localised nature and as a general rule are managed through appropriate design and site management practice. These are addressed in detail as part of this Environmental Impact Statement (EIS). Impacts associated with the insertion of the scheme and its operation are more long-term in nature. These are managed through sensitive design, implementation of appropriate mitigation measures and ongoing operation and maintenance of the system.

Consequently, to evaluate the main alternatives considered from an environmental perspective the focus was on the potential long-term impacts of the scheme on:

- air quality;
- protected structures;
- archaeology;
- the natural environment;
- townscape and landscape;
- noise;
- human beings.

5.4 ROUTE SELECTION

5.4.1 Development of principal route options

The study of alternative route options generally concerns itself with the identification and evaluation of the broad route corridors and principal destinations that the scheme will serve, rather than precise stop locations or track alignment. The main vertical alignment alternatives: tunnel, viaduct or surface running, are also considered at this stage.

In late 2001, RPA appointed Parsons Brinckerhoff (PB) to carry out a detailed feasibility study for the proposed Metro North line identified in A Platform for Change between Dublin city centre and Dublin Airport. The scope of the study was to identify and assess constraints and system design requirements, route options and emerging preferred routes for this section of Metro North and for potential extensions to Blanchardstown, Swords, Tallaght and Shanganagh (via the Luas Green Line).

The study of possible routes from the city centre to Dublin Airport moved from a large number of route options identified in the airport corridor to three emerging corridor length routes for more detailed definition and assessment. Initially, this effort involved review of completed studies by the Dublin Transportation Office, Iarnród Éireann, the Dublin Airport Authority (then Aer Rianta), Fingal County Council and Dublin City Council, as well as stakeholder interviews and workshops. Next, a more in-depth examination of route options, issues, impacts and opportunities in local areas was conducted. Further considerations such as demand, cost and environmental aspects were examined for each of the route corridors.

Finally, three corridor length metro route options: West, Central and East; were short-listed between the city centre and Dublin Airport. These route options are illustrated in Figure 5.1. As part of this study, two stop options were identified at Dublin Airport and two alternatives were short-listed for the route from Dublin Airport to Swords. These alternatives are illustrated in Figure 5.2.

In late 2002, RPA advised Government of the options for a metro system serving these corridors. In response to Government concerns, initially with regard to the affordability of the scheme, and later with regard to the quality of interchange in the city centre, RPA considered alternative routes for the city centre section. Cost savings were achieved by straightening the route and thus shortening the length of tunnels; and by eliminating one of the proposed city centre stops. Three options for interchanging with the DART at Tara Street: the D'Olier Street, Hawkins Street and Tara Street options, were developed. These alternatives removed a potential duplication with the proposed Iarnród Éireann Interconnector, and eliminated significant construction difficulties at Connolly Stop.

The feasibility study and subsequent consultation with Government resulted in a number of short-listed options for each section of the route from the city centre to Swords, as summarised in Table 5.1.

To facilitate consultation on the routes, the route options in each section were consolidated into three end-to-end route corridors, labelled the West Route, the Central Route and the East Route. However, some of the section options were interchangeable and the consultation documentation indicated that the final route selected may be a combination of the routes shown. The three end-to-end routes, illustrated in Figure 5.3 were included in the Metro North route consultation map, published in February 2006.

Table 5.1 Short-listed Metro North alignment options between city centre and Swords

Route section	Options
City centre	<ul style="list-style-type: none"> a) St. Stephen's Green to Parnell Street via Tara Street b) St. Stephen's Green to O'Connell Street via D'Olier Street c) St. Stephen's Green to O'Connell Street via Hawkins Street
City centre to Dublin Airport	<ul style="list-style-type: none"> a) West corridor, via Broadstone and Finglas b) Central corridor, via Glasnevin and Ballymun c) East corridor, via Drumcondra and Santry
Dublin Airport	<ul style="list-style-type: none"> a) Underground stop adjacent to the existing terminal and the proposed second terminal b) Elevated stop located approximately 800m to the east of the terminal (located differently on the East and Central corridors)
Dublin Airport to Swords	<ul style="list-style-type: none"> a) Via the R132 to terminate at the Lissenhall interchange or in the lands to the west of this interchange b) Via Nevinstown and the R132 to terminate at the Lissenhall interchange or in the lands to the west of this interchange.



Figure 5.1
Route options
Source: Parsons
Brinckerhoff (Ireland)
Ltd. and RPA

Figure 5.2 Dublin Airport to Swords route alternatives

Source: Parsons Brinckerhoff (Ireland) Ltd. and RPA



Figure 5.3 Dublin Metro North Options



5.4.2 The Alternative Central Route

An additional route option was developed by RPA in response to public consultation. This route was a variant of the Central Route, differing in the following respects:

- the D'Olier Street and Upper O'Connell Street stops were combined into a single stop at Lower O'Connell Street (now O'Connell Bridge Stop)
- the alignment from O'Connell Street followed the East Route to Drumcondra before crossing back to rejoin the Central Route at DCU via a new stop on Griffith Avenue

The consultation feedback leading to the development of this route option included the following:

- Very high quality interchange with the Maynooth railway line is considered essential. This issue was raised by a number of members of the general public as well as key stakeholders and representative bodies. These included submissions from the DTO; the rail users' group, Platform 11; and Dublin 15 community groups who are regular users of the Maynooth railway line.
- A new station on the Maynooth railway line at Prospect (where the Central Route crosses the railway) to provide interchange with the proposed scheme, is unlikely to be developed due to construction and operational difficulties. Such a station would be operationally inefficient, technically difficult to construct and not commercially viable. A railway station at this location had previously been considered, but not taken forward. In its feedback, Iarnród Éireann also noted that there was a relatively low catchment area and low redevelopment potential around this potential station location, which was less than the desired 1km separation from the next station at Drumcondra.
- A number of submissions were received from the general public in support of an additional metro stop between the Botanic Road and DCU stops to serve the areas around Griffith Avenue.
- There was strong demand for improved interchange with the Luas Red Line from the general public and key stakeholders such as the DTO and Platform 11.
- RPA met with Trinity College where they expressed their strong concerns about the risk of damage to historic buildings and the potential conflict between the Metro North infrastructure and the piled foundations of the Usher Library and disruption during construction. Trinity College subsequently submitted a response setting out these concerns in greater detail.
- Dublin City Council and Bus Átha Cliath had concerns over major road closures in D'Olier Street and O'Connell Street due to large scale cut and cover stop construction at these locations.

In response to these issues RPA instructed its technical advisers to investigate the feasibility of an alignment between Drumcondra and DCU and the feasibility of replacing the D'Olier Street and O'Connell Street Upper stops with a single stop in O'Connell Street Lower. This work formed the basis of the Alternative Central Route, illustrated in Figure 5.4, which was published for public consultation in June 2006.

This alternative was further bolstered by receipt of additional feedback as follows:

- Strong local preference exists for a stop at Drumcondra as opposed to Botanic Road. RPA met with the Iona and District Area Residents' Association in May 2006. This Association represents residents living between Botanic Road (the alignment of the Central Route) and Drumcondra (the alignment of the Alternative Central Route), between the Royal Canal and the Tolka River. They stated their strong preference for the Drumcondra stop over the Botanic Road stop. One of the key factors behind their preference was a desire to offer an alternative means of access to Croke Park on major event days. A considerable amount of illegal parking occurs in their area on these days causing significant safety hazards and inconvenience to the local community.
- Lands at DCU on Griffith Avenue will be made available by the University as an alternative construction and stop location site. RPA met with DCU in May 2006. They expressed a strong preference for a metro that served both Drumcondra and DCU as it would provide a linkage between the university campus in Ballymun and their associated colleges in Drumcondra (St. Patrick's College and Clonliffe College).

5.4.3 Other alternatives

A detailed submission was made on behalf of a developer-led consortium (the Metro East Alliance) in relation to a proposed variant to the East Route. The variant, also supported by Beaumont Hospital, consisted of:

- A deviation of the East Route through Clonshaugh Industrial Estate with an additional stop at Kilmore (approximately 1km from Beaumont Hospital).
- Options for connecting the East Route to an underground stop at Dublin Airport or an elevated stop closer to the airport terminal.
- Running at ground level between Whitehall and Santry, instead of on an elevated structure.



Figure 5.4
Alternative
Central Route

The Dublin City Business Association proposed that the Upper O'Connell Street stop be relocated to the plaza of the Department of Education on Marlborough Street. This proposal was also supported by the Dublin Chamber of Commerce, Clerys and Eason's. The main arguments in favour of this variant were that it would avoid construction on O'Connell Street and it was perceived that property in public ownership would be more easily available for public transport development.

5.4.4 Consideration of alternatives

The Alternative Central Route scored strongly against the other route options under almost all assessment criteria and was thus selected as the preferred route. A summary of the assessment is given in Table 5.2.

Table 5.2

Criteria	Key issues
Compliance with transport and land-use strategy	<p>The Fingal Development Plan 2005 – 2011 provides for a metro route through the county. In response to statutory consultation, Fingal County Council stated a preference for the metro route to provide a direct link between the strategic development sites of Swords, Metropark, Ballymun and DCU and from there to the centre of Dublin. Only the Central and Alternative Central Routes, which serve Ballymun and DCU, fully meet these objectives. The West Route partially meets these objectives as it serves Metropark and Swords, but not Ballymun or DCU. The East Route and the East Route Variant fail to meet these objectives.</p> <p>In response to statutory consultation, Dublin City Council stated a preference for the metro route to serve Ballymun and DCU to underpin the significant investment in Ballymun, a prime urban centre in the City Development Plan. Only the Central and Alternative Central Routes fully meet these objectives. The West and East Routes and the East Route Variant fail to meet these objectives.</p> <p>Dublin City Council also stated a preference for a route which provides access to the metro system both north and south of the River Liffey. The Marlborough Street variant fails to meet this objective...</p>

Criteria	Key issues
<p>Minimising environmental impacts</p>	<p>The West Route Option was evaluated as the least favourable of the four route options examined. At just over 22km in length it included approximately 5.5km of tunnelled sections and 8.5km of elevated sections. Being the longest route with the lowest percentage of bundling (15%) (tunnelled sections running parallel with or within existing road infrastructure), the West Route Option shows the highest concentration of major environmental constraints and by far the highest potential loss of habitats (along more than 3km). The evaluation suggests that there is a very high risk of discovering archaeological hot spots in the medieval part of the inner city over a distance of more than 1.4km. In addition some 39 protected structures are potentially affected by the West Route Option, 9 being within the at-grade or stop sections.</p> <p>The West Route Option is the only route option which crosses over the Royal Canal and the River Tolka. The structures will result in a visual barrier which will change the overall landscape character of these Conservation Areas. The West Route Option also has the greatest amount of greenfield land-take. The West Route Option would result in 5km of new severance.</p> <p>The East Route Option was evaluated as the third preferred option. It is the shortest and has an overall tunnel length of 5.1 km. As this route option is bundled with the M1 up to Clonshaugh, first in tunnel (in the city centre sections) and then at-grade, there are no major constraints up to the M50 roundabout apart from the archaeology in the inner city.</p> <p>From south of the River Liffey to the proposed Mater Stop, the East Route Option crosses 2 areas of very high, and 4 areas of high, risk in discovering archaeological finds which can potentially lead to time delays and extra costs. The total length of archaeological risk areas passed is in the order of 3km and thus the East Route Option ranks as the least favourable. The route passes by 50 protected structures, with two inside proposed stop locations.</p> <p>The East Route Option requires high bridges over the M50 and the M1 and is likely to have visual impacts in a wide area to the north and east and thus will significantly change the existing townscape. The route also crosses a sports ground and pitch and putt course which will likely lose part of their playing areas through land-take and severance. The East Route Option would result in 4.1km of new severance.</p> <p>The East Route Variant follows the same route as the East Route for much of its length and is likely to have similar impacts to the East Route.</p> <p>The Central Route Option is ranked second. It has a high percentage (32%) of tunnelled sections and some 8km (47%) running in parallel with or within existing road infrastructure (i.e. bundled). This results in a comparatively low number of major constraints, as there is a reduced level of landuse change, greenfield land loss or new severance. Thus the Central Route Option has the best potential to reduce the net impacts of the proposed scheme.</p> <p>The inner city section of the Central Route Option may impact on approximately 860m of very high risk archaeological areas through cut and cover construction and associated infrastructure. Between the River Liffey and the Mater Hospital the route has the potential to impact on up to 49 protected structures, though only 5 such structures are within the proposed stop locations.</p> <p>The likely loss of habitat for fauna and flora on the Central Route Option (65m) is significantly less than the West Route Option (3.2km). The Central Route Option would result in 0.9km of new severance.</p> <p>The Alternative Central Route Option is the best overall performing route. It is almost identical to the Central Route Option in its tunnel sections and bundling effects. There is the potential to encounter very high risk and high risk areas for archaeology but the length affected in total will be 800m shorter than that of the Central Route Option.</p> <p>The overall number of protected structures within a 30m corridor width is 59 of which only 4 are within proposed stop locations.</p> <p>The likely loss of habitat for fauna and flora on the Alternative Central Route Option (65m) is the same as the Central Route Option.</p>

Criteria	Key issues
Generating social and economic benefits	<p>The Alternative Central Route performs best in terms of forecast patronage on Metro North and in terms of generating patronage on the full public transport network. The West and Central Routes perform next best in terms of patronage while the East Route and the East Route Variant perform worst of all.</p> <p>The West Route, being the longest, has the greatest overall catchment and serves the highest number of disadvantaged people in terms of unemployment and education level. The Alternative Central is ranked second in this respect, closely followed by the Central Route. The East Route offers significantly less benefits in this regard, though the East Route Variant offers some advantages over the East Route, as a result of the introduction of an additional stop at Kilmore.</p> <p>All routes are broadly equal in terms of serving inner city RAPID (Revitalising Area by Planning Investment and Development) sites. The Central and Alternative Central Routes serve the largest RAPID site in the study area at Ballymun. The West Route serves the RAPID area covering Finglas West and North. The East Route and the East Route Variant serve no RAPID sites outside the city centre.</p> <p>The Alternative Central Route had the highest benefit to cost ratio, closely followed by the West Route. The East Route had the lowest benefit to cost ratio. Insufficient cost information was available on the East Route Variant to carry out a full cost benefit analysis of this option.</p>
Delivering good quality transport integration	<p>All routes terminate at St. Stephen's Green in the city centre and are thus considered neutral in terms of interchange with the proposed Interconnector and with the Luas Green Line.</p> <p>The Alternative Central Route offers significantly better quality of interchange with the Luas Red Line than all other routes. The Marlborough Street Variant performs poorly in terms of interchange with this Line.</p> <p>The Alternative Central Route, the East Route and the East Route Variant all have excellent interchange with the Maynooth Suburban Railway Line at Drumcondra. This is a strategically important interchange given the role of this line in the proposed restructured DART network. The Central and West Routes do not interchange directly with this line and interchange from these routes would involve walk times of approximately 15 minutes.</p> <p>Transport 21 also includes proposals for an orbital Metro line around Dublin, Metro West. A feasible connection between the East Route (and hence the East Route Variant) and Metro West has not been identified. Assuming the East Route could be modified to achieve this connection, the overall route length of Metro West would be significantly increased, resulting in a higher capital cost and a longer journey time between Blanchardstown and the city centre, a key objective of Metro West. All other route options can accommodate interchange with Metro West.</p> <p>The West Route best serves the Airport terminals. However, all routes could adopt the West Route stop option at the Airport and are thus considered neutral in this respect.</p> <p>It is assumed that bus routes will be reconfigured to facilitate interchange irrespective of the route selected.</p>

Criteria	Key issues
Optimising capital and operating costs	<p>The Central Route had the lowest capital cost, marginally less than the Alternative Central and East Routes. The East Route Variant is longer and thus more expensive than the East Route. The West Route was significantly more expensive than other routes.</p> <p>Cost savings could be generated on all route options through value engineering at the design stage. All routes were considered to have similar potential in this regard.</p> <p>The Alternative Central Route had the lowest maintenance and operating costs, slightly less than the Central and East Routes. The West Route had significantly higher maintenance and operating costs due to its greater length.</p>
Delivering a safe and operationally efficient system	<p>The West Route has the longest journey time due to its greater length. The Central, Alternative Central and East Routes all have similar journey times.</p> <p>In relation to the operational efficiency of the Transport 21 network, the West Route considerably shortens the length of Metro West and offers the shortest journey time from Blanchardstown to the city centre on that line. The Central and Alternative Central Routes offer acceptable journey times on Metro West. Neither the East Route nor the East Route Variant offer an acceptable connection between Metro West and the city centre.</p> <p>All routes have very high degrees of segregation and are considered neutral in terms of operational reliability. Safety considerations are also considered neutral across all route options.</p>

Criteria	Key issues
Achieving efficiency and minimising risk during construction	<p>The West Route is the longest and has the longest amount of tunnel and underground construction. The West Route has three separate tunnelled sections which adds to the total amount of work to be managed, though offers opportunities for parallel working to reduce overall construction timescales. The West Route is the least attractive against this criterion, while the Central, Alternative Central, East and East Route Variants perform similarly.</p> <p>The Central and Alternative Central Routes require no significant property acquisition in the city centre. The West Route requires significant property acquisition and demolition on Tara Street. The East Route requires the acquisition and demolition of a number of significant properties on Hawkins Street. The Marlborough Street Variant is significantly worse in this respect, requiring the acquisition and demolition of 14 properties, including protected buildings at the Department of Education on Marlborough Street.</p> <p>In terms of construction programme and risk, the West Route is the most complex overall due to its greater length and the need to tunnel in poorer ground conditions in the city centre. It also has a significant interface risk at Broadstone, where two operational bus depots would have to be relocated prior to works commencing. The Central Route has a major interface at the Mater Hospital, where the timing of the Mater Development and the Metro would have to be closely coordinated. The Alternative Central, East and East Route Variant Routes involve constructing a number of underground stops on the strategic Swords Road corridor, though some of these could be relocated off-street. The East Route and the East Route Variant would require significant mitigation measures during construction where they cross the alignment of the Dublin Port Tunnel. The proposed location of the Whitehall stop on the East Route Variant conflicted with the Dublin Port Tunnel. In the city centre, the West Route involves the construction of an underground stop and bored tunnel in close proximity to the operating railway bridge and in poorer ground conditions than exist further west on the line of the other routes.</p> <p>The Central and West Routes have the most significant impact on roads in the city centre. The East Route has less impact due to the location of the station on Hawkins Street. The Marlborough Street Variant performs best in this respect as it avoids construction disruption in O'Connell Street. The Alternative Central Route, incorporating a partly mined stop at O'Connell Bridge, reduces construction disruption compared to all of the other routes which involve full cut and cover stop construction.</p> <p>Overall, the Alternative Central Route performs best in respect of this objective.</p>

5.4.5 Parnell Square

During consultation on route options, Dublin City Council expressed a strong preference for a metro stop which would serve the Upper O'Connell Street and Parnell Street area, which would underpin DCC's regeneration objectives for this area. In announcing the preferred route in October 2006, RPA commenced a consultation process on an option of providing an additional stop on the preferred route at Parnell Square. This stop has significant benefits in terms of supporting regeneration and serving a greater catchment in the city centre. It also attracted strong support at consultation and was thus added to the selected route. The preferred route is illustrated in Figure 5.5.

5.5 ENGINEERING AND ARCHITECTURAL DESIGN

Following the selection of a preferred route, the engineering and architectural design stage concerns itself with the identification and evaluation of detailed design options for individual stops, and the associated track alignment between stops, along the preferred route corridor.

During this process of engineering and architectural design, environmental assessment and consultation continued and more local alternatives were studied and evaluated to optimise the design of the proposed scheme and mitigate potential significant negative environmental effects.

The following categories of alternatives were studied:

- Proposed stop locations, access and design including the proposed Metro West interchange
- Detailed horizontal and vertical track alignment between stops
- Location of crossovers and turn backs between tracks
- Location and design of Park & Ride car parks
- Depot location and design

The alternatives studied under each category are summarised below, following the route from north to south.

5.5.1 Proposed stops

The rationale behind the Metro North alignment and the provision and location of stops along the route is to provide a fast and efficient public transportation service that will facilitate existing and planned new residential and employment related uses, and which will allow an overall change in accessibility and mobility in the catchment area which it is planned to serve.

Stops constitute the points of access for passengers to the proposed scheme and ultimately to the overall Metro, Luas, DART, national rail network and bus networks. The choice of stop locations was determined by the catchment accessibility (which determines the actual number and location of stops along the proposed alignment) and mobility (which looks at the target population, network links and interchanges). The consideration of stop locations also took account of the existing and planned future development of the catchment area of the scheme alignment. Thus stop locations were considered in relation to how they can serve existing development and integrate into the planned future development of the catchment area.

A total of 17 new stops are proposed as part of the Metro North project as follows.

Belinstown

Belinstown Stop is located to the west of the M1 motorway and north of the Lissenhall interchange. The stop is located to serve the 2,000 space Park & Ride car park at this location. The alternatives considered for the Park & Ride car park are outlined below. The location of the terminus stop to the west of the M1 provides sufficient room to curve the proposed scheme route to ensure a straight perpendicular crossing of the M1 for a future extension to the Donabate area.

Lissenhall

Lissenhall Stop is located to the west of the R132 and close to the Lissenhall Interchange. This location is preferred by Fingal County Council. Though not shown on the current County Development Plan, Fingal County Council wish to see the area surrounding this stop location developed with high density commercial and residential developments – creating a new northern “gateway” to Swords.

Estuary

Estuary Stop is located to the west of the R132 alongside the Balheary playing fields. A stop is proposed in this location as Fingal County Council wish to see this area developed with high density commercial and residential developments. The stop has been located to avoid encroaching onto the playing fields. As a result the impact on the playing areas has been minimised, but there will be some loss of trees between the R132 road and the playing fields. Reinstatement planting will be provided as part of the scheme.



Figure 5.5
Metro North
preferred route

Seatown

Seatown Stop is located in the median of the R132, south of the existing Seatown roundabout. The Stop is located close to the centre of the existing residential property along the R132, and opposite the entrance to the new Dublin North Corporate Park industrial estate. It serves the residential areas of north Swords as well as local retail and business parks. Bus interchange facilities will be provided to accommodate bus feeder services from west Swords. An alternative location north of the Seatown Roundabout was eliminated due to Fingal County Council's desire to serve development south of the roundabout.

Swords

Swords Stop is located in the median of the R132 adjacent to the Pavilions Shopping Centre and associated future developments, which include plans to greatly increase the size of the Pavilions and create a retail park to the east of R132, connected to the Pavilions Centre by a plaza above the road and an underpass beneath the metro stop. The stop also serves Swords town centre. Good quality bus interchange facilities will make Swords Stop accessible to commuters living in west Swords, Malahide and Feltrim. The stop will link with the Swords Quality Bus Corridor.

Two main alternatives were studied for this stop:

- Option 1, located in the median of the R132 south of the Malahide Road Roundabout
- Option 2, located on the west side of the R132 adjacent to the Malahide Road Roundabout in the Castlethorn (Pavilions) site.

Option 1 emerged as the preferred option overall. Option 2 was less favourable in relation to accessibility and interchange with the planned developments on both sides of the R132. Option 2 also had greater environmental impacts associated with negative visual effects and loss of vegetation.

This stop is designed with an island platform 8m wide, to facilitate future connection (by lifts and escalators) to the planned shopping and plaza developments at its northern end. At grade signalised pedestrian crossings are also planned at each end of the stop to ensure adequate access.

Fosterstown

Fosterstown Stop is located above road level on the east side of the R132, close to Airside Retail Park. The stop serves the residential areas of Boroimhe and Abbeystone. Good quality bus interchange facilities will be provided for feeder bus services from River Valley and west Swords. A 300 space Park & Ride site will be provided to the east of the stop. Ramps, stairs and a lift will be provided to connect to the roadside footpaths. Access will also be provided to Airside Retail Park. A large housing development is planned on the west side of the R132, and a footbridge is provided over the road to connect this area to the stop.

An alternative stop location west of the R132 in this area was considered and eliminated because it severed the area of land available for development to the west of R132, and required significant additional structural and utilities works to pass between the Boroimhe residential area and the R132.

An alternative stop location in the car park of the Airside Retail Park, east of the R132 was also considered. This option was eliminated as it would be more expensive to construct than the option north of Airside, would cause more disruption during construction, and did not offer such good links to public transport

Airport

Airport Stop is located underground at Dublin Airport. This stop provides easy access to the existing airport terminal and the planned Terminal 2 for the forecast 30 million passengers and 20,000 employees at the airport. The stop forms part of the Ground Transportation Centre included in the Masterplan for Dublin Airport.

Two stop options were considered at the Airport – an elevated stop near the Great Southern Hotel, and an underground stop at the site of the proposed Ground Transportation Centre.

Transport and land use and transport integration criteria overwhelmingly supported the underground option at the airport. However, these criteria must be considered in the context of the greatly increased capital cost associated with the underground option. A high quality people mover link between the Metro station, Terminals 1 and 2, and other key airport locations could be provided at a fraction of the additional cost of the underground station.

Despite the difference in capital cost, the long term benefits to passengers in terms of ease of transfer between Metro North and the Terminals and the creation of a full multi-modal public transport interchange within the airport was considered decisive. The underground option at the airport was therefore selected as the preferred option.

Dardistown

Dardistown Stop is located south of Dublin Airport and is on the site of a major new planned development, consisting of a mix of residential and business uses. It is expected to generate significant levels of employment and residential population. The 300 space Park & Ride car park located at this stop will allow transfer from car onto Metro North from the M50 and from the Swords Road. This stop was initially located partly within the Outer Public Safety Zone (PSZ) of Dublin Airport. The stop has been moved some 20m southwards to avoid this zone, and minimise any risk to metro and airline passengers.

The tracks will be arranged to provide a 17.4m wide island platform at Dardistown, which will allow any future Metro West line to replace the centre of the Island, providing an interchange stop. The northbound Metro North track will be lowered south of the stop, to facilitate the future grade separation of any Metro West connection. The level differences will also help to minimise the land-take of the delta junction that will be required to allow Metro West to run direct services to the City centre. Metro West will eventually pass over the Metro North tracks so as to allow its bridge to be constructed along with its tracks, with minimum disruption of Metro North services. Similarly, the Metro North infrastructure north of the stop, has been designed so as to facilitate any future extension of Metro West eastwards toward Malahide.

Four alternatives were considered at this location.

- A single island platform shared with Metro West
- Three platform faces, one for Metro West services only
- A two level stop with an island platform for Metro West and Metro North
- Four platform faces, two for Metro West and two for Metro North.

The four platform face solution was chosen because it allowed greater operational flexibility than a single island platform and the three platform face solution, and occupied less land than the two level stop.

Northwood

Northwood Stop serves the area of North Ballymun, zoned for significant redevelopment, which is expected to generate high levels of new employment in the area. The proposed scheme will link the planned science and technology parks in the area with major educational institutions, including Dublin City University and Trinity College. An 8m wide island platform has been provided at this location to facilitate connections to possible future development over the stop. The stop orientation has been optimised to minimise impacts on the development site immediately to the south.

Three alternatives were considered for Northwood Stop:

- Option 1: An at-grade stop east of R108 Ballymun Road
- Option 2: An elevated stop above the central reserve of R108 Ballymun Road
- Option 3: An open cut stop west of R108 Ballymun Road and closer to the R108 Santry Avenue junction.

Option 2 was an integral part of an elevated option through Ballymun and was eliminated, along with that option, for reasons of visual intrusion and severance.

Option 3, west of Ballymun Road, was eliminated because its passenger catchment area overlapped with that of the Ballymun Stop; the stop would be less accessible as the platforms are below ground level; it would cause greater disruption during construction as it involves two additional crossings of the northbound carriageway of the R108; and because it was more expensive.

Option 1 best serves the existing high density residential area of Northwood and maximises the patronage at minimum capital cost and with least disruption during construction. This option is supported by Fingal County Council. For these reasons option 1 was chosen as the preferred option.

Ballymun

Ballymun Stop serves the new Ballymun Town Centre. Located conveniently close to the Civic Plaza in the heart of Ballymun, the stop provides easy access to local amenities including the Civic Centre, Ballymun Shopping Centre and the Axis Theatre, as well as serving the large community in the area. Bus interchange with the Ballymun Road Quality Bus Corridor is provided at this stop. The alternatives for this stop are linked to the alternative vertical track alignment options and are detailed in the alignment section of this chapter.

DCU

DCU Stop serves local residents, the 10,000 students and staff at Dublin City University and the 1,800 seat Helix Theatre. High quality feeder bus links along Collins Avenue will provide easy access to Metro North for the communities of Beaumont, Whitehall and Finglas.

Four alternatives were considered for DCU stop:

- Option 1: Open air stop on Ballymun Road
- Option 2: Underground stop on Ballymun Road
- Option 3: Open air stop in Albert College Park
- Option 4: Underground stop in Albert College Park

Options 3 and 4 had significant environmental impacts including loss of amenity and landscape at Albert College Park, and had significant visual impact for residents on Ballymun Road. Options 1 and 2 avoid the long-term environmental impacts on Albert College Park (through loss of habitat) and also have less visual impacts for residents on Ballymun Road, but have potential for long term noise associated with the operation of the stop. This impact is less with Option 2 than with Option 1, so that Option 2 is preferred. The impacts are further mitigated by moving the stop slightly south so that its northern entrance is further away from Albert College Court and its southern entrance is inside the grounds of a disused presbytery.

Griffith Avenue

Griffith Avenue Stop is located on the Dublin City University lands off Griffith Avenue. This stop is easily accessible to the residential areas in the surrounding area, including the areas of Drumcondra Road Upper, St. Mobhi Road and Home Farm Road. It will also link the planned university facilities on this site with the main Dublin City University campus and with the planned science and technology park in north Ballymun. Two options were considered for Griffith Avenue stop. These options were associated with the alternative alignment options for the tunnels between this stop and Drumcondra and the selection of the preferred stop is discussed below in the consideration of alignment options.

Drumcondra

Drumcondra Stop is an important interchange stop on the proposed scheme. Commuters on the Maynooth suburban rail line will be able to interchange at this stop to access the heart of the city centre or to travel to Dublin Airport. The stop serves local residential communities, the educational institutions at St. Patrick's College and Clonliffe College, and Croke Park. The stop will link with the Quality Bus Corridor on Drumcondra Road.

Five options for the stop at Drumcondra were considered:

- Option 1: Mined Stop beneath Drumcondra Road
- Option 2: Partial mined/cut-and-cover Stop in land adjacent to St. Joseph's Avenue
- Option 3: Cut-and-cover Stop beneath Drumcondra Road
- Option 4: Mined Stop under St. Joseph's Avenue
- Option 5: Cut-and-cover Stop in land adjacent to St. Joseph's Avenue

Option 1, 2, 3 and 4 were eliminated due to engineering, construction and traffic impacts. Option 5 was identified as the preferred option for the follow reasons:

- It avoids having a construction site located on a major traffic artery
- It avoids major disruption to utilities on Drumcondra Road.
- The length of time required to construct a cut-and-cover Stop adjacent to St. Josephs Avenue will be less than an equivalent structure in Drumcondra Road.

In addition non-construction related benefits include:

- Allowance for a holding area for crowds from Croke Park.
- Allowance for connection to existing Drumcondra Rail Station
- Potential to redevelop area above Stop

Mater

Mater Stop serves the Mater Hospital, which has been selected as the site for the planned National Children's Hospital. This stop serves local communities in the Dorset Street area and in Phibsborough. The stop also provides convenient access to Mountjoy, where a major redevelopment is being planned. The stop will link with the Quality Bus Corridor on Dorset Street.

There were a number of feasible design and location alternatives considered in relation to this stop:

- Option 1: Cut and cover box under the Mater Hospital car park
- Option 2: Cut and cover stop to the west of Dorset Street
- Option 3: Mined stop under Dorset Street

Option 1 is the preferred option as it minimises construction risk and the potential for disruption. Due to the requirement to demolish twenty residential properties in the case of Option 2 and the risks associated with mining a stop in boulder clay in the case of Option 3, these options were eliminated.

Parnell Square

Parnell Square Stop serves the Rotunda Hospital and the Parnell Square and O'Connell Street Upper area, which is to undergo regeneration in the coming years. The Parnell Square Stop is located predominantly beneath the east side of Parnell Square and partially in the Rotunda Hospital lands. The design of the box extends from north of the Gate Theatre up to the north east corner of the square, with both entrances adjacent to the Rotunda boundary on Parnell Square East. It was found that the area available beneath the carriageway of Parnell Square East alone could not accommodate the entire footprint of the stop structure. Consequently the possibility of extending parts of the stop box beyond the carriageway beneath Parnell Square East into the adjacent properties and lands owned by others was considered as follows:

- Option 1: to locate the stop entrances within the Ambassador building;
- Option 2: partially beneath the Rotunda and the Garden of Remembrance grounds;
- Option 3: partially beneath the carriageway of Parnell Square North, and the Garden of Remembrance;
- Option 4: beneath the full extent of Parnell Square East with entrances on Parnell Square North and Parnell Street;
- Option 5: fully beneath the carriageway on Parnell Square East for the full width of the road with stop entrances located along the boundary with the Rotunda;
- Option 6: partially beneath the carriageway on Parnell Square East and partially within the grounds of the Rotunda Hospital.

Options 1, 2 & 3 were eliminated as the impacts on the Ambassador, the Rotunda and the Garden of Remembrance would have been too great.

Option 4 & 5 were eliminated because of difficulties in traffic management during construction at the junction at the north east corner of the square, the requirement to maintain a bus lane and emergency access to the Georgian terrace on Parnell Square East and to the rear of the Gate Theatre for the full duration of the works.

Option 6 was selected as it takes due cognisance of stakeholders' requirements, area constraints and Masterplans in the area. Furthermore, while Option 6 encroaches into the hospital grounds this is unavoidable if a bus/emergency access lane is to be maintained along the east side of the stop during construction and the impacts on the Garden of Remembrance and Parnell Square North are to be avoided.

O'Connell Bridge

O'Connell Bridge Stop is situated at the very heart of Dublin city, beneath the River Liffey. Exits to the south of the river will provide ready access to the popular Temple Bar district, to Trinity College, to bus services on D'Olier Street, Hawkins Street and the Quays and to DART and suburban rail services via a short walk to Tara Street. Exits to the north of the river serve the busy retail areas around O'Connell Street, including Henry Street, Talbot Street and Abbey Street. Metro North passengers will be able to transfer to the Luas Red line to Tallaght at this point. Large structures are required below ground level on each side of the river to accommodate passenger circulation and stop operational equipment.

Two main options for the layout of the underground structures in Westmoreland Street were considered:

- Option 1: with shorter structures below D'Olier Street and Westmorland Street
- Option 2: with a single longer structure below Westmorland Street

Both options require structures beneath O'Connell Street, on the north bank of the Liffey.

Option 1 was eliminated because it required very complex traffic management arrangements to construct, resulting in a longer period of disruption, and more disruption than Option 2.

St. Stephen's Green

St. Stephen's Green Stop is the city centre terminus of the proposed scheme and serves the retail district around Grafton Street and the business and tourist areas surrounding St. Stephen's Green. Passengers will be able to transfer to the Luas Green line to Sandyford and to a planned railway station on the proposed Heuston to Spencer Dock Interconnector. The Interconnector will allow passengers travelling from the Kildare rail corridor to get to Dublin Airport with a single interchange at St. Stephen's Green. The Stop design accommodates the future construction of the Luas Green line extension to O'Connell St (Line BX), and makes provision for the extension of the running tunnels south of the Stop in the future.

The choice of the precise location and orientation of the stop at St Stephen's Green was complicated by the limited availability of space, the multiple uses of the area, and its importance as a national heritage site.

An initial location for the Stop was considered beneath St Stephen's Green West, but the disruption to the Luas system, the potential effect on nearby buildings, and nuisance to the working and visitor population of the area were substantial. A second option, partly in the street, and partly within the western boundary of St. Stephen's Green was therefore investigated. However this option caused disruption of the Green and its heritage features, whilst still having significant impacts on users of LUAS and of St Stephen's Green West.

Discussions with the owners of the Green (the OPW) and careful mapping of the trees and features of the park indicated that work fully inside the park could be allowed, provided the most sensitive vegetation was avoided or protected. In particular construction in the area of the north west or Upper Pond was identified as having least potential impact on the Green, and an area of ancient woodland west of the pond was identified as of great ecological importance, and could not be disturbed. It was also concluded that important features, such as the Pullham Rock, statues, railings and the Fusiliers Arch could be removed, stored, and replaced at the conclusion of construction. Vegetation could be renewed after construction. An area available for construction within the Green, centred on the Upper Pond, was therefore delineated and options within the Green were considered.

Seven feasible design alternatives for the St. Stephen's Green stop were identified and studied in conjunction with the Interconnector design team, in order to minimise the combined impacts of both schemes. All options included a ticket hall under the junction of Grafton Street, South King Street and St. Stephen's Green North and West. This allows the stop entrances to be closer to the busiest public area, provides sufficient space for a combined Interconnector and Metro ticket hall, and, because the ticket hall is of shallow 'top-down' construction, allows the early return of the area to public use. It is also possible to maintain adequate access for pedestrians and service vehicles during construction of the ticket hall. All options allow for interchange with the Interconnector platforms via escalators and lifts from the concourse level.

The seven options studied were:

Option 1: Entrances to the stop are located on Grafton Street, on St. Stephen's Green North and on St. Stephen's Green West with two escalators per entrance. The entrances are located close to the buildings on St. Stephen's Green to allow vehicular access to continue after construction. It has an island platform and a side platform to allow it to be a terminus stop.

Option 2: Entrance to the stop is via a bank of three heavy duty London Underground Specification escalators at the Grafton Street junction. The stop box is moved south by six metres relative to Option 1 to allow the escalators to be located as far as possible from the buildings on St. Stephen's Green. This requires the area around the stop entrances to be pedestrianised. This option has the same platform arrangement as Option 1.

Option 3: Entrances are located similarly to Option 1. The stop has a simple island platform arrangement with a loop south of the stop for turn back of LMVs. This arrangement reduces the overall size of the cut and cover box in the Green.

Option 4: Entrance to the stop is via a bank of three escalators at the top of Grafton Street and staggered single escalators on St. Stephen's Green North and West. The stop has an island platform and a side platform as per Option 1.

Option 5: Entrance to the stop is via a bank of three escalators on St. Stephen's Green North. The stop box is moved south by six metres relative to Option 1. This option has an island platform and a side platform as per Option 1.

Option 6: Entrance to the stop is via three banks of three escalators: one at the top of Grafton Street and one each at St. Stephen's Green North and West. In this option the north and west entrances emerge on the footpaths alongside the Green in the demise of the OPW. This option has an island platform and a side platform as per Option 1.

Option 7: This option is the same as Option 6, but the Interconnector running tunnel is moved further north under St. Stephen's Green North, closer to the existing buildings.

The options were evaluated by means of a weighted multi-criteria analysis. Options 2 and 7 scored best, followed by option 3. However option 7 required the provision of entrances alongside the boundary railings of St Stephen's Green North and St Stephen's Green West, which was unacceptable to OPW.

The preferred option was therefore a combination of Option 2, keeping the stop as far south as possible, and Option 3, with a loop for LMV turn back, and a single island platform. The loop configuration was found to be more efficient for the operation of services, and to have less direct impact on the Green, because it removed the need for a side platform thereby reducing the width of the box. A single island platform also allowed access from ticket hall directly to the Interconnector, which is preferable for wayfinding purposes.

Finally, an analysis was undertaken of the layout of entrances to the stop. As a result, it was decided to replace the escalators at the end of O'Connell Street with sets of three escalators in both St. Stephen's Green North and St. Stephen's Green West. This was preferred by Dublin City Council, allowed better access for service vehicles at the end of Grafton Street, and more open views to and from the Green.

5.5.2 Horizontal and vertical track alignment

The track alignment provides the links between the stops along the route. In general, the track alignment is designed to follow the straightest line and hence provide the fastest and most efficient service between stops, subject to other constraints on the route. The track alignment is also designed so as not to negatively impact on existing and planned new residential and employment related uses.

Belinstown to Lissenhall

The track alignment follows the most direct route from Belinstown Stop to Lissenhall Stop.

Lissenhall to Estuary

The track alignment crosses the Broad Meadow and Ward Rivers just to the west of the R132, using the line of the old Belfast road. These rivers share a shallow flood plain, which develops to the east of the R132 into the Malahide Estuary Special Protection Area. The Malahide Estuary is a particularly important wildlife habitat and an EU registered site for migratory birds. Bats and otters are known to frequent the route of the Broad Meadow River.

To minimise impacts in this area the track alignment crosses the Broad Meadow River on the old Lissenhall road bridge, which is a protected structure. This minimises disturbance to the habitat along the riverbank and avoids constructing another river crossing. The parapets of the bridge are of massive rough hewn masonry, and these will be retained, with new copings provided to the south to match the existing. At the Ward River crossing, the Balheary Bridge is also a protected structure. It is not possible to fit both tracks over the existing bridge. The northbound track has therefore been located over a new bridge just upstream of the Balheary Bridge.

Alternative alignments for these river crossings were considered, involving new bridges either east or west of the Lissenhall Bridge. However, any new crossing would require major construction works, with the potential to negatively affect wildlife and the visual setting of the old bridges. An alignment to the east was considered and eliminated as it brought the tracks close to the residential property at Retreat House Road, and would have required its demolition. An alignment to the west was considered and eliminated as it would impact the field to the north of the Broad Meadow River, which is noted to be of archaeological interest. This track alignment also had the potential to affect a major 18 inch diameter water main that supplies rural areas to the north of Swords.

The river crossing at Lissenhall Bridge is 100m south of the Retreat House Road side road. It has not been possible to devise a profile for this road to pass over or under the scheme on its existing route. In any case, such a profile was considered to be unacceptable as it would be intrusive for the adjacent residential property. Therefore Retreat House Road will be diverted over an at-grade crossing to a new junction with the Depot Access Road. A signal controlled junction will be provided at this junction, giving priority to metro. Pedestrian access along Retreat House Road will be maintained by means of an at-grade pedestrian crossing of the track, connecting the severed portions of Retreat House Road.

At the Balheary Bridge consideration was given to widening the existing structure to accommodate both tracks, but further to investigation and consultation with the Department of the Environment, Heritage and Local Government and Fingal County Council it was considered that an altered bridge would not retain the heritage value of the existing structure.

Track levels over the bridges are constrained by the existing bridge deck levels, raised by the thickness of a new structural slab. The track level will then be similar to that of the adjacent R132, just downstream of the bridges. An extreme flood occurred in 2002 (estimated to be about a 1 in 100 year event) but water did not reach the level of the existing bridge surfaces. In any case, further modification of these protected structures would not be allowed, so that the level of the track is considered to be appropriate.

Estuary to Seatown

The track alignment runs along the west side of the R132 between Estuary Stop and the Estuary Roundabout. The track alignment along the R132 is as close as possible to the road verge, but leaving space for a future Estuary Stop with 3.5m wide side platforms in anticipation of future commercial development on the playing fields. The alignment in this area has been arranged to avoid encroaching onto the playing fields. As a result the impact on the playing areas has been minimised, but there will be some loss of trees between the R132 road and the playing fields. Reinstatement planting will be provided as part of the scheme.

At the southern end of the playing fields, the track alignment swings eastward, to cross over the Estuary Roundabout area, and join the central reserve of the R132. This alignment takes advantage of the existing wide central reserve, thus minimising potential impacts on the tree screening planted along the verges of the R132, and land-take at the road boundaries. However, some land-take and realignment of the R132 is required to allow widening of the central reserve. Fingal County Council requested that any land-take for the scheme in this area be on the eastern side of the road, to minimise impacts on the residential properties on the west side. Planting on the east side of the road is not of particular ecological value, and will be replaced with new planting to the east to maintain the screening effect.

The track alignment is on a viaduct through this area to avoid causing additional road traffic congestion at these busy junctions and consequent delays to the metro services. This results in direct conflict with pedestrian overbridges that are currently provided at the Estuary and Seatown Roundabouts. To provide alternative facilities for pedestrians the existing roundabouts will be re-modelled as signal controlled junctions incorporating full pedestrian and cycle facilities. The at-grade crossings will be more convenient for pedestrians than traversing the existing footbridges and ramps.

To avoid direct conflict with the pedestrian bridges, a track alignment crossing below these roundabouts was also considered. This option was eliminated as the underpasses would be well below flood tide levels in the nearby rivers, and would be susceptible to inundation. A track level elevated over the pedestrian bridges was also considered. This option was also eliminated as it would require much longer ramps, prejudicing the optimum location of the Seatown Stop, and creating much more visual intrusion. Similarly, raising the pedestrian bridges over the viaduct would result in significant visual intrusion, and be inconvenient in use. An alternative of pedestrian subways was also considered, but these attract anti-social behaviour and are unattractive to vulnerable pedestrians.

Seatown to Swords

The track alignment continues on the line of the R132 central reserve, passing under the Malahide Roundabout to the Swords Stop, and then onward to the Pinnock Hill Roundabout. There are plans for major retail development of the lands on both sides of Swords Stop, and a proposal to link these developments with a plaza crossing above the R132. The alignment passes beneath the Malahide Roundabout in an underpass. An underpass is chosen at this location to minimise visual intrusion. This also avoids a clash with the proposed plaza deck over the R132. The level and location of the Malahide Roundabout creates a small risk of flooding, but a pumping sump will be provided at this location. A 5% gradient will be used on the Malahide underpass south ramp to minimise its length, and allow the Swords Stop to be as far north as possible to link with the proposed development in the area.

Swords to Fosterstown

South of the Swords Stop, the track alignment continues at grade in the central reserve, rising on a ramp approaching the Pinnock Hill Roundabout. A track alignment west of the R132 in this area associated with Option 2 for Swords Stop was eliminated because it resulted in a significant loss of tree screening and consequent significant visual impact for properties west of the R132.

The alignment passes over the Pinnock Hill Roundabout to the Fosterstown Stop on the east side of the R132, just north of Airside Retail Park. A track alignment west of the R132 in this area was eliminated because it severed a large area of land available for development, and required significant additional structural and utilities works to pass between the Boroimhe residential area and the R132.

Fosterstown to Airport

South of Fosterstown Stop, the alignment follows the back of the R132 east footpath past the Airside Retail Park car-park, necessitating some re-alignment of the R132 traffic lanes to pass between the road and the closest retail unit (Reid's Furniture warehouse), and between two ESB substations and the road.

The alignment then passes beneath the Airside junction, residential properties, a petrol station, and businesses, to the Fosterstown greenbelt area. This alignment minimises impacts on residential property, though it will be necessary to occupy the front gardens of two cottages to the south east of the junction to construct a cut and cover box section. The rear gardens of two cottages to the south west of the junction will be severed by a retained cut section of the scheme, as will the adjacent scrap yard, in order to minimise the length of closed box, with its attendant fire risks.

South of the Airside junction underpass, the alignment will remain in a cutting of reducing depth, to pass beneath the access road to McComish Precast at about 3m below ground level. This will allow the access road to be raised a moderate amount to pass over the tracks, whilst minimising earthworks. Setting the alignment in cutting will reduce visual and noise impacts on the properties to the east, which face the R132

Once under the access road, the route will rise to about ground level, and will pass over two small streams (Fosterstown North stream, and the Sluice stream). The streams are in valleys some 7m deep, and an agricultural underpass will also be provided in the northern valley to minimise the severance caused by the scheme. The vertical alignment in this area is designed to have a uniform gradient which is required as a base for the turnback trackwork which provides flexibility to allow some services to commence at the airport.

The alignment through the Fosterstown greenbelt area and across Airport lands is controlled by the Airport requirement that tunnels pass close to the new Ground Transportation Centre, but do not impact an underground water tank, or existing buildings at the Airport. This results in a more or less straight alignment from Airside to the Airport. A straight line alignment is also preferable for minimising construction and operation costs, and travel times.

South of the Sluice Stream, the level of the track is chosen to enter tunnels about half way up the steep hillside below the Airport. This will minimise the length of portal ramps, and avoid disturbance of the Naul Road, and adjoining halting site.

The alignment is as deep as reasonably possible beneath the airport taxiways and runways, or any future extension of them. Thus as the alignment enters tunnel in the valley side of the Sluice Stream, it descends to a low point half way between the tunnel portal and the Airport Stop. From the low point, the track rises to the Airport Stop level. The stop level is chosen to provide a 20m depth box (which can accommodate all the equipment rooms required in the plan area available) as well as keeping the box and tunnels far enough below rock levels to enable the control of any movement of surface structures.

The alignment gradient near the Stop will assist approaching LMVs braking and departing LMVs in accelerating as well as assisting drainage of the tunnels, with a pumping sump provided at each low spot. This alignment also minimises the risk of tunnelling disruption due to solution features in the karsitic limestone expected in this area.

Airport to Dardistown

A similar vertical alignment is provided south of the Airport Stop, with the track level reducing to a low point beneath the line of the southern runway, and rising again to the portal just south of the airport lands, whilst retaining sufficient cover not to disturb the airport perimeter road, nor the proposed new parallel dual carriageway route adjoining it to the south. This configuration is intended to minimise ground movements beneath the runway and taxiways, and will assist in accelerating and decelerating LRVs as they leave or approach the stop.

At the tunnel portal, the vertical alignment provides for at least one tunnel diameter cover beneath the airport perimeter road. The alignment ramps up from the Airport tunnel southern portal to Dardistown Stop which will be at ground level.

Dardistown to Northwood

South of Dardistown Stop, the northbound track will be lowered to facilitate the future grade separation of a Metro West connection. The alignment through this area comprises a large radius reverse curve, linking the alignment through the Airport buildings with its southern extension through Ballymun. An alternative alignment to the east of the Meat Packing Plant was considered, but was eliminated as it could not facilitate a future connection to Metro West, without severing excessive amounts of valuable development land.

The alignment is then arranged to give a square crossing of the M50 to simplify construction, minimise costs, and to match the existing crossings at the adjacent M50 / R108 interchange. The crossing location was chosen to be mid-way between the large country house (St. Anne's) and Santry Lodge and cottages situated on the other side of the Old Ballymun Road, thereby minimising impacts of the scheme. The vertical alignment of the bridge is constrained by the need to pass over the slip roads of the M50 / R108 interchange, and has been arranged to be on a shallow crest curve to assist drainage, and to match the adjacent M50 interchange bridges. This layout also minimises disruption to the M50 motorway during construction. The alignment runs parallel with the Old Ballymun Road, but lies some 50m to the west, thereby avoiding a mature wood of ecological value which lies to the east.

The proximity of the M50 to the R108, and avoidance of the development site just north of the Santry Retail Park access restrains the vertical and horizontal alignment in the vicinity of Northwood Stop. An underpass of the scheme will be required just to the north of the Northwood Stop to give access to residential properties, and the Old Ballymun Road will be lowered slightly to obtain sufficient headroom.

Northwood to Ballymun

From Northwood Stop the alignment descends to travel in shallow tunnel along the centreline of the R108, which it then follows to Santry Cross (the junction of Ballymun Main Street and Santry Avenue).

The emerging preferred route corridor for Metro North was identified in October 2006. One of the key issues arising during the public consultation process for route selection was the strong local opposition to elevated structures through the centre of Ballymun. A decision on the appropriate vertical alignment through Ballymun was thus not made at this time as it was accepted that more detailed analysis was required prior to a decision. Various alternatives for the vertical alignment through Ballymun have been studied, including:

- elevated
- at-grade (on the surface)
- in retained open cut
- in cut and cover tunnel
- in bored tunnel

The elevated option has the benefit of offering a fully segregated track alignment at an economic cost, and minimises the long term traffic impacts along Ballymun Road, particularly at the already overloaded Balbutcher Lane / Shangan Road junction and at the Ballymun Road / Collins Avenue junction. However, this option was eliminated due to its significant visual impacts on properties close to the alignment, and the severance effects of its approach ramps on Ballymun Main Street.

The at-grade option offers significant cost savings and greater accessibility to the scheme as the stops on this section of the alignment would be on the surface. However, this option was eliminated due to the significant long term negative impacts on traffic at the busy Balbutcher Lane / Shangan Road junction, and consequent impacts on the reliability of the service to be provided by the proposed scheme, and the tunnel portal ramps cause some severance on Ballymun Road.

The retained open cut option also has the benefits of offering a fully segregated track alignment at an economic cost, and minimising the long term traffic impacts along Ballymun Road, particularly at the already overloaded Balbutcher Lane / Shangan Road junction and at the Ballymun Road / Collins Avenue junction. However, this option was eliminated as it required high protective walls along either side of the open cut, which would have resulted in significant visual impacts on properties close to the alignment, and almost totally severed the properties along each side of Ballymun Road.

The cut and cover tunnel option offers the same benefits of a fully segregated track alignment and minimising the long term traffic impacts along Ballymun Road as the elevated and retained cut options, though at a greater cost. However, it also eliminates any visual impacts and severance along Ballymun Road. The biggest disadvantage of this option is the high level of disruption which will be caused by the construction of the cut and cover tunnel. Despite this, the cut and cover option was supported overwhelmingly by local residents and was also supported by Ballymun Regeneration Ltd.

The bored tunnel option has few advantages over a cut and cover tunnel option, other than in terms of reducing construction disruption. It has considerable disadvantages, particularly in relation to a significantly higher construction cost and poorer accessibility.

For the above reasons, the cut and cover tunnel option was selected as the preferred option.

Ballymun to DCU

The track alignment from Ballymun to DCU runs in a cut and cover tunnel. The discussion above in relation to the vertical alignment through Ballymun also applied to this section of the alignment between Ballymun and DCU Stop.

DCU to Griffith Avenue

The track alignment from DCU to Griffith Avenue runs in cut and cover and bored tunnel. The alignment continues due south from the DCU Stop to minimise the need to acquire property, although two properties must be acquired to permit the construction of DCU Stop and the tunnel. An alternative of running the tunnels out under Ballymun Road was considered. This would result in much greater traffic impacts during the construction of the stop and tunnel. As the owners of both properties are willing sellers, the alignment was maintained off the road. Once inside Albert College Park, the alignment takes the most efficient route allowing for a necessary curve approaching Griffith Avenue Stop.

Griffith Avenue to Drumcondra

The alignment runs from Griffith Avenue to Drumcondra in bored tunnels. Due to the length of this section of tunnel, an emergency access and ventilation shaft is required for fire safety and for operational reasons, approximately at the mid-point of the section. Initially, the most direct tunnel alignment was selected, with the shaft located in the south-west corner of St. Patrick's College grounds. In response to strong concerns regarding the impacts of tunnelling a further four tunnel alignment options were developed and studied. The five tunnel alignment options (original and four alternatives) are described below and illustrated in Figure 5.6.



Figure 5.6
Griffith Avenue to
Drumcondra tunnel
alignment options

- a) Option 1 (Green)
The tunnels continue south from a stop on the west side of the open lands on Griffith Avenue, passing under Griffith Avenue, Bantry Road, Valentia Road, Home Farm Road, Home Farm Park and the northern end of Ferguson Road before passing diagonally under the playing fields in St. Patrick's College. Leaving the College, the tunnels curve south and run along Drumcondra Road Upper to Drumcondra Stop. The emergency access and ventilation shaft is located beside Drumcondra Education Centre within the grounds of the College. The building housing the shaft and ventilation fans occupies part of the Drumcondra Education Centre car park and part of St. Patrick's Boys' Senior National School playground.
- b) Option 2 (Red)
The tunnels continue south from a stop on the east side of the open lands on Griffith Avenue, passing under Walnut Rise and Griffith Avenue, under the grounds of Corpus Christi Church and under Corpus Christi Girls' National School. From there, the tunnels pass under Home Farm Road to follow the green (Option 1) alignment to Drumcondra Stop. The emergency access and ventilation shaft is located in the same place as Option 1.
- c) Option 3 (Light Blue)
The tunnels continue south from a stop on the west side of the open lands on Griffith Avenue, passing under Griffith Avenue, Bantry Road, Home Farm Road, Hardiman Road and the northern end of Ferguson Road before passing diagonally under the playing fields and under the student residences in St. Patrick's College. Leaving the College, the tunnels curve south and run along Drumcondra Road Upper to Drumcondra Stop. The emergency access and ventilation shaft would be located beside the sports hall in the grounds of the College.
- d) Option 4 (Orange)
The tunnels run straight from a stop on the west side of the open lands on Griffith Avenue, passing under Griffith Avenue, Bantry Road, Home Farm Road, O'Daly Road, Hardiman Road, Joyce Road and Ferguson Road. The emergency access and ventilation shaft would be located in the southwest corner of the College playing fields, adjacent to St. Patrick's Boys' Junior National School. From there the tunnels continue southeast under Millbourne Avenue, Millmount Avenue, Botanic Avenue, Hollybank Road, Carlingford Road and Dargle Road before curving south into Drumcondra Stop.
- e) Option 5 (Dark Blue)
The tunnels curve south west from a stop on the west side of the open lands on Griffith Avenue, passing under Griffith Avenue, the rear gardens on Bantry Road, Home Farm Road and under Scoil Chatriona to run behind houses on Walsh Road. The tunnels then curve south and east to follow the line of the Tolka River along Griffith Park before turning south again, passing under Botanic Road, Hollybank Road, Carlingford Road and Dargle Road to Drumcondra Stop. The emergency access and ventilation shaft would be located close to the north end of Griffith Park.
- Option 2 involved an inefficient route with several curves on the tunnel alignment. It results in significant impacts on both Drumcondra Education Centre and St. Patrick's Boys' Senior National School due to the location of the emergency access and ventilation building. No acceptable mitigation of these impacts has been identified. It also has a much more significant visual impact on properties along Walnut Rise. The location of the Griffith Avenue Stop off Walnut Rise would result in significant traffic impacts within this quiet estate and would offer poor interchange with bus services on Griffith Avenue. The location of the stop also constrains the alignment north of the stop so that it runs under Hampstead Nursing Home and Convalescent Centre. This would result in unacceptable impacts on the patients during construction. For these reasons, this option was eliminated.
- Option 5 was longer than option 2 and passed under or close to more properties. It has significant negative environmental impacts associated with locating the emergency shaft within Griffith Park. For these reasons, this option was eliminated.
- Option 3 runs directly under the students' accommodation in St. Patrick's College and under a protected building. The location of the emergency access and ventilation building conflicts with the masterplan for St. Patrick's College and particularly with a planned extension of the sports hall. For these reasons, this option was eliminated.
- Options 4 and 1 scored best in the evaluation. However, there were significant issues with both of these options.

Option 4 generated significant public opposition due to the number of houses the tunnels pass under. Although the impacts of this are short term only, and although the risk of structural damage to property is low, there is an understandable concern among the residents affected by the alignment and this option passes directly under the most houses. Lands in the area between Ferguson Road and Walsh Road have undergone the greatest disruption to the natural ground conditions in the past. Such disruption relates to the formation of quarries and gravel pits together with re-profiling of the natural landform for the purpose of residential development or by the introduction of landfill for the purposes of disposing of waste materials. This is likely to require additional measures to protect property during construction.

Option 1 is more expensive than option 4 and will take longer to construct. Crucially, option 1 results in significant impacts on both Drumcondra Education Centre and St. Patrick's Boys' Senior National School due to the location of the emergency access and ventilation building. No acceptable mitigation of these impacts was identified.

These findings indicated that a hybrid solution between these two options is preferred. A hybrid option, which follows the alignment of option 1 between Griffith Avenue and St. Patrick's College before turning south under the College playing fields and following the option 4 alignment from there to Drumcondra Stop, was studied and subjected to the same assessment as the other 5 options. With this option, the tunnels run due south under the playing fields in St. Patrick's College, thus greatly reducing the number of houses under which the tunnels run.

The study found that the hybrid option is better than either option 1 or option 4. The benefits associated with this option are:

- The tunnels pass under significantly fewer houses than the original option (option 4)
- The tunnels are only marginally longer than option 4, the shortest option
- It offers an opportunity to locate a required emergency crossover in this section under green fields which minimises the risk of damage to overhead properties during its construction.
- The emergency access and ventilation building is in the location preferred by St. Patrick's College.
- It avoids a protected building

For the above reasons, the hybrid option was chosen. This option is illustrated in Figure 5.7.



Figure 5.7
Griffith Avenue
to Drumcondra
hybrid option

Drumcondra to Mater

The alignment runs from Drumcondra to Mater in bored tunnels. The tunnel alignment is constrained by the location of the stops and no alternatives are available.

Mater to Parnell Square

The alignment runs from Mater to Parnell Square in bored tunnels. The tunnel alignment is constrained by the location of the stops and no alternatives are available.

Parnell Square to O'Connell Bridge

The alignment runs from Parnell Square to O'Connell Bridge in bored tunnels. The tunnel alignment is constrained by the location of the stops and no alternatives are available.

O'Connell Bridge to St. Stephen's Green

The alignment runs from O'Connell Bridge to St. Stephen's Green in bored tunnels. The tunnel alignment is constrained by the location of the stops and no alternatives are available.

5.5.3 Location of crossovers and turn backs between tracks

The proposed scheme will have turn back facilities at Belinstown, north of the Airport and at St Stephen's Green. The system will also include four emergency crossovers between the northbound and southbound tracks.

Turn back facilities and emergency crossovers are required to allow LMVs to move between tracks to facilitate operational flexibility. The number and locations were chosen based on the system route length and maximising the benefits from reduced running in the event of section closures. In the event of an emergency it is important that there is minimum interruption to services and the four emergency crossovers have been located at strategic locations to enable LMVs to be turned back.

These facilities are provided at the following locations:

- Belinstown Stop (turn back facility) – the provision of this facility ensures fast turn-around of services and minimum dwell times for the LMVs at the terminus stop
- Between Estuary Stop and Seatown Stop (emergency crossover facility) – allows services to continue in the event of an incident at Belinstown
- Between Fosterstown Stop and Airport Stop (turn back facility) - allows for additional services between the Airport and the city centre to serve the needs of the Airport. It will also eventually serve Metro West. The optimum location of the crossover operationally is immediately north of the Airport Stop, however for ease of construction the crossover has been located on the adjacent at-grade section. Provision is made here for the stabling of one trainset if required. The track layout proposed at this location can also act as an emergency crossover.
- Between the Airport south tunnel portal and Dardistown Stop (emergency crossover facility) - allows for services to operate between Dardistown Stop and the city centre in the event of Airport closure. The location is determined by the operational requirement to locate the crossover as close as practicable to the north of Dardistown Stop.
- Between Griffith Avenue Stop and the Ventilation Shaft (emergency crossover facility) - allows for services to operate north of Drumcondra if there is an incident south of Drumcondra. This is located under the playing fields of St Patrick's College to minimise the potential impact on property at the surface from ground movements generated by mining of the crossing.
- Between O'Connell Bridge Stop and St. Stephen's Green Stop (emergency crossover facility) - allows for services to run to the city centre in the event of an incident at St. Stephen's Green.
- St Stephen's Green (turn back loop) - the turn around facility at St Stephen's Green is a loop arrangement. South bound LMVs will continue south after St Stephen's Green Stop, through the loop onto the north bound track. This is the optimal solution from an operational perspective. The main alternative considered in relation to this was the provision of caverns, one immediately north of St. Stephen's Green Stop to accommodate a single switch crossover and a second cavern further north to accommodate an operational scissors crossover. Both caverns were eliminated since the loop alternative significantly reduces the construction risk profile of the scheme, improves the layout within St. Stephen's Green Stop by reducing a three platform configuration to two, and enhances operational system performance. Provision of an operational crossover south of the St. Stephen's Green Stop was also considered. However this would not be operationally efficient as it would not allow a sustained two minute turn-around of LMVs at the terminus stop.

5.5.4 Park & Ride sites

The proposed scheme includes a number of Park & Ride sites. These sites are located and sized in accordance with the strategic plan prepared by the Dublin Transportation Office Rail Park and Ride Strategy for the Greater Dublin Area 2004. Following on from work done under A Platform for Change, the DTO formed a strategic group in 2002 to examine Park & Ride requirements arising out of the proposed changes to the public transport network for the greater Dublin area. Metro North Park & Ride sites were identified north of Swords (2000 spaces), south of Swords (Fosterstown) (300 spaces) and at Dardistown (300 spaces).

North of Swords

Traffic analysis indicated that there is likely to be significant demand for 2000 spaces at the Lissenhall Park & Ride site from commencement of service on Metro North. Two options were considered for the layout of the 2000 space Park & Ride site north of Swords.

- a) Option 1 - Surface Park & Ride
Approximately 60,000m² would be required to allow for access roads, landscaping and ancillary uses. This is a large surface area and has implications for landuse, costs, drainage, lighting, maintenance and security and control costs. The layout would result in long walking distances to the extremities of the parking from the stop.
- b) Option 2 - Multi storey Park & Ride
Providing 2000 spaces in a multi storey parking facility has a number of advantages. The land required is significantly reduced and walking distances to the stop are reduced. There are also economies with regard to drainage and lighting, access roads and control and security systems. There were a number of sub options for the multi storey arrangement considered including 2 storey of parking, 5 storey parking and hybrid with one basement storey. The 5 storey configuration was assessed as being the most economical. While this would have greater visual impacts than the surface Park & Ride or a lower multi storey Park & Ride, these impacts can be mitigated by appropriate landscaping and screening.

For these reasons, the multi storey option was selected.

Three locations for a multi storey Park & Ride site were considered at Lissenhall, in the vicinity of the Broad Meadow River. These were:

- on the Balheary playing fields
- just North of the Retreat House Road
- adjacent to the M1 / R132 Lissenhall Interchange.

All of these locations were rejected as they occupied land with important development potential, were opposed by Fingal County Council and would result in additional traffic movements at the already congested Lissenhall Interchange. Only the Balheary playing fields location would provide convenient access for pedestrians.

In conjunction with a decision to move the terminus stop to the Belinstown area, it was considered that a multi-storey structure built over the Belinstown Stop would maximise accessibility, whilst occupying a minimum of additional land, and reducing land cost per hectare. The car park was initially located symmetrically over the stop, but was subsequently moved to leave 800 spaces to the west of the stop, and 1200 to the east in order reduce visual impacts on residents of the 4 adjacent houses on Batter Lane. The car park was also arranged to have one basement level, to further reduce its impact, whilst still allowing connecting bridges to oversail the tracks. The car park is located to allow it to be accessed directly from the proposed Swords Western Bypass, if that project is realised.

Fosterstown

The DTO strategic Park & Ride report identifies a requirement for 300 parking spaces located south of Swords. This facility is provided at Fosterstown Stop (near the Airside business and retail park) and it is proposed to be a surface facility. It will serve Swords and areas to the east of the R132 including Malahide and Portmarnock.

Dardistown

300 Park & Ride spaces are provided at this stop. Access to the facility will be from the Airport southern perimeter road which is to be upgraded to a dual carriageway.

The Park & Ride car park is located inside the Airport Outer Public Safety Zone (PSZ), to the north of the stop, but this is acceptable within current guidelines on PSZs, and has been accepted by the Dublin Airport Authority and the Irish Aviation Authority. An alternative location south of the stop was eliminated because it occupied more valuable development land.

5.5.5 Depot location and design

The proposed depot site is located north of Belinstown Stop and is approximately 36 hectares in area. It is orientated on an east-west axis. Identification of the optimum location is critical as it impacts the operational efficiency of the entire scheme.

The following depot location options were considered:

- Sillogue;
- Dardistown;
- Fosterstown;
- Lissenhall;
- Belinstown.

It was determined that Sillogue was the least preferable depot location. Its location off the route would have led to significant inefficiencies in operation in terms of lost time and additional empty running. It was also located on lands currently occupied by Sillogue Golf Course and would have led to the loss of this recreational facility.

The Dardistown location performed well operationally, by virtue of its location in the middle of the route and its proximity to the airport which offered better service start up and greater productivity of drivers in terms of empty LMV running. However, land costs and development plans at Dardistown rendered this location unsuitable.

The Fosterstown location also performed better operationally by virtue of its location in the middle of the route and its proximity to the airport. However, there were many negatives with the site at Fosterstown such as its greenbelt designation, level changes and watercourse diversions. Fingal County Council were opposed to any change in the use of the greenbelt lands at Fosterstown.

Various locations at Lissenhall were eliminated as they occupied land designated by Fingal County Council for the future development of Swords.

Detailed discussions with Fingal County Council resulted in the route being extended beyond Lissenhall to a new terminus at Belinstown. Three depot locations were considered in this area:

- North of the likely route of the Swords Western Bypass and west of Batter Lane
- South of the likely route of the Swords Western Bypass and west of Batter Lane
- North of the likely route of the Swords Western Bypass and east of Batter Lane

The area south of the proposed Bypass was eliminated as it would substantially detract from the development area available north of Swords, and was opposed by Fingal County Council. Areas both east and west of Batter Lane are of archaeological interest, but these impacts can be mitigated. However the western option would result in environmental impact in a new area of land, whereas that to the east was limited by the existing landform. The option east of Batter Lane and north of the Bypass was therefore preferred.

5.5.6 Depot access

Having identified the location for the depot, consideration was given to access for construction, delivery of LMVs and maintenance equipment, all requiring the use of long articulated vehicles. Two alternative access routes are required to the depot, to ensure that access is maintained on one route in the event of a closure of the other road for any reason. Emergency vehicles, staff and equipment can then be reasonably sure of access to protect and maintain the Metro North service. A new access route was provided alongside the tracks to the south, connecting to the R132 Swords Road.

Options for the second access were considered to the south west along Balheary Road, and to the north west along Batter Lane. Balheary Road would result in a long length of road improvement to accommodate long vehicles, and did not offer a straightforward connection to the Motorway network. Batter Lane did provide a good link to the major road network (R132 and M1) and could be improved at low cost.

An option was considered of using the western end of Batter Lane and connecting it to the depot via an existing access road along the west side of the motorway. However, this route would clash with the layout of a possible Swords Western Ring Road at the south west corner of the depot. The Batter Lane option was therefore chosen to provide a safe and economical alternative access to the depot.

The possibility of a combined depot for Metro North and Metro West fleets was also considered at the following locations:

- Lissenhall
- Sillogue and
- Abbotstown

The study concluded that a combined depot was technically feasible and would provide financial and operational benefits. However, because these are two separate projects at different stages of development to provide a combined depot would introduce greater life long contractual risk to both projects. Therefore this option was not progressed.

06

DESCRIPTION OF THE SCHEME

- 6.1 [Introduction](#)
 - 6.1.1 General description of the proposed scheme
 - 6.1.2 Interchange and connectivity
 - 6.1.3 Passenger demand and capacity
 - 6.1.4 Procurement strategy
- 6.2 [Characterisation of the seven areas of the alignment](#)
 - 6.2.1 Area MN101: Belinstown to Swords Stop
 - 6.2.2 Area MN102: Swords Stop to Dublin Airport north portal
 - 6.2.3 Area MN103: Dublin Airport
 - 6.2.4 Area MN104: Dublin Airport south portal to Santry Avenue
 - 6.2.5 Area MN105: Santry Avenue to Albert College Park
 - 6.2.6 Area MN106: Albert College Park to Mater Stop
 - 6.2.7 Area MN107: Mater Stop to St. Stephen's Green
- 6.3 [Characterisation of the proposed scheme](#)
 - 6.3.1 Stop locations
 - 6.3.2 Stop characteristics
 - 6.3.3 Tunnels
 - 6.3.4 Intervention and ventilation shafts
 - 6.3.5 Structures
 - 6.3.6 Track
 - 6.3.7 Turn back facilities and emergency crossovers
 - 6.3.8 Substations
 - 6.3.9 Traction power and signals
 - 6.3.10 Depot
 - 6.3.11 Vehicles
 - 6.3.12 Lighting
 - 6.3.13 Park & Ride facilities
 - 6.3.14 Limits of deviation
- 6.4 [Operating characteristics](#)
 - 6.4.1 Operating system
 - 6.4.2 Operating pattern and timetable
 - 6.4.3 Ticketing arrangements
 - 6.4.4 Security and staffing
- 6.5 [Construction of the proposed scheme](#)
 - 6.5.1 Safety
 - 6.5.2 Construction phasing
 - 6.5.3 Principal construction activities
 - 6.5.4 Area specific construction activities



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.

6.1 INTRODUCTION

6.1.1 General description of the proposed scheme

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 under full signal control on a segregated alignment between St. Stephen’s Green and Fosterstown Stops and running on a line of sight basis, at grade, in underpasses or on elevated sections between Fosterstown and Belinstown. Metro North will run in a mix of bored and cut and cover tunnels beneath the city and in bored tunnels beneath Dublin Airport.

The forecast journey time between St. Stephen’s Green and the Airport is approximately 20 minutes and from St. Stephen’s Green to Belinstown is approximately 30 minutes. The proposed scheme has the capability to run with a minimum operating time of 2 minutes between services (i.e. two minute “headway”). The proposed scheme will operate using 45m long Light Metro Vehicles (“LMVs”), coupled together to form 90m trainsets.

The proposed scheme will be interoperable with the existing and proposed Luas and Metro systems. In order to facilitate the development of interoperable systems in the future the proposed scheme will incorporate the following key requirements;

- A track gauge of 1435mm;
- A standardised developed kinematic envelope (based on 2400mm wide vehicle);
- Standardised vehicle/platform interfaces;
- A 750V DC overhead traction power supply;
- Space-proofing of both infrastructure and vehicles, including ducting and wiring, for the addition of communication and control systems.

6.1.2 Interchange and connectivity

The proposed scheme provides a major new transport corridor, linking the city centre with the Swords area, Dublin Airport, and the northern central suburbs including Ballymun and Drumcondra. It is a significant part of the overall proposed rail, light rail and metro network, and indirectly serves a far wider area via interchange with all other light rail lines and other transport modes.

Under the proposals outlined in the Government’s investment programme, Transport 21, the Luas Green line will run from the Bray area through the city centre and on to Cabra and possibly Finglas. The proposed scheme will interchange with the Luas Green line at its current terminus at St. Stephen’s Green and once the Luas is extended through the city centre, at Westmoreland Street.

The Luas Red line will run from Citywest and Tallaght in the south-west of the city to The Point in the Docklands area to the east of the city centre. The proposed scheme will interchange with the Luas Red line at Abbey stop, which is adjacent to the O'Connell Bridge Stop.

The route for the proposed Lucan Luas line serving the west of the city is still to be determined but is expected to provide interchange with the proposed scheme at either St. Stephen's Green or O'Connell Bridge Stops, or possibly both.

Transport 21 also includes an orbital light rail line (Metro West) running roughly parallel to the M50 from Tallaght in the south-west via Clondalkin and Blanchardstown to Dardistown. From here Metro West services will continue, using the proposed scheme infrastructure, to the Airport and Swords area to the north, or the city centre to the south.

The proposed scheme will also provide direct interchange with the DART network. DART services will be re-configured once the proposed Interconnector linking Heuston station and Spencer Dock is in place. DART services from Malahide and Howth will run through the Interconnector to Heuston and on to Hazelhatch on the Kildare line. The Interconnector will include an underground station at St. Stephen's Green which is fully integrated with the St. Stephen's Green Stop.

DART services from Bray and Greystones will run through Pearse (where they interchange with the Interconnector), Tara Street and Connolly stations and onwards to Maynooth. The proposed scheme crosses this DART line at Drumcondra, and a new interchange station is being provided at Drumcondra Stop. Passengers may also interchange between the proposed scheme and DART in the city centre via a short walk from O'Connell Bridge Stop to Tara Street.

Interchange with bus and taxi will be facilitated throughout the system, with bus pull-in bays and pick-up/drop-off facilities being designed into all at grade stops.

Integration with internal and international flights, as well as many long-distance coach services is provided at Dublin Airport.

Park & Ride facilities are provided at 3 stops, (Belinstown, Fosterstown and Dardistown) which give access to the places served by the proposed scheme for those living beyond walking distance from public transport routes.

Cycle facilities are provided at all stops (excluding the Airport Stop).

6.1.3 Passenger demand and capacity

Public transport services are sized to meet the forecast passenger demand. Passenger demand on a public transport route is the number of people wishing to travel on the busiest section of the route, over a given period of time. The capacity of a transport route is the maximum number of passengers it can carry at any particular point on the route, over a given period of time. Passenger demand and capacity are both measured in terms of passengers per direction per hour.

Passenger demand on the proposed scheme has been forecast using a multi-modal transport model built specifically for RPA and independently validated. The model is divided into over 700 zones and covers the entire Greater Dublin Area. The model predicts future transport mode choice between the existing modes and new light rail/metro lines.

Inputs to the model include demographic data for the base and future years (using population and employment forecasts provided by the local authorities) and a public transport network and road network that allow the travellers in the model to move from zone to zone. The model predicts demand for an average hour within a peak period of 07:30 to 09:30 and for an average off peak hour within a period of 13:30 to 15:30, in the year 2016.

The forecast passenger demand in the morning peak hour on the proposed scheme is 6,000 passengers per direction per hour (based on modelled 2016 patronage forecasts). To allow for a higher comfort level for a line serving the Airport, and to allow for medium term growth in demand, the proposed scheme will have a capacity of 10,000 passengers per direction per hour when it opens. This capacity is achieved by operating 15 trainsets per direction per hour at peak times, with each trainset having a carrying capacity of approximately 670 persons. The initial forecast passenger demand and capacity is illustrated in Figures 6.1 and 6.2.

Passenger demand will grow over time with growth in population and employment along the catchment of the proposed scheme, and with the delivery of more of the public transport network envisaged in Transport 21. Other schemes, such as full public transport integration and road traffic demand management will also cause passenger demand to grow.

The proposed scheme has been designed to allow capacity to grow incrementally to 20,000 passengers per direction per hour over time to meet growing passenger demand. Capacity will be added through increasing the frequency of services and will not require any infrastructural changes.

The total forecast passenger demand at the Airport Stop (passengers boarding and alighting metro both northbound and southbound) in 2016 is approximately 3,700 in the peak hour. At this time, the airport is forecast to carry in excess of 30 million air passengers per annum. The Airport Stop is designed to cater for over 13,000 boarders and alighters per hour, and thus has significant reserve capacity to cater for long term growth at the Airport.

The planned capacity of the proposed scheme is typical of metros in cities of similar size and population density to Dublin, including Manchester, Munich, Seville, Budapest and Vancouver. Metros with higher capacities are generally only found in cities with very high populations such as London and Paris.

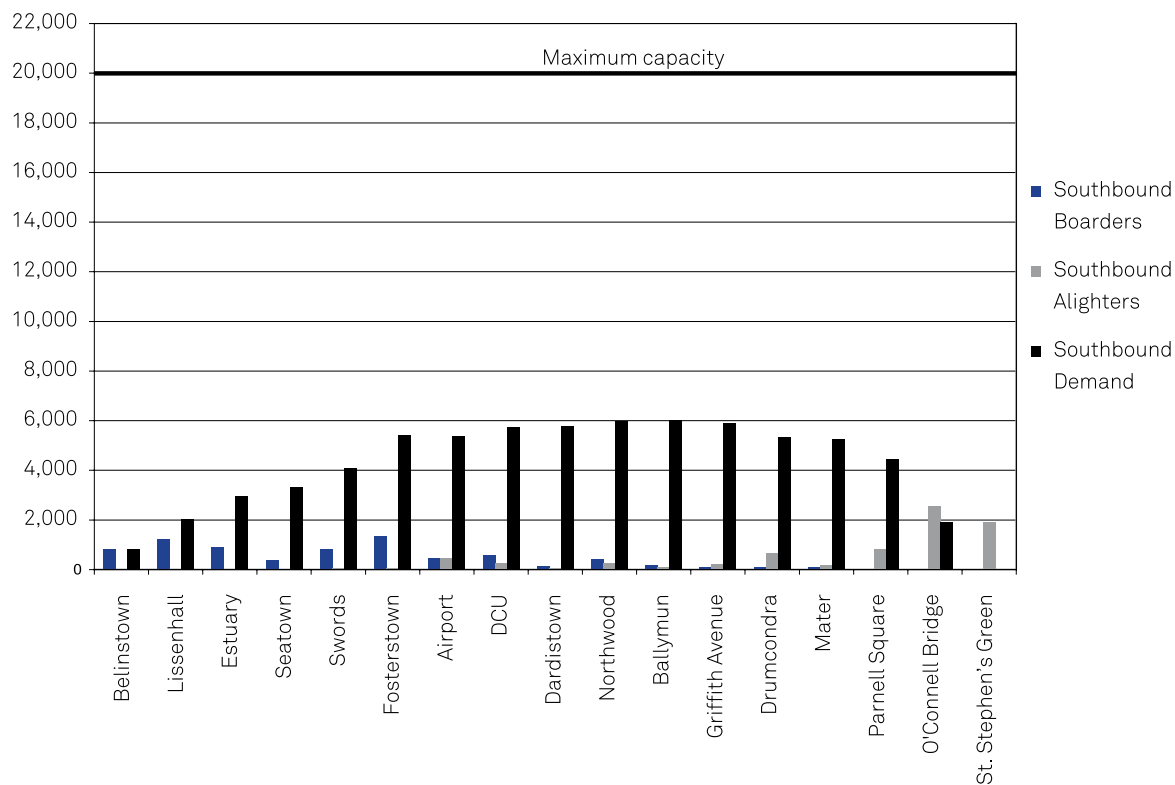


Figure 6.1
Passenger demand and capacity on the proposed scheme at service commencement (Southbound)

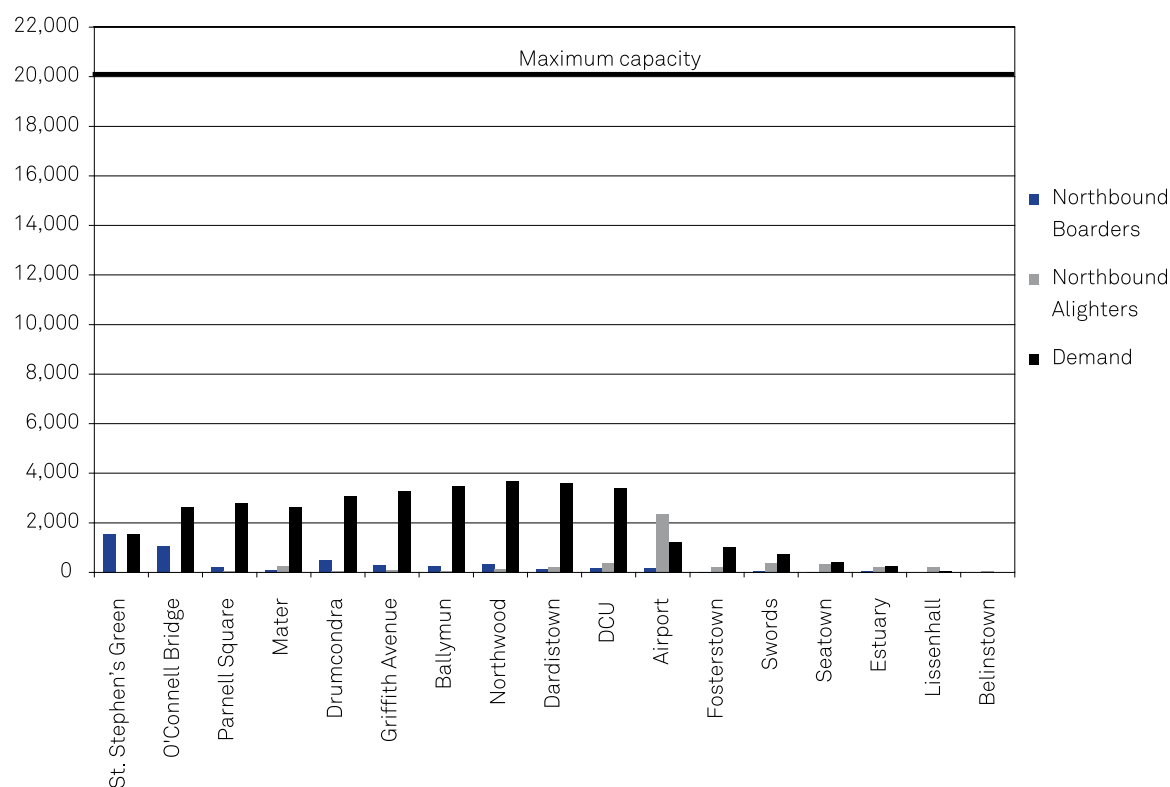


Figure 6.2
Passenger demand and capacity on the proposed scheme at service commencement (Northbound)

6.1.4 Procurement strategy

The proposed scheme will be delivered using a Public Private Partnership (PPP) contract model. The details of the proposed PPP contract process are summarised as follows.

- RPA will award a Design, Build, Finance and Maintain Infrastructure Contract to an Infrastructure Company (InfraCo). InfraCo will enter into contractual arrangements with a Rolling Stock Supplier for the supply (and possibly the maintenance) of the rolling stock.
- RPA will award a separate Operating Contract to the Operator. The Operator will also enter into contractual arrangements with InfraCo and is required by RPA to act as a sub-contractor to InfraCo during the tender and construction periods as well as to assist with testing and commissioning of the proposed scheme and bringing it into service.
- InfraCo and the Operator will have separate contracts with RPA during the operations and maintenance period. Their relationship during the operations and maintenance period will also be governed by a cooperation agreement.
- InfraCo is responsible for all maintenance activities of infrastructure and rolling stock. The Operator will supply operations management, driving and fare collection staff.

6.2 CHARACTERISATION OF THE SEVEN AREAS OF THE ALIGNMENT

For ease of local identification, in this EIS the proposed scheme alignment has been divided into seven areas. These areas are numbered Area MN101 to Area MN107. 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 Volumes 1 – 3 of this EIS. A description of the proposed scheme with reference to each of these seven areas is as follows:

6.2.1 Area MN101: Belinstown to Swords Stop

Area MN101 begins at Belinstown which is located approximately 2km to the north of Swords, adjacent to and directly west of the M1 motorway, on land that is currently used for agriculture. The maintenance depot, stabling facilities and a 110kV substation serving the proposed scheme are to be located in this area. The northern terminus stop of the proposed scheme, Belinstown, lies immediately southwest of the depot. A Park & Ride facility with 2,000 parking spaces, designed as a multi-storey car park, is planned adjacent to the stop.

From Belinstown, the alignment passes southwards, across greenfield land at surface level, to a provisional stop at Lissenhall. This stop is located in a greenfield site to the west of the interchange between the M1 and R132 in an area of potential development proposed by Fingal County Council. The alignment continues southwards and crosses the Broad Meadow River and the Ward River and then runs at surface level along the western verge of the R132 to a second provisional stop at Estuary.

The alignment then rises up onto an elevated section of track which crosses over the Estuary Roundabout, travels along the median of the R132 and over the Seatown Roundabout before descending to reach the next at grade stop, at Seatown. The Seatown Stop is located in the central median of the R132. The Estuary and Seatown Roundabouts are to be converted to signal controlled junctions.

After Seatown Stop, the alignment proceeds southwards on the surface along the central median of the R132 and then descends to pass under the Malahide Roundabout. To the south of the roundabout, the alignment emerges from the underpass and rises to the surface in the median of the R132 to the Swords Stop which is located opposite the Pavilions Shopping Centre. Initially, access to this stop is by pedestrian crossings of the R132. However, provision is made to allow this stop to be accessed from a possible future east-west bridge over the R132. Swords Stop marks the end of Area MN101.

6.2.2 Area MN102: Swords Stop to Dublin Airport north portal

South of the Swords Stop, the alignment rises up onto an elevated section of track to cross over Pinnock Hill Roundabout and continues south to an at grade stop at Fosterstown. This stop is located north of the Airside retail park on the east side of the R132. An at grade Park & Ride car park with 300 spaces is to be provided to the east of this stop. The alignment then continues southwards along the east side of the R132 and then descends to cross under the R132 just south of the junction at Airside and Boromhe.

The alignment emerges from the underpass, passes under a new accommodation bridge serving a local business at Fosterstown, to rise to the surface and onto embankments through a greenfield area. A turn back facility is provided in this area to the north of the airport to allow some Metro services to reverse at the airport in the future. A new agricultural underpass is located beneath the turn back facility. The turn back facility marks the end of Area MN102.

6.2.3 Area MN103: Dublin Airport

The alignment enters two bored tunnels (one for northbound metro services and one for southbound) to the north of Dublin Airport. A tunnel portal and ventilation building is located in this area. The alignment traverses the airport in a southerly direction passing under the Airport South Perimeter Road (Collinstown Lane) which marks the end of Area MN103. An underground stop, Airport, is located on this tunnelled section close to the existing airport terminal and the second terminal currently under construction on the site of the proposed airport Ground Transportation Centre.

6.2.4 Area MN104: Dublin Airport south portal to Santry Avenue

South of the airport perimeter road, the alignment emerges from tunnel and rises to surface level. A tunnel portal and ventilation building is located in this area. The alignment 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 alignment crosses the M50, associated slip roads, and Old Ballymun Road on bridges. South of these bridges the alignment 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 alignment descends into a cut and cover tunnel along the median of the R108 (Ballymun Road). This tunnel passes under Santry Avenue, which marks the end of Area MN104 and is the boundary between the Fingal County Council and Dublin City Council functional areas.

6.2.5 Area MN105: Santry Avenue to Albert College Park

The alignment continues southwards in a cut and cover tunnel beneath Ballymun Road, to a shallow underground stop at Ballymun, adjacent to the new civic plaza. Continuing south in a cut and cover tunnel along the Ballymun Road, crossing under Collins Avenue, the next stop is DCU. This is a shallow underground stop on the east side of Ballymun Road beside Albert College housing estate. Area MN105 ends at the DCU access road, just south of the DCU Stop.

6.2.6 Area MN106: Albert College Park to Mater Stop

The alignment continues in a cut and cover tunnel across Albert College Park, entering twin bored tunnels near the southern boundary of the Park. The alignment remains underground in bored tunnel until its termination at St. Stephen's Green.

Continuing south in bored tunnel from Albert College Park, the next stop is Griffith Avenue. This stop is located in the southwest corner of the agricultural lands on the north side of Griffith Avenue. Proceeding in a south-easterly direction, the alignment continues in tunnel under St. Patrick's College playing fields. An emergency access and ventilation shaft is located in the southwest corner of the college playing fields. The alignment continues in tunnel under the Tolka River to Drumcondra Stop. This stop is located to the west of Lower Drumcondra Road and adjacent to St. Joseph's Avenue.

An interchange with Iarnród Éireann's suburban rail services to Maynooth is provided at this stop. The alignment turns in a south-westerly direction passing under a second mainline railway and the Royal Canal, to the Mater Stop, located under the Mater Hospital's existing surface car park. Area MN106 ends 100m further south where the tunnels pass under St. Joseph's Parade.

6.2.7 Area MN107: Mater Stop to St. Stephen's Green

On leaving the Mater Hospital the alignment turns south easterly under the Dorset Street/ North Frederick Street junction and on to Parnell Square East where a cut and cover stop, Parnell Square, will be constructed. To the south of Parnell Square, the alignment proceeds in tunnel under O'Connell Street to O'Connell Bridge Stop. This stop is located under the River Liffey and access to this stop is provided to the north and the south of O'Connell Bridge. Entrances to the north of the River Liffey will facilitate interchange with the Luas Red Line. From O'Connell Bridge the alignment proceeds beneath Westmoreland Street and College Green and under buildings between Clarendon Street and Grafton Street. The terminus stop, St. Stephen's Green, is located in the north west corner of the Green. Entrances to this stop are outside the Green on St. Stephen's Green North and St. Stephen's Green West. This stop will permit interchange with the Luas Green Line services and the proposed Iarnród Éireann Interconnector. Turn back of LMVs is via a tunnel loop under St. Stephen's Green.



6.3 CHARACTERISATION OF THE PROPOSED SCHEME

6.3.1 Stop locations

The rationale behind the proposed scheme and the provision and location of stops along the alignment is to provide a fast and efficient public transportation service that will facilitate existing and planned new residential and employment related uses, and which will allow an overall change in accessibility and mobility in the catchment area which it is planned to serve. Stops constitute the points of access for passengers to the proposed scheme and thence to the overall Metro North, Luas, Dublin Area Rapid Transit (DART) and national rail networks.

The choice of stop locations was determined by catchment accessibility (which determines the actual number and location of stops along the alignment) and mobility (which looks at the target population, network links and interchanges). The consideration of stop locations also took account of the existing and planned future development of the catchment area of the proposed scheme. Thus stop locations were considered in relation to how they can serve existing development and integrate into the planned future development of the catchment area.

A total of 17 new stops are planned as part of the proposed scheme, 9 underground and 8 at grade. Two of the at grade stops, at Estuary and Lissenhall, are provisional stops to be provided at a later date with minimum disruption to services and systems. The proposed stop locations and a brief description of each stop are given in the following Table 6.1.

Table 6.1 Stop Descriptions

Stop Location/Name	Description
Belinstown	An at grade stop with two 6m wide island platforms, located south of the proposed depot. A 2000 space multi-storey Park & Ride site is located here.
Lissenhall	An at grade stop with two 3.5m wide side platforms located in the heart of the proposed Lissenhall development. The stop is accessed directly from adjacent footpaths.
Estuary	An at grade stop with two 3.5m wide side platforms located between Balheary playing fields and the R132. The stop is accessed by signal controlled pedestrian crossings of the R132.
Seatown	An at grade stop with two 3.5m wide side platforms located in the median of the R132. The stop is accessed by signal controlled pedestrian crossings at all four platform ends.
Swords	An at grade stop with an 8m wide island platform, located in the median of the R132. The stop is accessed by signal controlled pedestrian crossings at both platform ends.
Fosterstown	An at grade stop with a 6m wide island platform located on the east side of the R132. The stop is accessed at grade from the south, or using a footbridge over the R132 with lift and stairs at the northern end. A 300 space Park & Ride site is also located here.

Stop Location/Name	Description
Airport	An underground stop with a 14m wide island platform, located east of the existing multi storey car park and the terminal buildings. The stop is accessed from Dublin Airport Authority's proposed Ground Transport Centre.
Dardistown	An at grade stop with a 17.7m wide island platform and 3.5m side platform located approximately 300m north of the M50 in the proposed Metropark development area. Platform and track layouts provide for a future operational link to Metro West. A 300 space Park & Ride site is located north of this stop.
Northwood	An at grade stop with an 8m wide island platform located south of the M50 and east of Ballymun Road.
Ballymun	An underground stop with two 3.5m wide side platforms, located west of the Ballymun Civic Plaza. Accessed via stairs and lifts.
Dublin City University (DCU)	An underground stop with a 6m wide island platform, located adjacent to Albert College Estate. The stop is accessed via stairs and lifts from two surface entrance buildings.
Griffith Avenue	An underground stop with a 12m wide island platform, located north of Griffith Avenue and south of the Elmhurst Convalescent home on DCU lands. The stop is accessed via escalators and lifts.
Drumcondra	An underground stop with a 12m wide island platform, located north of the existing Iarnród Éireann Drumcondra station. The stop is accessed via escalators and lifts. There is a direct connection to the existing Drumcondra station.
Mater	An underground stop with a 9.8m wide island platform, located in the north east corner of the Mater Hospital site. The stop is accessed via escalators and lifts from the North Circular Road.
Parnell Square	An underground stop with a 9.8m wide island platform, located beneath Parnell Square East. Access is via escalators and lifts from Parnell Square East.
O'Connell Bridge (OCB)	An underground stop with two 3.5m wide side platforms, located beneath O'Connell Bridge. Access is provided via escalators and lifts north and south of the River Liffey. This facilitates interchange with the Luas Red Line at Abbey Street and the proposed Luas Line BX at Westmoreland Street.
St. Stephen's Green (SSG)	An underground stop with a 20m wide island platform, located beneath St. Stephen's Green. Interchange is provided with the proposed Iarnród Éireann Interconnector and the Luas Green line.

6.3.2 Stop characteristics

Platforms on all stops are 94m in length. The platform surface is 280mm above rail level and the face of the platform will be 1242mm from the centreline of the track. At grade stops will have a ramp at each end of the platform to footpath level. The minimum platform widths are 3.5m on side platforms and 6m on island platforms.

The following facilities are provided at stops as appropriate;

- Ticket vending machines (TVMs);
- Smart card validators;
- Closed Circuit Television (CCTV) cameras;
- Public Address (PA) system;
- Emergency Help Points and Passenger Help Points;
- Provision for advertising;
- Cycle parking facilities;
- Parking area for the use of maintenance or service vehicles;
- Emergency vehicle facilities.
- Passenger seating on platforms;
- Bins;
- Notice boards;
- Passenger information displays (PIDs);
- Stop name signage;

At grade stops will have the following facilities in addition to those listed above;

- Shelters with integrated seating (double sided shelters are provided on island platforms);
- ‘Kiss and Ride’ lay-bys for private car pick up and drop off of passengers;
- Bus and taxi interchange facilities.

Underground stops will have the following facilities in addition to those listed above:

- Lifts and escalators or stairs serving street, concourse and platform levels;
- Emergency escape staircases and fire fighting lifts;
- Ticket control gates;
- Local Control Room;
- Staff facilities;
- Deterrent systems to prevent passengers from entering the tunnels;
- Rooms for operational equipment such as:
 - CCTV systems;
 - Uninterruptible power supply (UPS) for the central control system;
 - Low voltage and high voltage switch rooms;
 - Communications, signalling and the associated UPS;
 - Equipment rooms.
- A fire detection system throughout the stop and in the equipment rooms;
- A fan assisted emergency ventilation system.

The proposed scheme allows access for mobility impaired persons in accordance with the technical guidance arising from Part 3 of the Disability Act 2005, as published by the National Disability Authority. Tactile surfaces, audio and visual emergency warnings, Braille maps and edge delineation will be provided to assist visually or hearing impaired people. Other aids to mobility impaired persons will be provided as appropriate.

6.3.3 Tunnels

The proposed scheme will run underground from St. Stephen's Green to south of Northwood Stop, a distance of approximately 8km, and also beneath Dublin Airport, a distance of 2km. The tunnel configuration is as follows;

- Twin bore running tunnels between St. Stephen's Green and Albert College Park;
- Twin cell cut and cover running tunnels between Albert College Park and a point south of Northwood Stop;
- Twin bore running tunnels beneath Dublin Airport.

In addition there is a single bore tunnelled loop beneath St. Stephen's Green, to provide a turn back facility for LMVs.

The configuration of the bored tunnel sections will comprise twin bores with a single track in each bore. The internal tunnel diameter is approximately 6m. An emergency escape walkway is provided on one side of the tunnel at LMV floor height with a maintenance access way at rail level on the other side.

The cut and cover tunnel box has a wall dividing the tunnel cells. Each cell is approximately 5m wide and 5m high.

Cross passages are provided for emergency escape and access by emergency personnel between the two running tunnels. These are no more than 250m apart or 250m from the nearest stop, tunnel portal or intervention shaft. Two hour fire separation doors are provided between the tunnel bores and cross passages.

The tunnels will include the following equipment and facilities:

- A fire main with hydrants throughout the tunnel sections;
- Cable hangers and troughs with access covers underneath the tunnel walkways;
- Tunnel and emergency lighting;
- Provision for access by the emergency services at the stops, tunnel portals and the ventilation/intervention shaft;
- CCTV cameras monitoring at the tunnel portals and each cross passage;
- Emergency telephones at each cross passage;
- A pumping main and pumping equipment;
- Tunnel ventilation equipment;
- A signalling system.

Transition ramps are located between the tunnel portals and the surface sections of the alignment. The transitions from the portals to the surface are designed as retained cut with concrete walls or as earthwork slopes as proposed at the airport. These structures vary in dimension from at grade to a maximum depth of 8m. The retained cut walls may be extended up to 1.8m above ground level to protect the system from road vehicle impact.

6.3.4 Intervention and ventilation shafts

An intervention shaft is required between stops to provide safe egress to the surface and access for emergency services, where the distance between stops or between a stop and the tunnel portal exceeds 1km. A ventilation and intervention shaft is provided between the stops at Drumcondra and Griffith Avenue at St Patrick's College.

At this shaft there is a permanent hard standing for emergency vehicles, a new access road off Millbourne Avenue and a new surface structure. This structure is approximately 34m x 18m x 8m high. Access to and from the tunnels from the surface is provided by a pressurised stairway and a fire fighting lift. Provision for an equipment room is provided at tunnel level.

Emergency tunnel exhaust vents are provided at each stop. Each vent is a maximum of 25m² in area. These will only operate in the event of a fire in the tunnel or adjacent stop. There are also vents at the north and south Airport tunnel portals. Jet fans to ventilate the tunnel are provided in the cut and cover tunnels north of Ballymun Stop. Fans will be tested every two weeks for a period of approximately 30 minutes. Emergency tunnel exhaust vents are located as follows:

- Airport North Portal – There are two vents located in a portal building at the north end of the tunnels;
- Airport Stop – There are two emergency tunnel exhaust vents located at each end of the stop incorporated into the entrance structures;
- Airport South Portal – There are two vents located in a portal building at the south end of the tunnels;
- Ballymun Stop – There are two vents 3m high at the north end of the stop adjacent to the Ballymun Civic Plaza and two 3m high vents in the median of Ballymun Road at the south end of the stop;

- DCU Stop – There are four vents 1.0m high incorporated into the landscaped verge, two at each end of the stop;
- Griffith Avenue Stop – There are two vents 3m high above the building roof at each end of the stop;
- Drumcondra Stop – Four vents are incorporated into the stop buildings (two in the north building and two in the south building);
- Mater Stop – There are two vents incorporated into buildings at both the north and south end of the terrace of houses on Leo Street;
- Parnell Square Stop – There are four vents incorporated into the stop entrance building on the west side of Parnell Square East;
- O’Connell Bridge Stop – There are two vents located north of Eden Quay/ Bachelors Walk in the median of O’Connell Street and two vents on the corner of Aston Quay and Westmoreland Street and on the island between D’Olier Street and Westmoreland Street;
- St. Stephen’s Green Stop – There are four vents incorporated into the island of the upper pond in the northwest quadrant of the Green.

6.3.5 Structures

The proposed scheme includes the following permanent structures:

Table 6.2 Structure Descriptions

Structure	Purpose	Structural Form	Dimension (Approximate)
Lissenhall Bridge	To cross the Broad Meadow River	Strengthened existing historic five span arch bridge	Length: 25m Width: 10m Track height over river: 4.2m
Lissenhall Retaining Wall	To retain the track between Lissenhall Bridge and Ward River Bridge	New masonry faced in-situ reinforced concrete wall	Length: 80m Max. retained height: 2.6m
Ward River Bridge	To cross the Ward River (Northbound line only)	New single span bridge with fully integrated abutments on piles	Length: 14.35m Width: 5.3m Track height over river 3.5m.
Balheary Bridge	To cross the Ward River (Southbound line only)	Strengthened existing two span arch bridge	Length: 8m Width: Track height over river: 2.0m

Structure	Purpose	Structural Form	Dimension (Approximate)
Estuary Viaduct	To cross over the Estuary and Seatown Roundabouts (R132)	New 21 span pre-cast post tensioned segmental box girder	Length: 860m Max span 60m. Width: 8.8m Depth of deck: 1.75-3.3m. Max track height over EGL (existing ground level): 9.1m
Chapel Lane Footbridge	Replacement of existing footbridge	New cable stayed footbridge	Length: 86m plus ramps. Main span: 56m Width: 4.2m Height of tower 18m Height of deck: 7.7m
Malahide South Footbridge	Replacement of existing footbridge	New cable stayed footbridge	Length: 71.6m plus ramps Main span: 43.6m Width: 4.2m Height of tower: 15m Height of deck: 8m
Malahide Underpass	To carry Malahide Roundabout over the proposed scheme	New single box structure with retained cut on approaches	Length: 87m (370m including ramp walls) Clear Span: 8.6m Width: 9.8m Clear height: 6.5m
Pinnock Hill Viaduct	To carry the proposed scheme over the Pinnock Hill Roundabout (R132)	New 9 span pre-cast post tensioned segmental box girder	Length: 390 m Max span: 40m Width: 8.8m Depth of deck: 1.75m Max track height over EGL: 7.5m
Fosterstown Footbridge	To carry pedestrian flow from Fosterstown Stop over the R132	New single span steel truss	Length: 26m Width: 4m Height over road: 8.2m
Fosterstown Underpass	To carry the R132 and Airside Retail Park Road over the proposed scheme	New twin box structure with dividing wall, secant pile side walls and retained cut on approaches	Length: 211.5m (450m including ramp retaining walls) Width: 13m
Fosterstown Accommodation Bridge	To carry existing access road over the proposed scheme	New reinforced concrete box	Length: 8.3m Width: 10.6m (34m including retaining walls)
Accommodation Underpass north of the airport boundary	To provide access between fields divided by the proposed scheme	New reinforced concrete box	Length: 25m (41m including retaining walls) Width: 5m

Structure	Purpose	Structural Form	Dimension (Approximate)
Culvert	To cross the Sluice Stream	New reinforced concrete box.	Length: 40m (45m including retaining structures) Width: 2.1m Height: 1.8m
Culvert	To cross the Turnapin Stream	New reinforced concrete twin box	Length: 40m (44m including retaining structures) Width: 1.8m Height: 1.8m
Metropark Bridge	To carry existing access road over the proposed scheme and provide access for future Metro West and area development	New single span bridge with reinforced earth abutments	Length: 38.7m with wing walls. Clear Span: 21.5m, Width: 12.8m Height: 9.9m above lowest track, 7.5 m above EGL
M50 Bridge	To cross the M50 motorway	New 4 span bridge with reinforced earth abutments	Length: 115m Width: 9.6m. 4 spans of: 18m, 21m, 21m, 18m. Height: 9.3m above motorway level
Northwood Bridge	To cross Old Ballymun Road	New single span bridge with reinforced earth abutments	Total Length: 26.8m. Width: 11.4m Clear Span: 9m Height: 7.4m above road level
Marlborough Street Temporary Bridge	To provide an alternative route across the River Liffey during construction	3 span steel truss (Bailey Bridge) supported on piled piers in the River Liffey	Total Length: 45m. Width: 18m Clear Span: 10m Height: 1m above road level on the quays and 3.0m clearance over mean sea level.

6.3.6 Track

Twin track (one running line in each direction) is provided along the whole route.

- The normal track spacing on surface sections is 3.3m between centrelines;
- The track gauge is 1435mm, as per the Luas Red and Green lines;
- The maximum speed will generally be 70 km/h;
- Derailment containment is provided in tunnels, on all elevated structures and on retained embankments.

6.3.7 Turn back facilities and emergency crossovers

Turn back facilities are required to allow LMVs to move between tracks to facilitate operational flexibility. These are provided at the following locations:

- Belinstown Stop;
- North of the Airport Stop;
- St. Stephen's Green.

The turn back facility at St. Stephen's Green is a loop arrangement as noted above.

Emergency crossovers to enable LMVs to be turned back in an emergency are provided at the following locations:

- South of the provisional stop at Estuary;
- South of Airport Stop;
- North of Drumcondra Stop;
- South of O’Connell Bridge Stop.

6.3.8 Substations

Substations are an essential component of the proposed scheme as they provide power for LMVs and stop facilities. A power simulation for the proposed scheme concluded that 15 substations are required to serve the route. One substation is located at each stop with the exception of Mater and Estuary Stops, and one additional substation is located at the Belinstown Depot complex to meet the requirements of the maintenance and stabling facilities. This is sufficient to serve the proposed scheme in the event that one of the substations malfunctions or must be shut down for essential maintenance works.

In addition, there is a requirement for three main ESB supply substations at Belinstown, Dardistown and St. Stephen’s Green. These will supply power to the stop substations by means of a 22kV ring main routed along the track.

6.3.9 Traction power and signals

The power supply for the proposed scheme is a 750V DC floating system, fed to the LMVs through an overhead catenary system via a pantograph. The maximum and minimum line voltages are 900V DC and 500V DC respectively. A collection system is to be incorporated to return any stray current to the substation supply.

The signalling system will provide and maintain a peak operational headway of two minutes. In order to achieve this implementation of the following systems are proposed:

- Between St. Stephen’s Green and Fosterstown Stop: an automatic signalling system with Automatic Train Protection (ATP);
- Between Fosterstown Stop and the Belinstown Depot: a “Line of Sight” system with an Automatic Vehicle Location System (AVLS).

A technical cubicle is located at every stop. These contain the equipment for each individual stop such as electrical power supplies, telecommunications equipment, cable transmission network equipment and AVLS. The cubicles also contain the telecommunications equipment for the fixed equipment at the stop such as PIDs and the PA system.

6.3.10 Depot

The depot site at Belinstown is aligned in an east – west orientation, and occupies an area of approximately 36 hectares (including landscaping embankments surrounding the site). In accordance with the Guidelines for the Design of Railway Infrastructure and Rolling Stock and for operational reasons the depot area is built on a levelled site. The depot includes:

- Headquarters and administration building and associated facilities;
- LMV maintenance and stabling facilities;
- Infrastructure maintenance facility.

The headquarters and administration building includes accommodation for operational, maintenance and RPA staff, and houses the Central Control Room. The Central Control Room will have views overlooking the entry tracks to the depot and the stabling area. It is the central point where the systems and staff are located to control and regulate the service during normal and emergency operations, and communicate with staff and passengers. It has primary control over local control rooms located within the underground stops. All control rooms will have an access control system to restrict access, fire detection and suppression system and are air-conditioned.

The LMV maintenance and stabling facilities provide capacity for the stabling and maintenance for a nominal fleet of 86 LMVs plus provision for expansion to accommodate a further 18 LMVs. Shed lengths accommodate two LMVs and have an allowance for splitting and coupling clearances. The facilities are double ended and enable flexible access by LMVs to all areas of the site. The LMV maintenance and stabling facilities also include:

- A maintenance workshop;
- Secure maintenance stores;
- A covered inspection and sanding facility;
- An LMV washing facility operating with a minimum of 70% recycled water;
- Road/rail access point for LMV delivery and road/rail transfer;
- Car parking for staff and visitors.

The infrastructure maintenance facilities include:

- 4 sidings (nominal length 100m);
- Crane and plant compound and hard standing;
- General stores;
- Spares stores;
- Workshop;
- Maintenance vehicle parking area;
- Car parking for staff and visitors.

A Security Gate House is located adjacent to the main entrance to the site.

6.3.11 Vehicles

The LMVs are designed and built to relevant international or equivalent national standards. They will meet the requirements of the Railway Safety Commission and the Guidelines for the Design of Railway Infrastructure and Rolling Stock. The LMV design will also meet the UK Rail Vehicle Accessibility Regulations 1998, including the 2000 amendment

The LMVs are bi-directional, 2.4m wide and approximately 45m long. Vehicles will have a minimum of 70% low floor area and the ability to negotiate curves of 25m radius. Seats for about 80 passengers, baggage storage and other designated facilities for the mobility impaired will be provided according to applicable regulations. The drivers' cabs are air conditioned and the passenger saloons are equipped with a heating and ventilation system.

Safety and security are important features of the system. The LMVs are equipped with security cameras and a PA system, allowing communication between the Central Control Room and drivers and passengers. The LMVs will also be fitted with a driver vigilance detection system. This ensures that the LMV comes to a stop in the event that the driver becomes incapacitated.

The LMVs will be designed to meet all appropriate safety standards. Each LMV has an incident recorder as part of an on-board monitoring system incorporating the recording of critical events and data capture and storage.

Based on journey time modelling, a nominal fleet of 86 LMVs is required to run the ultimate peak service at two minute headways with trainsets of two coupled LMVs. A nominal fleet of 44 LMVs is required to run the peak opening service at four minute headways.

6.3.12 Lighting

Public lighting is provided at all stop locations to illuminate the platforms and crossing points. The depot and Park & Ride facilities will use low level lighting and lighting masts that will incorporate anti-glare hooded fittings.

6.3.13 Park & Ride facilities

Three Park & Ride facilities are provided as part of the proposed scheme as detailed in Table 6.3.

Table 6.3 Park & Ride descriptions

Location	Size	Form
Belinstown	Two buildings 10m high, one to the east of the stop 119m by 68m, and one to the west of the stop 88m by 68m	2 five storey car park buildings, linked by bridges, with a total capacity of 2000 cars
Fosterstown	85m by 190m	At grade car park for 300 vehicles, taxi rank, drop off point and bus stop.
Dardistown	80m by 190m	At grade car park for 300 vehicles, taxi rank, drop off point and bus stop.

6.3.14 Limits of deviation

In executing any railway works the Agency may:

- (a) Where those works are situated in a public road:
- (i) Deviate laterally by an amount not exceeding 2.5m from the lines or situations shown on the plan;
 - (ii) Deviate vertically by an amount not exceeding 1m upwards from the levels shown on the plan;
 - (iii) Deviate vertically by an amount not exceeding 1m downwards from the levels shown on the plan;
 - (iv) Deviate longitudinally by an amount not exceeding 20m.

- (b) Where those works form part of an underground stop other than such parts as are situated in a public road:

- (i) In executing any railway works the Agency may... where those works form part of an underground station other than such parts as are situated in a public road amend the internal layout of the stop provided that such amendments do not reduce the accessibility or amenity of the publicly accessible areas within the stop.

- (c) Where those works form part of an underground tunnel:

- (i) Deviate laterally by an amount not exceeding 10m from the lines or situations shown on the plan;
- (ii) Deviate vertically by an amount not exceeding 5m upwards from the levels shown on the plan;

- (iii) Deviate vertically by an amount not exceeding 10m downwards from the levels shown on the plan;
 - (iv) Deviate longitudinally by an amount not exceeding 20m.
- (d) Where those works are situated otherwise than in (a) or (b) or (c):
- (i) Deviate laterally by an amount not exceeding 5m from the lines or situations shown on the plan;
 - (ii) Deviate vertically by an amount not exceeding 2m upwards from the levels shown on the plan;
 - (iii) Deviate vertically by an amount not exceeding 2m downwards from the levels shown on the plan;
 - (iv) Deviate longitudinally by an amount not exceeding 20m.

The Agency may, in executing railway works, lay down either single or interlacing tracks of parallel rails in places where double tracks are shown on the plan.

Within the limits of deviation at the underground stop locations, the layouts of the stop may be varied, for example, longer escalators may be used and the number of floors reduced.

The purpose of these powers of deviation is to allow a limited degree of flexibility in the design and construction to react to changing circumstances which are unforeseeable at this stage.

6.4 OPERATING CHARACTERISTICS

6.4.1 Operating system

The system is designed to provide a safe, reliable and punctual public transport system. All the LMVs are in radio contact with the Central Control Room and a computerised display is available to the controllers, showing the position of each LMV on the system at any point in time.

A monitoring system is provided to check on the status of the power supply system. This will provide information on the critical elements of the power supply and the controller is able to grant isolations of the overhead power systems for maintenance and in emergencies. A CCTV monitoring system of stops, the Park & Ride sites and key junctions in the system is located in the Central Control Room.

TVMs, ticket validators and real time PIDs are located on all stop platforms. Additionally these facilities will be provided on concourse areas of underground stops.

At certain locations where LMVs need to change tracks, a localised signalling system will ensure that LMVs can operate safely over points and crossings and to ensure that no conflicting movements can occur. At these locations the points are motorised. A similar system will control points in the depot.

6.4.2 Operating pattern and timetable

The proposed scheme is designed to operate an ultimate peak service running at two minute headways (30 trainsets per hour in each direction). At opening the peak service will run at four minute headways and will use trainsets of two coupled LMVs. Peak services will operate as follows;

- Southbound:
07:00 to 10:00 hours and 15:30 to 19:00 hours
- Northbound:
07:30 to 10:30 hours and 16:00 to 19:30 hours

Services may also operate as single LMVs during periods of low patronage. Services will operate between the following hours;

- Monday to Thursday
05:00 and 01:00
- Fridays
05:00 and 03:00
- Saturdays
06:00 and 03:00
- Sundays and bank holidays
07:00 and 23:30

All services will stop at every stop on the route.

6.4.3 Ticketing arrangements

The proposed scheme will use the integrated smart card ticketing scheme currently under development. This is a card the size of a credit card which allows customers to pay-as-they-go. Magnetic tickets may also be available. Ticket options will include single, return and one day only tickets, weekly and monthly and annual tickets, tax-saver commuter tickets, student travel (with identity cards) and pre-paid tickets available from ticket agents at retail outlets.

All stops on the proposed scheme will have ticket machines that accept coins, notes and credit cards for topping up credit on smart cards and for the sale of magnetic tickets. All stops on the proposed scheme will be fitted with smart card validators.

All underground stops will include automatic ticket validation gatelines to prevent unauthorised access to the stops.

6.4.4 Security and staffing

A video security monitoring system will be provided at the proposed stops and at the Park & Ride facilities and will be displayed at the control centre. All underground stops are staffed during operational hours.

6.5 CONSTRUCTION OF THE PROPOSED SCHEME

6.5.1 Safety

All construction work in connection with the proposed scheme will be carried out in accordance with relevant health and safety legislation and best practice, with particular regard to:

- Safety, Health and Welfare at Work Act 2005;
- Safety, Health and Welfare at Work (Construction) Regulations 2006.

The planning, testing and commissioning and operation of the proposed scheme will be carried out in accordance with the Railway Safety Act 2005 and with consents and directions issued by the Railway Safety Commission under that Act. A safety management system and safety case will be in place for the operation of the proposed scheme.

6.5.2 Construction phasing

In the construction of a metro system there is generally a sequence of activities to be followed. Due to the linear nature of the construction site it is possible for certain activities to overlap with others or to run concurrently. In general the construction works will involve the following phases:

- Site preparation;
- Establishing site offices, compounds and security;
- Utilities diversion;
- Excavation and construction of underground stops;
- Construction of tunnels and structures;
- Installation of the trackbed and rails;
- Installation of mechanical, electrical and operating equipment;
- The fitting out of stops and associated equipment;
- Finishing to surfaces and soft landscaping.

The activities described here should be regarded as typical of the construction work to be undertaken along the route. Although specific details are provided on an area by area basis as detailed from Section 6.5.4 a detailed programme and schedule of works will be developed prior to the commencement of work on site and is dependent on more detailed design work and finalisation of work methodology by the appointed contractors.

Until contractors have been formally appointed to undertake the construction of the proposed scheme, a precise programme cannot be established. For the purposes of this EIS the following assumptions can reasonably be made based on the required end date for completion of the works and the commissioning of the system, and on the basis of experience gained on the Luas Red and Green Lines and on Luas Lines B1 and C1 which are currently in construction.

- Work will start simultaneously at a number of locations;
- Duration will be 48–60 months;
- A period for testing and commissioning the system is also required;
- LMVs will be supplied during the construction period.

6.5.3 Principal construction activities

6.5.3.1 Introduction

Surface works in all areas will follow a similar sequence of preparation and completion. On entering any land, temporary or permanent boundary fencing, hoardings and traffic management signage will be installed. Topsoil will be removed to store and temporary and permanent drainage will be installed before the main works commence. Construction compounds will be established for the storage of materials, plant and equipment and for site offices. 25 such compounds are proposed as part of the construction of the proposed scheme as illustrated in Volume 3, Book 1 of 2. In such areas, a crushed stone working platform will be laid, utilities installed, and portable offices, welfare facilities and stores placed. On completion of the main work, all construction materials will be removed, and topsoil will be spread and seeded. Landscape planting will then be installed. Temporary fencing and signage will then be removed.

The location of the site compounds are illustrated on maps (Construction Compounds) contained in Volume 3, Book 1 of 2 and as described in Table 6.4.

Table 6.4 Construction Compounds

Area	Construction Compound No.	Location	Main Construction Activity Supported	Approximate Size (m ²)
MN101	1	Depot	Depot Earthworks, Trackwork & Buildings	336
MN101	2 (option 1)	Balheary Demense	Depot access road and Estuary viaduct	24
MN101	2 (option 2)	Balheary Demense	Broad Meadow and Ward River bridges	6
MN101	3	Chapel Lane footbridge	Chapel Lane Footbridge	3
MN101	3 A	Ashley Avenue	Malahide Underpass and Footbridge	4
MN101	4	Malahide South Footbridge	Malahide Underpass and Footbridge	2
MN102	5	Pinnock Hill Viaduct	Pinnock Hill Viaduct and Fosterstown stop and footbridge	24
MN102	6	Fosterstown	Fosterstown earthworks, underpass, accommodation bridge +agricultural underpass.	21
MN103	7	North Portal Airport Tunnel	Tunnel and Ventilation building	12
MN104	8	South Portal Airport Tunnel	Main tunnel works and ventilation building. Overall works management.	157
MN104	8 A	Metropark	Metropark earthworks and Dardistown Stop.	16
MN104	9	M50 Viaduct - North	Metropark bridge and M50 bridge	22
MN104	10	M50 Viaduct - South	Northwood Bridge and Ballymun cut and cover tunnels	12
MN104	10 A	Northwood Stop	Northwood Stop and Ballymun cut and cover tunnels	5
MN105	11	Ballymun	Ballymun Stop	3.0
MN105	11 A	Ballymun support to compound	Ballymun Stop and Cut and Cover tunnels	4.5
MN105	12 A	Albert College Tunnel Portal	DCU Stop, Cut and Cover Tunnels	
MN105	12 B	Albert College Tunnel Portal	Main City Tunnels,	
MN106	13	Griffith Avenue Stop	Griffith Avenue Stop	16 (?)
MN106	14	St. Patricks ventilation shaft	Ventilation shaft and crossover construction	2.5
MN106	15	Drumcondra	Drumcondra Stop	6
MN106	16	Mater	Mater Stop	5
MN107	17	Parnell Square	Parnell Square Stop	3.5
MN107	18	O'Connell Bridge	O'Connell Bridge Stop	11.5
MN107	19	St. Stephen's Green	St Stephen's Green Stop	19

Construction materials will be stored at these compounds and delivered to the site as required. For the storage of materials and/or substances that are potentially hazardous, measures will be put in place to ensure these materials are securely and safely stored. Access to the compounds will be required at all times but will be restricted to site personnel and authorised visitors. Chemical agent risk assessments will be completed and filed on site.

General construction activities which will take place across the proposed scheme are described below including:

- Enabling works;
- Surface (at grade) stops;
- Sub surface stops;
- Earthworks and roadworks;
- Landscaping and boundary treatment;
- Track;
- Cut and cover tunnels;
- Bored tunnels;
- Substations;
- Waste management and construction materials.

6.5.3.2 Enabling works

RPA has identified a number of packages of enabling works that will commence in advance of the main construction works including:

- Early construction of the stop box at Mater;
- Advanced utility diversions e.g. in Ballymun, DCU/ Collins Avenue and the city centre;
- Advanced heritage works e.g. Parnell Square, O'Connell Bridge and Street, College Green and Saint Stephens Green;
- Advanced archaeological works e.g. surveys and investigations;
- Advanced environmental surveys e.g. noise and air quality;
- Advanced buildings and basement surveys and monitoring e.g. building condition survey and building movement survey;
- Traffic management and junction reconfiguration, especially in the city centre ;
- Relocation of underground substations in O'Connell Street;
- Acquisition and installation of a temporary bridge over the River Liffey.

6.5.3.3 Surface stops

The foundations of surface (at grade) stops will be prepared and reinforced concrete track slabs will be cast. The platform ducting will be laid, and lean mix platform infill placed and compacted. Platform furniture will be erected, stop equipment installed, and paving slabs laid. Track will be affixed to the slabs, and infill concrete laid and patterned to the finished levels. All systems cables will be laid, connected to stop equipment, and tested. Construction of at grade stops is likely to take approximately 3 months, with a further 3 months required to complete systems installation and fit-out.

6.5.3.4 Sub-surface stops

Construction of the sub-surface stops will vary from stop to stop and is described in further detail in Section 6.5.4. Each stop box has been designed to allow the tunnel boring machines arriving at the stop to be winched through the stop and continue to complete the next tunnel drive.

On completion of each stop structure, the electrical and mechanical fit out (including major equipment such as transformers, lifts and escalators) will proceed, followed by architectural finishes.

6.5.3.5 Earthworks and roadworks

Bulk earthworks will be undertaken by excavators or motorised scrapers. Areas of fill will be compacted by small bulldozers towing vibratory rollers. Ballast will then be imported and spread. Road foundation layers will be laid and paved using bituminous or concrete paving machines and roadrollers.

Underground excavation will use impact and hydraulic breakers and low velocity pyrotechnics. The excavations will be supported by sprayed concrete and lattice arch girder linings in the soft ground, or with the addition of rockbolts in the limestone.

6.5.3.6 Landscaping and boundary treatment

Due to the extent of the permanent land-take, soft landscaping directly associated with the proposed scheme will generally be confined to a strip of low level planting outside of the swept path of the LMVs (at grade sections only). Hard landscaping will include the surfacing of the track bed and the completion of the civil works around stop entrances. Landscaping will commence on completion of the track laying and erection of the overhead lines. Details of the landscaping proposals are illustrated as Landscape Insertion Plans (Volume 2, Chapter 13).

6.5.3.7 Track

Track bed construction will generally entail the preparation of a firm formation some 8 metres wide just below the existing ground level. Protection measures to the existing underground services will then be carried out and the required surface water drainage and ducting will be installed. The track bed formation is then compacted and levelled with a layer of granular fill.

Three different types of track bed are proposed along the length of the line: ballasted track, slab track and embedded track. Embedded track may incorporate grass panels to form Grass Track. The engineering requirement of a particular location will dictate the type of track bed required at that location, and can be summarised as follows:

Table 6.5 Track types

Track type	Typical use
Ballast track	In long sections with no pedestrian access
Slab track	On structures and in sections adjacent to public roads
Embedded track	In stop areas and wherever vehicles or the public have access to the track
Grass track	Where required for aesthetic reasons

Ballast track

The bottom layer of ballast is placed and compacted. The railway sleepers are laid on this bottom layer of ballast using a hydraulic crane. The rail is laid out in sections and the next layer of ballast is placed between the sleepers and tamped to move the track into place. The track sections are then welded and stressed and the final layer of ballast placed. A final tamping pass is then carried out to bring the track to the exact engineered position.

Slab track

A reinforced concrete slab is formed on the prepared surface and a proprietary fixing system is installed to fix the rails directly to the reinforced concrete slab.

Embedded track

Grooved rail is placed on a track slab, and a final layer is placed between the tracks. This final layer generally comprises patterned / imprinted concrete or asphalt.

Grass track

Grass Track is formed in the same way as embedded track, but sections of the final layer are omitted, and replaced with a growing medium which is planted with grass.

6.5.3.9 Cut and cover tunnels

The tunnel side walls will be installed using diaphragm wall techniques. The structural concrete roof slab will then be cast on ground excavated between the walls.

When the roof has been cast, the soil beneath can be excavated and removed by conveyor belt from below and internal struts installed. The base slab can then be cast. Tunnel ventilation and spoil handling equipment can be located at compounds at each end of the tunnel. Once the base slab has been installed, the central dividing wall will be cast and grouted up to the roof slab. The tunnel will then be backfilled and roadworks completed. In confined areas the cut and cover tunnels will need to be constructed in two halves with the central wall constructed from the surface as a piled wall, minimising the area of carriageway occupied at any one time.

6.5.3.10 Bored tunnels

Tunnel Boring Machines (TBMs) will be assembled on the portal approach in the compound provided.

TBMs will consist of a rotary cutting head within a tubular shield the same diameter as the tunnel. Mixed mode TBMs will be used for the proposed scheme which can be adapted to suit each ground condition as it is encountered, operating either with or without pressurised slurry to support the excavation face. Spoil will be removed from the cutting head by conveyor, or rail mounted wagons, and automatically loaded onto lorries at Albert College Park. Air will be supplied to the tunnel by ducts from a compressor at Albert College Park, together with electrical power for the TBMs and lighting. Seepage water will be extracted from the tunnel by a system of pipes and pumps, and treated at the head works before being returned to local watercourses.

6.5.3.8 Overhead catenary system

The installation of the overhead catenary system (OCS) and the power supply facilities follows the completion of the trackbed. The support pole foundations will be installed in tandem with the track bed formation. The support poles are erected and fixed to the foundation, and the OCS wires strung from rail mounted vehicles.

Tunnels will be lined with pre-cast concrete tunnel segments imported by road, and taken to the TBMs by rail mounted bogies. The lining will be sealed by gaskets to minimise the inflow of water. The TBMs will be winched through each stop box structures, before continuing to drive southwards. Cross passages between the tunnels will be formed after the main drives are complete. On completion of the tunnel structure, a structural concrete track slab will be laid, and track, power and control systems fitted.

6.5.3.11 Substations

Surface substations will be constructed at locations which are generally close to planned Stops or infrastructure, in order to minimise the impact of new buildings on the existing environment. Ducting will be laid, and the substation compound will be covered in a layer of crushed rock. Bituminous road construction will be laid on the access road and parking areas. At feeder substations (Belinstown and Dardistown) steel pylons and precast concrete trestles will be erected to accept incoming cables from the ESB network. Elsewhere, substations will be supplied from a 20kV ring main laid along the track. A brickwork housing will be erected on a concrete slab foundation, and a concrete roof cast in situ. Transformers and switchgear will then be delivered by road and installed using small cranes. Cabling will then be laid and the equipment electrically connected and tested.

6.5.3.12 Waste and spoil management and construction materials

Spoil will be generated as part of the construction of the proposed scheme as detailed in the Soils and Geology chapter of this EIS (Volume 1, Chapter 17). Approximately 4.8 million tonnes of spoil will be generated as part of the construction phase.

Uncontaminated spoil will be reused where possible within the proposed scheme for the construction of the depot, embankments, bunds and landscaping structures and it is therefore unlikely that there will be a requirement to import bulk fill materials for the proposed scheme. Uncontaminated spoil will be loaded directly onto trucks so that intermediate storage will not usually be required. Any contaminated spoil will be treated in accordance with all relevant legislation and best practice guidelines at the point of origin or at an alternative suitable site prior to disposal. Spoil will be dewatered, as part of treatment, if required, in order to reduce the volume of spoil generated. Once the spoil has been loaded onto the trucks, the trucks will then travel directly to the area in which the spoil is to be reused, recycled or disposed. All trucks will be covered during transport. Spoil that cannot be reused or recycled will be disposed of in a manner that is in accordance with all relevant legislation and best practice guidelines.

Surplus inert excavated materials with some engineering strength (e.g. brick and stone rubble, stiff clay, and rock) can be suitable for disposal in a land reclamation project if one were proceeding at the same time as the proposed scheme. Waste management is addressed in the Soils and Geology chapter of this EIS (Volume 1, Chapter 17).

A waste management plan will be developed by the Contractor in accordance with the Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects (DoEHLG, 2006) as part of the construction environmental management plan to ensure that all construction waste is managed, stored and disposed of in an appropriate manner by appropriate contractors in accordance with all relevant waste legislation.

The proposed scheme will require specific construction materials (such as crushed rock, concrete, reinforcement, rails and cabling) to be imported to the site. In general, these materials are regularly used in civil engineering infrastructure projects, such as major roads and buildings.

6.5.4 Area specific construction activities

6.5.4.1 Construction activities specific to Area MN101

Works proposed in Area MN101 will include the construction of the maintenance depot and stabling facilities, a 110kV substation, a multi storey Park & Ride building, 5 stops at Belinstown (northern terminus stop), Lissenhall (provisional), Estuary (provisional), Seatown and Swords, a new bridge crossing the Ward River, a viaduct at Estuary (to cross the Estuary and Seatown Roundabouts), replacement footbridges at Chapel Lane and Malahide South and an underpass at Malahide Road.

Depot

The depot will be constructed on a level earthworks platform and roads and trackwork laid. Materials and equipment for the depot will be delivered via a new Depot Access road constructed along the east side of the proposed scheme, and connecting to the R132 just south of the M1 Lissenhall Interchange.

Earthworks beneath the main buildings and trackwork will be completed first, to allow early completion of these facilities for delivery and acceptance testing of the LMV's. Construction of the initial trackwork and the buildings will take approximately two years. Completion of the track and its Overhead Catenary System (OCS), and fitting out of the buildings will continue for one year, with testing and commissioning taking a further year.

The large landscape mound at the southern edge of the depot will be built up over two to three years, as spoil is imported from the tunnel activities elsewhere from the proposed scheme. Stored topsoil will be re-used at the depot and along the proposed scheme or sold to other projects.

The construction of each building at the depot, including the multi-storey car park, will follow a similar sequence, as set out below:

- Excavate and prepare foundations to main structure;
- Erect structural steelwork;
- Install floors and clad structure;
- Excavate and prepare bases for machinery and pits;
- Install any internal trackwork, and cast base slabs;
- Construct internal walls and partitions;
- Fit out of mechanical and electrical systems, and install relevant equipment.

Upon delivery of the LMV's to Ireland these vehicles will be transported to the depot by road, and will be commissioned and test run at the depot during the final year of construction.

Substations

The construction of all substations in Area MN101 will be undertaken as detailed in Section 6.5.3.11.

Stops

The construction of all five stops in Area MN101 will be undertaken as detailed in Section 6.5.3.3.

Belinstown Stop to Lissenhall Bridges

A traffic signal controlled junction with the R132 will be constructed, involving temporary lane closures, but maintaining two lanes of traffic in each direction. The Depot Access Road will be completed early in the construction process to facilitate construction of the depot. Work in this area will be supported from compound No. 2 established at the south end of the Depot Access Road.

Lissenhall Bridges

Initial work in this area will involve the maintenance work on the Lissenhall Bridge (over the Broad Meadow River), including the removal of vegetation growing on the structure, and re-pointing. The existing road surface over the bridge will be removed and a load-spreading slab cast over the deck area. A retaining wall between the bridges will be constructed from the tramway side to minimise damage to adjacent trees. The wall will be of random stone, laid by hand, and tied back to the existing wall, with the gap between filled with mass concrete.

Maintenance work on the Balheary Bridge (over the Ward River) will be same as for the Lissenhall Bridge.

The Ward River Bridge is to be built just upstream of the Balheary Bridge, on piles set back on the river banks to minimise impacts on the river bed. Parapets, and ductwork will then be cast, and handrails fitted. Installation of trackwork and the OCS throughout this section will then be installed in progressive operations.

Work in this area will be supported from compound No. 2 established at the south end of the Depot Access Road. Work on the Lissenhall Bridges and retaining wall will take approximately six months, if all operations are undertaken concurrently.

Lissenhall Bridges to Estuary Viaduct

Installation of trackwork and OCS in this area will take approximately two months, and will be undertaken at the same time as the Lissenhall Bridges track and OCS construction described above.

Estuary Viaduct and Seatown Junctions

Demolition of the Estuary and Seatown footbridges is required as part of the proposed construction. Initially, temporary signal controlled pedestrian crossings will be established in the vicinity of each bridge. Demolition will then be undertaken by diverting R132 traffic into a contraflow on the northbound and southbound carriageways in turn, and removing the bridge piers and spans.

After removal of the footbridges, the two central lanes of the R132 will be cordoned off between the Estuary and Seatown Roundabouts to facilitate the installation of foundations. Pre-cast segmental units will be lifted into place to form the viaduct deck. The lifting process may require the cordoning off of an additional lane of the R132 for safety reasons, and will therefore be undertaken at night or in periods of low traffic flow.

At the Estuary and Seatown junctions, construction will be by a similar method, but a series of complex traffic diversions will be required to give access to the pier locations. These diversions will be effected within the existing highway boundary, and will maintain at least two lanes of through traffic on the R132 at all times. The diversions will be arranged to allow the progressive alteration of the existing roundabouts to signal controlled cross road junctions. At least one lane in each direction will be maintained on the side roads during this process.

The reinforced earth ramps at each end of the viaduct will be built up in layers as the concrete facing units are installed. Parapets and ductwork will then be cast and handrails fitted. Installation of trackwork and the OCS throughout the viaduct will then be installed in a progressive operation, from the viaduct deck.

Work in this area will be supported from compound No. 2. It is estimated that completion of the viaducts and junctions will take approximately 18 months.

Swords Road and Seatown Stop

Work in this area will commence with the demolition of the Chapel Lane Footbridge, in a similar manner to that of the Estuary and Seatown footbridges as previously described. The works will require the closure of one lane of the northbound carriageway and two lanes of the southbound carriageway of the R132. An extra southbound lane will be constructed on the east side of the R132 to ensure that two traffic lanes are maintained in both directions at all times. This will provide working space for construction of Seatown Stop, using the methods described in Section 6.5.3.3 above. Trackwork will then be installed along the R132.

The Chapel Lane Footbridge will be replaced by a new lightweight steel propriety structure, brought to site by road. Assembly of the bridge components will be undertaken in compound No. 3 and diversion of R132 traffic into a contraflow on the northbound and southbound carriageways will be required. It is likely that this work will be undertaken at night, or during periods of low traffic flow to minimise impact on traffic. Construction in this area will take approximately six to nine months.

Malahide Underpass

This underpass cannot be constructed until the existing Malahide Footbridge is demolished, and the new bridge erected. This work will be undertaken as described for the Chapel Lane Footbridge. The remainder of the Swords Road will then be widened and Swords Stop built as described in Section 6.5.3.3 above. The Malahide underpass will then be constructed in the widened central reserve of the R132, with one lane northbound and two lanes southbound cordoned off. Roundabout traffic will be temporarily re-aligned to allow construction of the ramps and underpass.

6.5.4.2 Construction activities specific to Area MN102

Works proposed in Area MN102 will include the construction of the Pinnock Hill viaduct, a stop, footbridge and Park & Ride facility at Fosterstown, and an underpass and an accommodation bridge at Fosterstown.

Pinnock Hill Viaduct

The construction of the Pinnock Hill viaduct will require the closure of one lane of the northbound carriageway and two lanes of the southbound carriageway of the R132. An extra southbound lane will be constructed on the east side of the R132 to ensure that two traffic lanes are maintained in both directions at all times. This will ensure that the central lanes of the R132 are available for the viaduct construction. Installation of foundations will proceed, and pre-cast segmental units will be lifted into place to form the viaduct deck. The lifting process may require the cordoning off of an additional lane of the R132 for safety reasons, and will therefore be undertaken at night or in periods of low traffic flow.

At the Pinnock Hill Roundabout, a temporary closure of the northern circulatory carriageway will be required for approximately one to two weeks to construct the viaduct span above it, with traffic diverted via the Malahide Roundabout. Similarly, the southern circulatory carriageway will be closed for the same period to construct the southern viaduct span. The southern closure will prevent right turns to or from the Dublin Road access to Swords, and advance signing will be required to direct motorists via alternative routes. The reinforced earth ramps at each end of the viaduct will be formed in stages, and finished with parapets and ductwork cast in place, and handrails fitted. Installation of trackwork and the OCS throughout the viaduct will then be installed. Completion of the viaduct will take approximately nine months.

Fosterstown Stop and Park & Ride

A retaining wall will be constructed adjacent to Swords Road and the Fosterstown footbridge will be constructed, commencing with the installation of piled foundations. The footbridge itself will be assembled nearby, and lifted into place as a single span. This will require a temporary closure of the R132, and will need to be done at night, with traffic diverted around the Airside Retail Park. An underground drainage storage area will be excavated beneath the car park and filled with plastic water storage units. The Park & Ride site will then be paved. The stop will be built using the methods described in Section 6.5.3.3 above. Construction of the stop and Park & Ride site will take approximately six to nine months.

Fosterstown underpass

Work on the underpass will commence with piling for the northern approach ramp, which will require a temporary closure of the southbound bus lane alongside the Airside Retail Park Car Park. The section of underpass beneath the Airside Park Access road will be built in two stages, with traffic diverted around the work. At least one lane of traffic in each direction will be maintained on this side road. Construction of the underpass beneath the R132 will proceed in a similar manner, with traffic diverted first to the west of the work (partly in the curtilage of the petrol station), then around each side of it, and finally to the east. On completion the existing road layout will be reinstated. Two lanes of traffic in each direction will be maintained on the R132 throughout these works.

The underpass will be fitted out with track and the necessary control systems by working below the R132 from the adjacent site compounds Nos. 5 and 6. Construction of the Fosterstown underpass and its approaches will take approximately 15 months to complete.

Greenbelt Land

Work between Fosterstown underpass and the Sluice River requires the construction of a large earthworks cutting and smaller embankments. A comprehensive network of drains will be installed as a part of these earthworks to maintain the current drainage pattern.

The earthworks plant in this area will be serviced from the site compound south of the Fosterstown Underpass (Compound No. 6), and part of this area will also be used for topsoil storage.

Before the earthworks can be completed, a combined culvert and agricultural underpass will be constructed on the stream at the northern end of this area. The stream will be diverted into a temporary channel around the construction site, and returned to its current route, passing through the new structure.

A temporary diversion of the access road to the McComish Precast works will be required to construct a bridge to carry the reinstated road. Almost the entire length of this private access road will be reconstructed. On completion of the earthworks, track, control systems and OCS equipment will be installed. Earthworks and structures in this area will take approximately four months.

6.5.4.3 Construction activities specific to Area MN103

Works proposed in Area MN103 will include the construction of bored tunnels under the airport, a tunnel portal and ventilation building and an underground stop at the airport.

Airport North Ventilation Building

Earthworks for the ventilation building will form a platform for the receipt of the TBM, when it completes each tunnel from the south. The Ventilation Building Access Road will give access to the portal area from St Margaret's Road, and to return the TBM in parts to the south portal to commence the second drive, or to remove it from site when the tunnels are complete. On removal of the TBM, the foundations of the vent building will be dug and filled with structural concrete. The building walls and floor and roof slabs will then be cast in structural concrete, and mechanical and electrical plant fitted.

Construction of the portal area will take approximately three months, and must be complete in time to receive the TBM driving from the south. On completion of tunnelling, construction of the ventilation building will take approximately nine months.

Airport Tunnels

The TBM will be launched and serviced from the main tunnelling worksite located at Dardistown (in Area MN104) on the south side of the airport, and driven in a northerly direction. It is expected that a single TBM will be used for the Airport tunnels, driving from the south to complete one tunnel, before being dismantled and returned to the south portal, reconstructed, and driving the second tunnel. The Airport Tunnels will take approximately two to three years to complete, depending on the ground conditions encountered.

Fosterstown Stop and Park & Ride



Airport Stop

Construction of the Airport Stop will commence with the installation of piled walls down to rock level around the perimeter of the Stop box. The ground within the box will then be excavated in stages. Routes for road transport to and from the Airport have been agreed with Dublin Airport Authority and will be separated from normal Airport traffic. Construction of the Airport Stop will take some two to three years to complete, before testing and commissioning can commence.

6.5.4.4 Construction activities specific to Area MN104

Works proposed in Area MN104 will include the construction of a tunnel portal and ventilation building, at grade stops at Dardistown and Northwood, a Park & Ride facility and 110kV substation at Dardistown, bridges at Metropark, the M50, and Northwood, and a cut and cover tunnel along the median of the R108 (Ballymun Road).

Airport South Ventilation Building and Tunnel Portal

Earthworks and roadworks for the ventilation building and its approach roads will form a platform for the assembly of the TBM as it commences driving each tunnel in a northerly direction. On completion of tunnelling, the foundations of the ventilation building will be dug and the building walls and floor and roof slabs erected and mechanical and electrical plant fitted. Compound No. 8 will provide all the support facilities for tunnelling, and may also be used for topsoil storage arising from the proposed earthworks and the construction of the compound itself.

Construction of the portal area and compound will take approximately two months. It will need to be constructed before delivery of the TBM. On completion of tunnelling, construction of the ventilation building will take approximately nine months.

Metropark Earthworks and Roadworks

Earthworks, roadworks and trackworks in the Metropark area will take approximately six months to construct.

Dardistown and Northwood Stops

These Stops will be built using the methods described in Section 6.5.3.3 above. Construction of the stops will take approximately three months, with a further three months required to complete systems and fit-out.

Metropark Bridge

This bridge will be constructed off the line of the existing access road. Piles will be installed from ground level, and then extended up to abutment height and cased in steel sleeves. The deck beams will be installed and the access road diverted over it. The Metropark Bridge will take approximately four months to construct.

M50 Bridge

Pier foundations are constructed in the central median and side embankments of the M50. Precast bridge piers and crossheads will be lifted onto the foundations during separate night time closures of single lanes of the M50, and grouted into place. The bridge abutments will be piled and constructed as described for the Metropark Bridge. Temporary night time closures of the M50 slip roads will be required to erect the bridge side spans. Trackwork and the OCS throughout the viaduct will then be installed. Construction of the M50 bridge will take approximately six months. This work may be undertaken early in the construction process in order to provide a haul road between earthworks operations north and south of the M50.

Earthworks at Santry Lodge

Construction of earthworks and trackwork in this area will take approximately six months to complete.

Northwood Bridge

This bridge will be constructed in the manner described for the Metropark Bridge and will take approximately four months to construct.

Ballymun cut and cover tunnels

In the area of the Northwood portal, three temporary traffic lanes will be constructed to the east of the existing road, allowing two lanes of traffic to be maintained in each direction past the works. The diversions will rejoin Ballymun Road just south of the proposed IKEA junction.

Cut and cover tunnels in this area will be constructed as described in Section 6.5.3.9. Construction of the cut and cover tunnels in Area MN104 will proceed in conjunction with those in Area MN105, and will take approximately two years to complete, assuming that work proceeds on two fronts (i.e. from Northwood southwards, and from DCU northwards)

6.5.4.5 Construction activities specific to Area MN105

Works proposed in Area MN105 include the construction of a cut and cover tunnel beneath Ballymun Road, and underground stops at Ballymun and DCU.

Ballymun Cut and Cover tunnels

The cut and cover construction activities in MN105 will be undertaken in the manner described in Section 6.5.3.9. Various traffic management diversions will be required around the work, but two lanes of traffic will be maintained northbound and southbound on Ballymun Road, and at least one lane in each direction on side roads. Additional right turn lanes will be provided from Santry Avenue, Collins Avenue and Glasnevin Avenue. Temporary short closures of Coultry Road, Shangan Road and Albert College Drive will be required. At all stages existing pedestrian crossings will be replaced by temporary signal controlled crossings within 50m of the existing location.

Construction of the cut and cover tunnels in Area MN105 will take approximately two years to complete, assuming that work proceeds on two fronts (i.e. from Northwood southwards, and from DCU northwards). On completion of the tunnel structure, a structural concrete track slab will be laid in the boxes and track, OCS and control systems fitted using rail mounted vehicles.

Ballymun Stop

The first stage of construction of the stop will be to divert four lanes of road traffic (two northbound, two southbound) to the west of the main box footprint, necessitating the occupation of an 8m strip of land to the west of Ballymun Road. During this stage it will be necessary to close Shangan Road, and to divert local traffic along Coultrey Road, to a new temporary signal controlled junction with Ballymun Road some 150m to the north. This will also allow construction of the emergency tunnel vents beneath Shangan Road.

Diaphragm walls will be installed and the ground between excavated to base slab level. The structural base slab will be cast, followed by the mezzanine floor and roof slab. On completion of the main roof slab, Ballymun Road will be reinstated, and traffic diverted over the main box, so that the western stop access corridors can be constructed. On completion of the stop structure, the electrical and mechanical fit out (including major equipment such as transformers and lifts) can proceed, followed by architectural finishes. The existing road layout will then be reinstated over the box.

The area available for construction at the stop is very confined, and additional land for support services has been made available in compound 11A in front of the flats to the north west of the stop. Construction of Ballymun Stop will take approximately two years to complete, before testing and commissioning can commence.

DCU Stop

The first stage in the construction of DCU Stop will be the diversion of the R108 some two metres to the east into its new alignment. This, together with a closure of the southbound bus lane will provide adequate working area. Additional working space for support services will be available at compound No. 12A to the south of the stop. The western half of the semi-detached house at 1 Albert College Lawn will be carefully demolished, and a new gable wall and chimney stack built in its place. Westfield House will also be demolished. Diaphragm walls will then be installed around the perimeter of the stop, and the ground between excavated in stages. The permanent stop walls, floor and roof slabs will then be cast in structural concrete.

The electrical and mechanical fit out (including major equipment such as transformers and lifts) will then proceed, followed by architectural finishes. Construction of DCU Stop will take about 18 months before testing and commissioning can commence.

6.5.4.6 Construction activities specific to Area MN106

Works proposed in Area MN106 include the construction of a cut and cover tunnel across Albert College Park, bored tunnels south from Albert College Park, three underground stops at Griffith Avenue, Drumcondra and the Mater Hospital, and an emergency access and ventilation shaft at St. Patrick's College.

Albert College Park cut and cover tunnels

Construction of the cut and cover tunnels in this areas is similar to that described in Section 6.5.3.9. Construction of these tunnels will take approximately four months.

Albert College compound 12 and 12A

Establishment of this compound will be a critical activity in order to facilitate an early launch of the main TBMs and allow as much time as possible for completion of the bored tunnels. This compound will provide the support facilities required for tunnelling. Access to the compound will be from a new signal controlled junction on Ballymun Road. The tunnel portal area will be retained by walls installed from ground level. On completion of the bored tunnel works, the tunnel box will be cast in structural concrete. Compound No. 12 will take approximately three months to establish.

Bored Tunnels

Two TBMs will be launched and serviced from the main tunnelling worksite at Albert College Park as described in Section 6.5.3.10. It is expected that the bored tunnels will take some three to four years to complete, depending on the ground conditions encountered.

Griffith Avenue Stop

Construction of Griffith Avenue Stop will commence with the installation of piled walls down to rock level around the perimeter of the stop box. The ground within the box will then be excavated. Construction traffic routes to the stop will be via Griffith Avenue and Ballymun Road. A new access will be constructed onto Griffith Avenue to avoid damaging the Avenue trees.

On completion of the stop structure, the electrical and mechanical fit out (including major equipment such as transformers, lifts and escalators) can proceed, followed by architectural finishes. Construction of Griffith Avenue Stop will take two to three years to complete, before testing and commissioning can commence.

St. Patrick's College Ventilation Shaft

Initial work at this shaft will involve earthworks and the construction of a reinforced retaining wall to create a working area. A piled wall to rock head level will be installed around the circumference of the shaft, and excavation will proceed to track level. The cross passages at the foot of the shaft and the emergency crossover caverns north of the shaft may be excavated from the shaft. Construction traffic will access and leave the site via Millmount Avenue and Drumcondra Road. The shaft internal structure will be installed, and the building walls formed in in-situ structural concrete. Mechanical and electrical plant will then be fitted. Construction of the shaft at St. Patrick's College will take approximately 30 months.

Drumcondra Stop

Initial work at this stop will include the demolition of existing buildings within the stop and hoardings will be erected along site boundaries to minimise disruption to residents. A site access will be created onto Drumcondra Road Lower opposite Clonliffe Road.

Construction of Drumcondra Stop will commence with the installation of a piled wall down to rock level around the perimeter of the stop box. At the north and south ends of the box the piles will be extended into rock to the base level of the stop. The ground within the box will then be excavated. Construction traffic will access the site via the Port Tunnel and Clonliffe Road, and leave via Drumcondra Road Lower. On completion of the stop structure, the electrical and mechanical fit out (including major equipment such as transformers, lifts and escalators) can proceed, followed by architectural finishes.

Construction of Drumcondra Stop will take two to three years to complete, before testing and commissioning can commence.

Mater Stop

As detailed in Section 6.5.3.2 the Mater Stop is to be constructed by RPA as an enabling works package in advance of the main construction contract.

Construction of Mater Stop will commence with the installation of piled or diaphragm walls down to rock level around the perimeter of the stop box. The ground within the box will then be excavated. Construction traffic will access the site via Eccles Street and leave via North Circular Road, Dorset Street and Drumcondra Road.

On completion of the stop structure, the electrical and mechanical fit out (including major equipment such as transformers, lifts and escalators) can proceed, followed by architectural finishes.

Construction of the Mater Stop will take two to three years to complete, before testing and commissioning can commence.

6.5.4.7 Construction activities specific to Area MN107

Works proposed in Area MN107 include the construction of bored tunnels, three underground stops at Parnell Square, O'Connell Bridge and St. Stephen's Green and a tunnel loop under St. Stephen's Green.

Parnell Square Stop

Following establishment of hoardings around the site area, piled walls will be installed to form the main stop structure. A bus lane will continue in operation along the east side of Parnell Square East. Extensive grouting of the ground and the soil rock interface will be required to reduce ground water flow into the excavation. Grouting will be undertaken by sinking small diameter holes allowing site mixed grout to be pressure injected into the ground.

A temporary steelwork construction deck will be installed spanning the walls to provide working space, and the ground within the box will then be excavated in stages. Construction traffic will access the site via Drumcondra Road, Gardiner Street and Parnell Street, and leave via Dorset Street and Drumcondra Road.

The permanent stop floor and roof slabs will be cast in structural concrete. On completion of the stop structure, the electrical and mechanical fit out (including major equipment such as transformers, lifts and escalators) will proceed, followed by architectural finishes. It is expected that the construction of Parnell Square Stop will take two to three years to complete, before testing and commissioning can commence.

O'Connell Bridge Stop Entrance Boxes

As detailed in Section 6.5.3.2 enabling works will be undertaken to remove substations, utilities and cultural heritage features from the vicinity of the works. Traffic diversions will be implemented and hoardings erected around the worksites. Traffic diversion measures will include the erection of a temporary bridge across the River Liffey between Marlborough Street and Hawkins Street to facilitate the movement of buses and pedestrians. This bridge will be supported on piles anchored into limestone bedrock in the bed of the River Liffey. A 30m length of the River Liffey downstream of the O'Connell Street Bridge will be decked over to provide working area for the contractor in the City centre.

Piled walls will be installed to rockhead around the perimeter of the north box on O'Connell Street and the south box on Westmoreland Street. Traffic and pedestrian diversions will be operated around these works, maintaining two traffic lanes northbound over O'Connell Bridge, and one southbound. Footways will not be less than 3m wide.

A temporary steelwork construction deck will then be installed between the piled walls to provide a working platform. The ground within the boxes will then be excavated in stages. Construction traffic will access the site via the North Quays, Lombard Street and Pearse Street and leave via D'Olier Street and Tara Street.

Grouting of the soil rock interface will be required to reduce ground water flow into the excavation. Grouting will be undertaken as described for Parnell Square Stop. Excavation in rock layers will proceed and the permanent stop base, walls and floor slabs will be cast. On completion of the stop structure, the electrical and mechanical fit out (including major equipment such as transformers, lifts and escalators) can proceed, followed by architectural finishes. Finally, surface finished to roads and footways will be completed.

O'Connell Bridge Stop Platform Tunnels

Excavation of the tunnels will be undertaken independently of the remainder of this stop. A 5m metre diameter shaft will be sunk from the surface worksite. Similar to all underground stops the TBMs will be winched through the stop, and a structural concrete track slab laid and track, overhead catenary systems and control systems fitted. Architectural and electrical finishes will then be installed on the platforms. Construction of all elements of the O'Connell Bridge Stop will take four years to complete, which is the longest single task in the overall construction phase.

St. Stephen's Green Stop

As at O'Connell Bridge Stop, enabling works will be undertaken to remove cultural heritage features from the vicinity of the works. The northwest pond will be drained and the Pulham Rock features removed. Physical features will be stored and re-instated on completion of the work. Hoardings will be erected around the worksite to protect the remaining parts of the Green. Work on this stop will commence with the installation of a piled wall to rock head level around the outline of the stop, and will then proceed in two parts: the concourse box, and the main stop box.

The concourse box will be excavated to roof level, and the roof slab cast in concrete. Excavation of the concourse will then proceed beneath the slab. Floor slabs will be cast as they are encountered. This method of construction will allow the early return of the roads around the Green to public use.

The main stop box will be excavated to base slab level. Walls, and floor and roof slabs will then be cast, working from the bottom up. Excavation will continue beneath the main box to form the westbound tunnel of the proposed Irish Rail Interconnector, and the invert of the running tunnels north of the concourse will be excavated out to form voids for the eastbound interconnector tunnels.

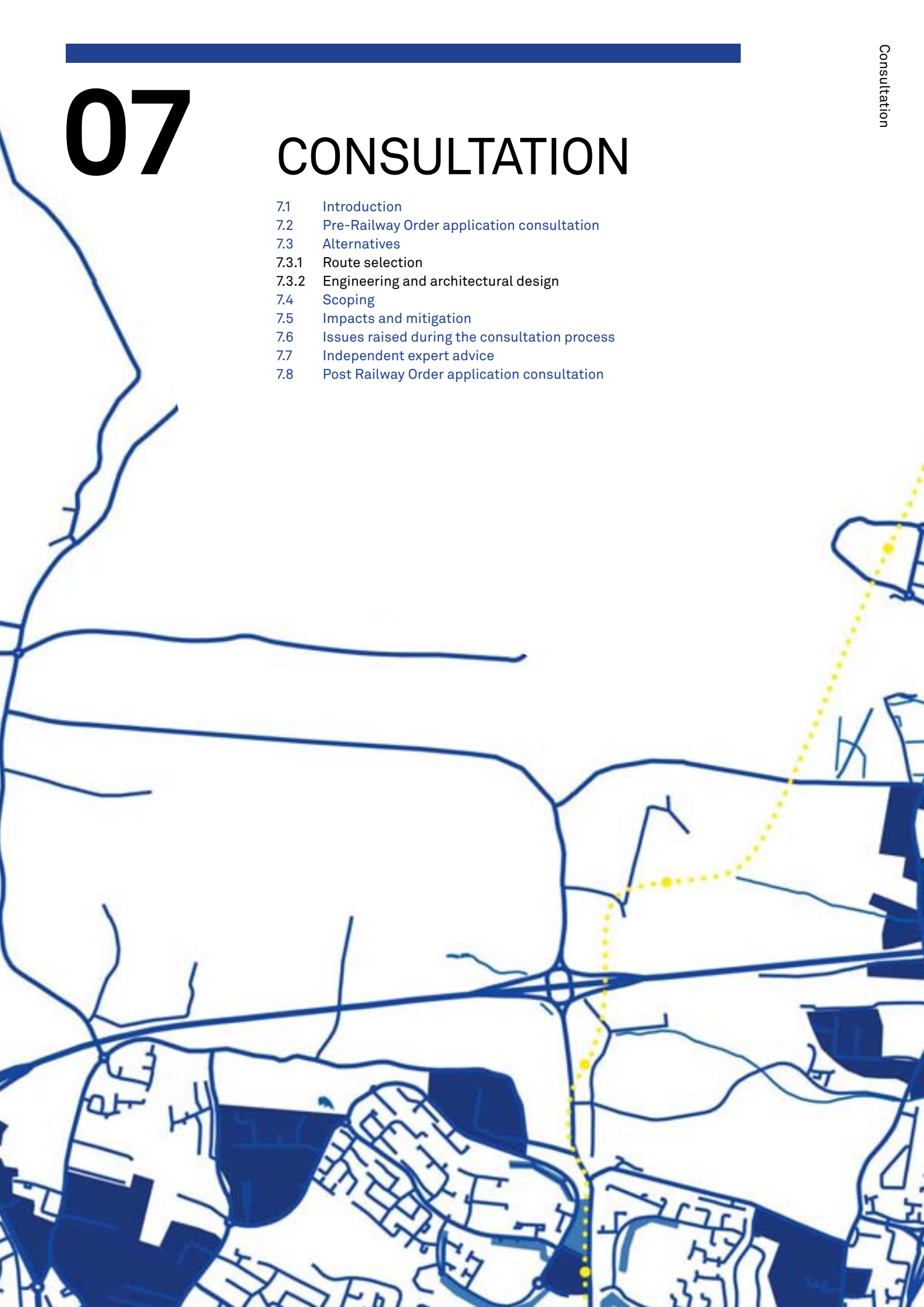
Construction traffic will access the site via the North Quays, Lombard Street, Westland Row, Merrion Square North, Fitzwilliam Street, Leeson Street Lower and St. Stephen's Green, and leave via Dawson Street, Nassau Street, Westland Row, Pearse Street and Tara Street.

The turn back loop tunnel will be excavated and upon completion of the stop and tunnel structure, a structural concrete track slab will be laid, and track, OCS and control systems fitted. On completion of the stop structure, the electrical and mechanical fit out (including major equipment such as transformers, lifts and escalators) can proceed, followed by architectural finishes. Construction of the St Stephen's Green Stop will take approximately three years before testing and commissioning

07

CONSULTATION

- 7.1 Introduction
- 7.2 Pre-Railway Order application consultation
- 7.3 Alternatives
 - 7.3.1 Route selection
 - 7.3.2 Engineering and architectural design
- 7.4 Scoping
- 7.5 Impacts and mitigation
- 7.6 Issues raised during the consultation process
- 7.7 Independent expert advice
- 7.8 Post Railway Order application consultation





Consultation is an important element of the Environmental Impact Assessment (EIA) process. This chapter of the EIS has been prepared in order to record the consultation carried out in respect of this proposed scheme.

7.1 INTRODUCTION

RPA has carried out extensive consultation in relation to the proposed scheme with members of the public, including residents, businesses, institutions, representative individuals and organisations, statutory bodies and bodies with environmental responsibility and interest. The objective of the consultation is to ensure that the views and concerns of all are taken into account in the EIA process.

This chapter outlines the consultation initiatives taken by RPA and ERM prior to the Railway Order application and the main issues identified during this process. Consultation is an ongoing process and will continue right through the planning process (post Railway Order application) and for the life of the project.

An outline of stakeholder and public consultation is detailed in Table 7.1 to Table 7.5.

7.2 PRE-RAILWAY ORDER APPLICATION CONSULTATION

RPA has consulted widely with the public in relation to the proposed scheme, including consulting with residents, residents' associations, businesses, business representative bodies and elected representatives. Statutory stakeholders and bodies with environmental responsibility and interest and other interested parties were also consulted in relation to the proposed scheme. Consultation focused on the following topics:

- Alternatives: This focused initially on route corridor options and then progressed to proposed stop locations, detailed tunnel alignment, and associated infrastructure design and location.
- Scoping: The environmental impact statement (EIS) scoping exercise represented the beginning of the environmental assessment for the emerging preferred route corridor. The purpose of the scoping exercise was to establish the scope and methodology for the EIS and to provide the public and relevant bodies with environmental responsibility and other interested parties with information on the proposed scheme and to invite their input to the EIA process.
- Impacts and mitigation: Where the potential for significant effects was identified detailed consultation with key stakeholders was undertaken to minimise the effects.

Consultation evolved with the project design and environmental assessment from general topics to more specific topics as the design of the proposed scheme progressed. Various approaches were used to facilitate consultation on the project. These included:

- Newsletters direct to peoples' homes including free post comment cards;
- Open days in local civic centres, community halls and hotels;
- Meetings with residents' associations, businesses, schools, sporting clubs and other groups;
- Public meetings;
- Direct correspondence and meetings with individual residents;
- Detailed discussions and workshops with statutory stakeholders and bodies with environmental responsibility;
- Written correspondence including letters, emails and faxes;
- Presentations and detailed discussions with local public representatives;
- RPA website, including maps, drawings, newsletters, responses to frequently asked questions (FAQs), and an e-mail address to facilitate questions and information requests;
- Freephone telephone – receiving and answering queries from residents, businesses and local representatives;
- Direct mailshots to persons on the RPA contact database (which includes over 1,666 subscribers in relation to Metro North);
- Press releases and updates to local and national media outlets;

7.3 ALTERNATIVES

7.3.1 Route selection

On 28 February 2006 Mr Martin Cullen TD, Minister of Transport, launched the consultation process for the proposed scheme from the city centre to Dublin Airport and Swords. This consultation process ran parallel with technical and environmental studies to evaluate route options being considered and to determine the overall best route corridor. The consultation initiative included the publication of a newsletter outlining three different route options under consideration (the 'West', 'Central' and 'East' routes). Over 100,000 newsletters were distributed to residents and businesses in the city centre and on the north side of the city within approximately 500m of any of the route options. Six open days were advertised and held at locations along the route corridors including Ballymun Civic Centre, Finglas Civic Offices, Dublin City Council Offices, Fingal County Council Civic Offices in Swords, the Great Southern Hotel Dublin Airport and the Regency Hotel. Details of the route options were displayed at the Open Days and RPA's project team was on hand to address and record issues raised by those that attended.

Statutory stakeholders and bodies with environmental responsibility and interest were also written to directly and issued with a copy of the newsletter. RPA also met with key local stakeholders that may be affected such as residents' associations, sports clubs and other representative bodies to discuss the route corridors. This consultation phase resulted in over 2,000 written submissions demonstrating overall support and a keen interest in the proposed scheme.

Consideration of this feedback led to the identification of a fourth route corridor option (the 'Alternative Central' route). This option was essentially a combination of two of the originally published options, namely the East and Central routes, and a variation of the city centre route section. The consultation feedback which led to the development of this route option included a widespread demand for very high quality interchange with the Maynooth railway line, demands for additional stops, demands for improved interchange with Luas and concerns about the impact of construction on strategic road corridors.

In June 2006 consultation in relation to this section of route corridor commenced by means of a newspaper notice in the national newspapers and the distribution of 10,000 newsletters to residents and businesses in the areas affected by the new option, particularly residents and businesses in Drumcondra.

A preferred route corridor for the proposed scheme was announced in October 2006. A newsletter outlining the preferred route corridor was distributed to 55,000 households, statutory bodies and bodies with environmental responsibility and interest inviting comment. Details were posted on the RPA website. Feedback from statutory bodies and some city centre business interests in response to the original consultation initiative suggested the inclusion of an additional stop at Parnell Square to underpin the regeneration of the area.

Accordingly, as part of the announcement of the preferred route corridor, a focused consultation initiative in relation to the introduction of an additional underground stop at Parnell Square East was launched. Further to technical and environmental feasibility studies and consultation resulting in the receipt of over 700 submissions from members of the public, local businesses and key stakeholders in favour of the proposed stop at Parnell Square East, it was confirmed in November 2006 that a Parnell Square Stop would be included as part of the proposed scheme.

7.3.2 Engineering and architectural design

Following the announcement of the preferred route corridor in October 2006 the focus of consultation moved on to more detailed engineering and architectural design issues, relating to the design of the tunnels, track layout and stops along the emerging preferred route corridor. There was significant feedback challenging some of the design proposals, in particular the vertical alignment through Ballymun, the vertical and horizontal tunnel alignment between Drumcondra and Griffith Avenue and the location of the Dublin City University (DCU) Stop. In response to this feedback RPA undertook further design, environmental assessment and consultation in relation to feasible alternatives at these locations. Further details in relation to these are presented in the Alternatives chapter of this EIS (Volume 1, Chapter 5).

7.3.2.1 Ballymun

On 11 January 2007, RPA held an Open Day in Ballymun Civic Centre to outline the feasible design alternatives and their potential environmental effects on the area. The feedback from residents and public representatives to this consultation overwhelmingly supported an underground alignment through Ballymun. This feedback was incorporated into the overall assessment. On 20 April 2007, RPA confirmed that the preferred option for the design of the proposed scheme was to run underground through Ballymun in a cut and cover tunnel from Albert College Park to north of Santry Avenue.

7.3.2.2 Drumcondra to Griffith Avenue tunnel alignment

The preferred route corridor announced in October 2006 included stops at Drumcondra and Griffith Avenue. In April 2007, drawings showing the detailed tunnel alignment design for the section of the route between these stops were made available to the public. RPA wrote to property owners directly above and within close proximity of the proposed tunnels to inform them of the location of the tunnels, the potential construction and operational impacts that might result, and the proposed mitigation measures which would be put in place. RPA requested comment from these properties directly, as they would have particular concerns which RPA were keen to address.

In response to public concerns regarding the potential impacts of tunnelling, RPA undertook extensive consultation between April and June 2007 with the communities affected by the detailed tunnel alignment. Following meetings with various local residents' associations and groups including Griffith Avenue and District Residents' Association, Iona and District Residents' Association, Hampstead Avenue & The Rise (& close surrounds) Action Group, Residents for Realignment Ltd. and Courtlands Residents' Association, RPA developed four feasible alternative tunnel alignment options for this section of the route corridor. RPA issued over 2,300 letters to households in Drumcondra in July 2007 setting out five detailed tunnel alignment options (the original design issued in April 2007 and the four alternatives) and their associated design and environmental effects. The public were invited to provide feedback to RPA. An Open Day was held on 2 August 2007 in the Regency Hotel Drumcondra to provide the public an opportunity to address specific concerns directly to members of the project team.

The feedback from residents, public representatives and key stakeholders to this consultation was varied with no consensus on a preferred option. Further to consideration of the detailed feedback and completion of the technical and environmental studies a preferred tunnel alignment was identified and announced on 10 October 2007. This was a combination of the original tunnel alignment and one of the alternative options. The assessment of the options is detailed in the Alternatives chapter of this EIS (Volume 1, Chapter 5).

Since this announcement there have been ongoing discussions with interested parties who have concerns in relation to the tunnels and the potential environmental effects associated with them. This includes consultation with Corpus Christi Girls National School; local residents and other interested parties to address their concerns.

7.3.2.3 DCU Stop

There was local opposition in relation to the proposed location and design of the DCU Stop alongside Albert College estate. In response to this RPA engaged in detailed discussions with local residents' representatives in relation to location and design of the stop. Four feasible alternative options were developed and subject to technical and environmental studies and consultation. RPA issued over 3,300 letters setting out the four options for the DCU Stop to local residents. On 13 September 2007 RPA held an Open Day in Ballymun Civic Centre to display the four options for the DCU Stop and to provide the public an opportunity to address specific concerns directly to members of the project team. Meetings were held with residents' associations representing Albert College and Ballymun Road. A number of meetings were held with public representatives of Dublin City Council's North West Area Committee. RPA also had meetings with the 177th Scout Group whose Scout Hall is in close proximity to the proposed stop at DCU.

The feedback from residents, public representatives and key stakeholders to this consultation was varied with no consensus on a preferred option. Following completion of the technical and environmental studies and consideration of the detailed feedback from consultation the preferred location and design for the DCU Stop was announced on 12 December 2007. Again over 3,300 households in the area were notified by letter of the preferred option.

Discussions are ongoing with the 177th Scout Group and the residents' associations in relation to mitigation measures.

7.3.2.4 Albert College Park

The tunnel boring launch site for the proposed scheme is Albert College Park. RPA is consulting with the sporting clubs that will be affected during the construction phase, as well as Dublin City Council.

RPA has met on many occasions with representatives from Hampstead Avenue & The Rise (& close surrounds) Action Group to ensure that their concerns in relation to construction impacts in this area are addressed. There have also been discussions with National Parks and Wildlife Service (NPWS) of the Department of the Environment, Heritage and Local Government in relation to potential construction impacts.

7.3.2.5 Swords

In November 2007 two information open days were advertised and held in the Pavilions Shopping Centre in Swords. Public reaction at these open days was positive.

Following these open days, RPA met with residents of Carlton Court to discuss their concerns about the possible impacts of the elevated track sections in this area. Discussions are ongoing in relation to mitigation measures.

7.3.2.6 Removal of footbridge at Estuary Roundabout

Several meetings have been held with Fingallians GAA Club to discuss their concerns in relation to the reconfiguration of the Estuary Roundabout and the removal of the footbridge. Discussions are ongoing in relation to mitigation measures.

7.3.2.7 Belinstown Depot and Park & Ride facility

Individual meetings have been held with residents of Batter lane who are living in close proximity to the proposed depot and Park & Ride facility. Feedback was generally positive and concerns regarding potential flooding, increased traffic and illegal parking in the area and visual impact are assessed as part of this EIA.

7.3.2.8 City centre businesses

From the earliest stages RPA has consulted with the various business associations about plans for the proposed scheme in the city centre. Dublin City Business Association, Dublin Chamber of Commerce and the North City Business Association have all contributed to the consultation process as well as the Dublin branch of the Irish Hotel Federation.

Several meetings and presentations have taken place between RPA and business representatives and the views of the business community have been taken into account in the design process. The business community want to ensure that footfall is maintained to their premises and that city centre car parks remain open. They also want to ensure that working hours do not impact negatively on their customers whether they are shoppers, guests staying in hotels or students attending classes. Discussions are ongoing in relation to specific mitigation measures

RPA has also met with individual businesses in close proximity to the stops at Stephens Green, O'Connell Bridge and Parnell Square East in order to identify their specific concerns about access and deliveries during construction.

7.4 SCOPING

Following the identification of the preferred route corridor for the proposed scheme a draft EIS Scoping Report was prepared and issued to all prescribed bodies as set out in the Guidelines on the Information to be contained in Environmental Impact Statements, EPA 2002. The Scoping Report was also made available to the public on the RPA website (www.rpa.ie/Metro) for comment and was communicated through the October 2006 Metro North newsletter. The aim of this consultation initiative was to identify the issues and emphasis that are likely to be important during the EIA process and to eliminate those that are not, as well as providing the opportunity for exchange of views at an early stage when there is still flexibility in the design of the development. During the scoping stage the likely potential impacts of the proposed scheme and the appropriate methods by which to evaluate environmental topics prior to the commencement of data collection and assessment were also determined.

In December 2006 an EIS scoping workshop was held with representatives of some of these statutory bodies to agree the proposed approach to the EIA for the proposed scheme including:

- The Department of the Environment, Heritage and Local Government (DoEHLG);
- Dublin City Council;
- Fingal City Council;
- An Taisce;
- Bord Gais;
- Eircom;
- Dublin Airport Authority (DAA);
- Dublin Port Authority;
- Dublin Transportation Office;
- Geological Survey of Ireland;
- The Irish Aviation Authority;
- National Roads Authority;
- The Office of Public Works (OPW).

The main focus of this workshop was on the environmental topics which were to be assessed as part of the EIA, allowing the opportunity for views to be put forward on such topics as heritage, traffic, human beings, noise and vibration, material assets (non agricultural property, landuse, and utilities), ecology, landscape and visual, air quality, water quality and design issues.

Feedback from these initiatives was incorporated into the Final Draft Scoping Report dated February 2008. The EIS is the primary document which will emerge from the ongoing EIA.

7.5 IMPACTS AND MITIGATION

During 2007 and 2008, the EIA progressed with engineering and architectural design the assessment of the likely environmental impacts and consultation with the public, statutory bodies and bodies with environmental responsibility and interest. Ongoing consultation was an integral part of the EIA process and the development of detailed design of the route to determine the likely acceptability of the residual effects. Particular attention was given to parties with significant interface with the proposed scheme including such parties as Local Authorities, the DoEHLG, the OPW, Irish Rail and the DAA. There was significant consultation with these bodies during 2007 and 2008 to inform the design and thus ensure that the potential for negative environmental effects was minimised via design optimisation.

Pre-application consultation meetings were also held with An Bord Pleanála (ABP) in accordance with statutory requirements. The record of these meetings forms part of the public file held by ABP.

7.6 ISSUES RAISED DURING THE CONSULTATION PROCESS

Consultation is ongoing and further initiatives are planned as the project progresses. A summary of some of the issues raised to date during consultation are outlined below and all are dealt with in this EIS

- Human Beings: Consultees raised concerns over the impact of the proposed scheme on local business, in particular those in Parnell Square East. This is dealt with in the Human Beings: Socio-economic chapter of this EIS (Volume 2, Chapter 3).
- Human health. Concerns have been raised in relation to the potential for negative health effects associated with the proposed scheme, in particular during the construction phase. In response to this RPA appointed a public health specialist to complete a health assessment for the proposed scheme and this is detailed in the Human Health chapter of this EIS (Volume 1, Chapter 8).
- Material assets including non agricultural property and utilities and human beings:
 - landuse: The potential for negative effects on existing utilities; access difficulties to cables under the track; and the possible need to divert gas mains along the route and near the stops was noted. Concerns were also raised in relation to the potential impact on the existing navigation systems located at Dublin Airport. Changes in landuse that may develop as a consequence of the proposed scheme and any required landtake was also requested to be considered. These concerns are addressed within the Landuse, Non Agricultural Property and Utilities chapters of this EIS (Volume 2, Chapters 2, 16 and 17 respectively).

- Noise and vibration impact during construction of tunnels and stops and during operations: Concerns have been raised in relation to the potential for nuisance and disturbance associated with the proposed scheme due to noise and vibration. This is dealt with in the Noise and Vibration chapters of this EIS (Volume 2, Chapters 4 and 5 respectively).
- Landscape and visual: Concern was raised in relation to the potential visual impacts resulting from elevated structures, lighting, and the entrances to the stops. This is dealt with in the Landscape and Visual chapter of this EIS (Volume 2, Chapter 13).
- Air: Concern was raised in relation to the potential for negative effects on air quality due to the generation of dust and removal of spoil during the construction of the proposed scheme. This is dealt with in the Air and Climatic Factors chapter of this EIS (Volume 2, Chapter 12).
- Ecology, flora and fauna: The potential to negatively effect hedgerows, nesting birds, badgers, bats and the Broad Meadow Estuary, which feeds the Malahide Estuary (an SAC, SPA and pNHA) was raised as a concern, as well as the loss of trees. This is dealt with in the Flora and Fauna chapter of this EIS (Volume 2, Chapter 8).
- Water: Concern was raised in relation to the potential impact of groundwater drawdown, ingress, settlement and pollution. It was suggested that best practice measures be implemented to ensure that only clean, uncontaminated surface water and storm water run-off is allowed to enter the River Tolka and the Royal Canal during the construction phase. It was also suggested that any culverts or bridges do not impact salmonid species and that the riparian habitat integrity is protected throughout the life of the proposed scheme. This is dealt with in the Surface Water and Groundwater chapters of this EIS (Volume 2, Chapters 10 and 11 respectively).
- Increased traffic and parking congestion: Traffic and parking congestion is a problem for some residents along the proposed route and they are concerned that the presence of stops will intensify this problem. There potential traffic disruption associated with construction of the proposed scheme in particular in the city centre was a concern noted by many parties. This is dealt with in the Traffic chapter of this EIS (Volume 2, Chapter 7).
- Buses, Pedestrians and Cyclists Impacts on bus routes and services, and pedestrian and cycle arrangements were raised as a concern for both the construction and operational phases. This is dealt with in the Traffic chapter of this EIS (Volume 2, Chapter 7).
- Property damage. Residents living directly above the tunnels are particularly concerned about the impact of tunnelling on their properties. This is dealt with in the Soil and Geology chapter of this EIS (Volume 2, Chapter 9).
- Property value. A number of residents have raised concerns that the value of their property will fall as a result of the proposed scheme. This is dealt with in Non Agricultural Property chapter of this EIS (Volume 2, Chapter 16).
- Anti-social behaviour at stops. Concerns have been raised that stops will attract anti-social behaviour. This is dealt with in the Human Health chapter of this EIS (Volume 1, Chapter 8).
- Property acquisition. Discussions have taken place with all the owners of properties which may have to be acquired to facilitate the proposed scheme. These discussions were of a sensitive nature requiring one to one meetings. RPA understands the severity of the situation for the property owners in question and has therefore offered to begin early negotiations if requested so as to allow them time to find alternative accommodation and adjust to this life changing situation.
- St. Stephen's Green. The potential for negative effect on Stephen's Green was raised and this is dealt with in the Flora and Fauna, Material Assets: Archaeology, Architectural Heritage and Cultural Heritage chapters of this EIS (Volume 2, Chapters 8 and 15 respectively).

To conclude, at each and every phase of the consultation process RPA has been willing to consult with interested parties in an open and professional manner. Public dialogue is a core activity of the Agency which will help deliver a first class transport system for and supported by the public. Further initiatives are planned.

7.7 INDEPENDENT EXPERT ADVICE

During the consultation process with residents in the areas of the proposed scheme where tunnelling is planned, RPA was requested to provide independent engineering advice to the residents. RPA agreed to provide this advice and appointed O'Connor Sutton Cronin consulting engineers to prepare a report for residents assessing the impacts of the tunnel alignment options in Drumcondra. This report was made available to all residents' associations and representative groups in time to support their responses to the consultation process on these options.

RPA has also agreed to provide an Independent Engineering Expert to advise interested residents groups along the entire alignment in relation to the design of the proposed scheme and EIS.

7.8 POST RAILWAY ORDER APPLICATION CONSULTATION

Consultation relating to the proposed scheme does not stop at the submittal of the EIS to ABP but will continue for some time thereafter. This EIS accompanies an application for a Railway Order (including plans of any works to be carried out under it) and will be put on public display for a minimum of 6 weeks. Notices of the application are required to be placed in newspapers and RPA writes to property owners and occupiers affected by the application. All the application documents will be placed on display at ABP and at RPA's offices in Parkgate St, Dublin 8 as well as being available to view on the RPA website.

Once RPA has published newspaper notices of the Railway Order application and put the documents on public display, interested persons may make written submissions to ABP with any views they may have on the application.

ABP may hold a public oral hearing in relation to any Railway Order application made by RPA. As well as writing to ABP as outlined above, members of the public can come to an oral hearing and express their views to the ABP inspector.

As part of the oral hearing process ABP must consider any submissions made to it. It will also consider the EIS submitted as part of the application. If ABP decides to make a Railway Order, newspaper notices of this decision are published and copies of the order or relevant extracts from it will be sent to affected persons, including property owners and occupiers. The order made will also be available for the public to view at RPA's offices.

Table 7.1 Metro North Consultation Newsletters

Date	Newsletters / Updates	Recipients	Total Sent	Submissions
February 2006	Dublin Metro North Newsletter Route Selection	Residents	100,000	2094
June 2006	Dublin Metro North Public Notice	Residents & Newspapers	10,000	N/A
October 2006	Dublin Metro North Newsletter Selected Route	Residents	55,000	N/A
October 2006	Dublin Metro North Parnell Square Stop	Residents	55,000	761
January 2007	Dublin Metro North Ballymun Open Day	Residents & Stakeholders		
April 2007	Dublin Metro North Griffith Avenue to Homefarm Rd Alignment Letter	Residents within 30m of tunnels	713	N/A
Summer 2007	Dublin Metro North Borehole Notices	Residents & Businesses		N/A
June 2007	Dublin Metro North Drumcondra / Griffith Avenue	Residents & Stakeholders	2,322	N/A
July 2007	Dublin Metro North Drumcondra Alignment Options & Open Day Notice	Residents, Stakeholders & Database Members	3,314	330
August 2007	Dublin Metro North DCU Stop Options Letter & Open Day Notice	Residents, Stakeholders & Database Members	3,334	459
October 2007	Dublin Metro North Mater to Parnell Tunnel Alignment	Residents & Stakeholders	1,105	N/A
October 2007	Dublin Metro North Announcement of Preferred Alignment in Drumcondra	Residents, Stakeholders & Database Members	3,666	N/A
October 2007	Dublin Metro North Independent Expert	Residents Associations	13	5
December 2007	Dublin Metro North DCU Stop Announcement	Residents, Stakeholders & Database Members	3,680	N/A
April 2008	Dublin Metro North Albert College Glasnevin	Residents	257	5
July 2008	Dublin Metro North Invitation	Residents Stakeholders & Database Members	80,000	N/A

Table 7.2 Metro North Press Releases

Date	Press Release
28 February 2006	Metro North Launch
June 2006	Route Alternative
June 2006	The Big Dig
October 2006	Chairman's Statement
October 2006	Route Announcement
December 2006	Ballymun Design Options
21 December 2006	Procurement Process
22 March 2007	Metro North goes to Tender
13 September 2007	Tender Shortlist
12 November 2007	Qualified Bidding Groups
13 May 2008	Qualified Bidding Groups
July 2008	Metro North Open Days

Table 7.3 Metro North Open Days

Open Days	Date Held	Location
Metro North Route Options	28 March 06	Ballymun Civic Centre
Metro North Route Options	30 March 06	Fingal Co Co Offices
Metro North Route Options	03 April 06	DCC Wood Quay Offices
Metro North Route Options	05 April 06	Regency Hotel
Metro North Route Options	07 April 06	Finglas Civic Offices
Metro North Route Options	10 April 06	Great Southern Hotel Dublin Airport
Ballymun Section	11 January 07	Ballymun Civic Centre
Drumcondra Alignment Options	02 August 07	Regency Hotel
DCU Stop Options	13 Sept 07	Ballymun Civic Centre
Ballymun Regeneration	08 Nov 07	Ballymun Civic Centre
Swords Awareness Campaign	15 Nov 07	Pavilions Shopping Centre
Swords Awareness Campaign	22 Nov 07	Pavilions Shopping Centre
Pre Railwayorder Order Application	15 July 2008	Mater Centre for Nurse Education
Pre Railwayorder Order Application	17 July 2008	Regency Hotel
Pre Railwayorder Order Application	27 July 2008	Ballymun Civic Centre
Pre Railwayorder Order Application	29 July 2008	DCC Wood Quay Offices
Pre Railwayorder Order Application	31 July 2008	Fingal Co Co Offices

Table 7.4 Metro North Consultation - Residents Associations Meetings (as of June 2008)

Residents Associations Meetings	2006	2007	2008
Albert College Residents Association (ACRA)	-	3	1
Ballymun Road Area Association (BRAA)	1	2	2
Ballymun Regeneration	2		-
Blessington Court Residents Association (BLEND)	-	1	-
Courtlands Residents Association	1		-
Griffith Avenue & District Residents Association (GADRA)	3	4	-
Glengarriff & District Residents Association	-	1	-
Hampstead Avenue & The Rise (& close surrounds) Action Group	-	3	-
Iona & District Residents Association (IADRA)	2	1	-
Residents for Realignment (RfR)	-	7	-
Valentia Road Residents (ROTO)	-	2	1

Table 7.5 Metro North Consultation Meetings

Other Meetings	Other Meetings
Albany Homes	Department of Agriculture, Fisheries and Food
Ambassador Theatre	Department of Communications, Energy and Natural Resources
An Garda Síochána	Department of the Environment, Heritage and Local Government (DoEHLG)
An Post	Department of Transport
An Taisce	Dublin Airport Authority Plc.
Ballymun Regeneration Ltd.	Dublin Bus
Bank of Ireland	Dublin Chambers of Commerce
Boird Gáis Distribution	Dublin City Business Association
Bord Gáis Éireann (Irish Gas Board)	Dublin City Council
Brown Thomas	Dublin City Development Board
Bus Éireann	Dublin Deaf Association
Carroll's Irish Gift Store	Dublin Dockland Development Authority
Cassidys Pub	Dublin Fire Brigade
Catholic Institute for the Deaf	Dublin Port Company
Chamber of Commerce	Dublin Regional Authority
Córas Iompair Éireann (CIE)	Dublin Tourism
Corpus Christi Girls National School	Dublin Transportation Office (DTO)
	Dunnes Stores

Table 7.5 Metro North Consultation Meetings (continued)

Other Meetings

Easons
Eastern Regional Fisheries Board
Eircom
Electricity Supply Board (ESB)
Emmaus Centre
F & C Ireland
Fingal County Council
Fingallians Football Club
Fitzwilliam Hotel
Gaiety Theatre
Health Services Executive
Heritage Council
Iarnród Éireann
Irish Aviation Authority
Irish Georgian Society
Irish Life Investment Managers
Irish Times Building D'olier Street
Irish Times Training
John Spain & Associates
Lidl
Liffey River Cruises
Mater Public Meeting
Na Fianna
National Council of the Blind
National Disability Authority
National Monuments Section (DoEHLG)
National Museum of Ireland
National Parks and Wildlife Services (DoEHLG)
National Roads Authority
National Taxi Drivers Union
Nethercross Holdings
North West Area Committee

Other Meetings

O'Scanail Veterinary
Office of Public Works
Our Lady of Victories Church
Quinn's Pub
Royal College of Surgeons
Scouts Group
St. Joseph's CBS Marino
St. Laurence O'Toole Trust
Stephens Green Shopping Centre
Tara Winthrop Private Clinic
Texaco Garage
The Belvedere Hotel
The Fleet Street Hotel
The Tanning Shop
The Traveller Community
The Westin
Treasury Holdings
Waterways Ireland
Whelan Corcoran Smith

08

HUMAN HEALTH

- 8.1 Introduction
- 8.2 Methodology
 - 8.2.1 Introduction
- 8.3 Study area
- 8.4 Consultation
- 8.5 Hazard evaluation/literature review/impact assessment
- 8.6 Potential health impacts of noise
 - 8.6.1 Noise-induced hearing impairment
 - 8.6.2 Interference with speech communication
 - 8.6.3 Schools
 - 8.6.4 Sleep disturbance
 - 8.6.5 Cardiovascular and physiological effects
 - 8.6.6 Mental health effects and effect on performance
 - 8.6.7 Effects of noise on residential behaviour and annoyance
- 8.7 Potential health impacts of vibration (including groundborne noise)
- 8.8 Potential health effects of radon (soil and geology)
- 8.9 Potential health effects of electromagnetic interference and radiation
- 8.10 Potential human health impacts of construction/operational dust (air quality)
- 8.11 Potential psychosocial health effects (human beings)
- 8.12 Other potential impacts on human health
 - 8.12.1 *Aspergillus fumigatis*
- 8.13 Leptospirosis (Weils disease)
- 8.14 Groundwater and surface water
- 8.15 Landfill sites
- 8.16 References



The World Health Organisation (WHO) defines health as complete physical, psychological and social wellbeing and not simply in terms of absence of disease or infirmity.

8.1 INTRODUCTION

RPA has carried out extensive consultation in relation to the proposed scheme (as detailed in the Consultation chapter of this EIS (Volume 1, Chapter 7)). The objective of the consultation is to ensure that the views and concerns of all are taken into account in the Environmental Impact Assessment (EIA) process. Concerns have been raised in relation to the potential for negative health effects associated with the proposed scheme, in particular during the construction phase. In response to this RPA appointed an environmental health specialist to complete a health assessment for the proposed scheme and this is detailed below.

The World Health Organisation (WHO) defines health as complete physical, psychological and social wellbeing and not simply in terms of absence of disease or infirmity.

Prior to compiling this chapter, a number of guidelines and policy documents were reviewed including:

- Guidelines on the information to be contained in Environmental Impact Statements EPA 2002;
- Advice notes on current practice (in the preparation of EIS) EPA 2003;
- Quality and Fairness, a Health System for you (Department of Health and Children 2001).

8.2 METHODOLOGY

8.2.1 Introduction

There are two possible approaches that can be used to assess the possible health effects of a project such as this.

Method 1:

- Assess the environmental baseline in terms of existing conditions, for example by measuring existing levels of contaminants in the air;
- Then examine how these existing conditions will change due to emissions or influences associated with the construction and operational phases of the project;
- Finally estimate the resulting effects on human health, paying particular attention to vulnerable receptors such as hospitals, schools, nursing homes and elderly persons.

Method 2:

- Assess the human health baseline identifying in particular vulnerable groups and estimating possible effects of probable emissions;
- Then examine how this could potentially change due to emissions from the construction and operational phases of the project.

Both methods depend on knowledge of the likely emissions and the potential health effects associated with these emissions. The apparent suitability of Method 2 is that it puts human health as the central study issue. When the practicalities are examined there are however great difficulties with this approach. Some of the main drawbacks are due to the fact that baseline data on human health for a defined geographical study area is very difficult to obtain and that which can be obtained may not be reliable or scientifically sound.

For example any baseline assessment would seek to quantify baseline levels of major human health conditions such as cancer and other relevant conditions such as asthma or cardiovascular disease.

When one begins to look for this data it is quickly evident that there are difficulties in obtaining such data. For most conditions no reliable data, in an accessible form, exists and where it exists there are inadequacies.

For cancer, reasonably reliable data exists as diagnosis is based on firm diagnostic criteria such as, for example, histological confirmation. There is a national data base maintained by the National Tumour Registry however it is not possible to extract data on a precise geographical basis such as 500 meters either side of a proposed line and in addition the data does not contain all relevant detail such as person's previous residence which may be where exposure to the causative agent was.

Other conditions can cause even more difficulties. For example, estimations of community prevalence of asthma may be very unreliable as they may depend more on the readiness of local doctors to diagnose the condition rather than on actual occurrence. However if one only includes clinically proven cases diagnosed by specialist centres one may miss out on the greater number in the prevalence of the conditions.

Baseline environmental analysis is by comparison a fairly exact science. Measurements particularly when they are taken over a period of time in a number of different sites can give a very detailed understanding of the baseline environment. Modelling for potential changes in this baseline environment caused by potential emissions is also reliable. Health thresholds for environmental agents are levels below which we do not expect any detrimental health effects. Organisations such as the World Health Organisation have issued and continue to review health based environmental guidelines, for example, Air Quality Guidelines (AQGs). This means we can reliably extrapolate from potential changes in environmental conditions to potential impacts on human health. The use of this method therefore has the benefit of providing a more reliable method of assessment for a project such as the proposed scheme.

It is true to say it is difficult to measure potential effects not directly affected by emissions, such as social well being. However the assessment of these areas is more subjective regardless of the method chosen and at any rate the vast majority of possible detrimental effects are related to emissions.

For these reasons, Method 1, which refers to the environmental baseline, will be used in this assessment of the potential impacts of the proposed scheme on human health. It is of note that the Health Service Executive has endorsed the use of this methodology with respect to the proposed scheme.

The following steps were taken in the Human Health evaluation:

- (a) Identification of the study area and characterisation of the baseline environment with the identification of sensitive populations and receptors;
- (b) Consultation with interested parties;
- (c) Literature search to identify issues identified with similar projects elsewhere;
- (d) Analysis of predicted residual changes, after mitigation, in the environment attributable to the construction and operational phases of the proposed scheme;
- (e) Proposal of additional mitigation measures where applicable.

When the potential effects on human health of any emissions are assessed, amongst the most important factors to be considered are, the number of people who may be exposed, the duration of that exposure and the vulnerability or sensitivity of those individuals to those emissions.

Residential areas, public and private health facilities, workplaces, commercial areas and educational facilities are particularly important because significant numbers of persons usually spend significant time at these locations.

Places of worship and recreational areas are also important because of the significant numbers but the fact that people usually spend less time in these places may be relevant for some emissions.

Agricultural areas usually have limited numbers of people present and for a limited time but farm residences themselves are considered like any other homes.

The sensitivity of an area in this context refers to the vulnerability of the population. Vulnerable persons include the sick, the very young or old. Receptors that are considered to be very highly sensitive include health care facilities, both public and private, as these are more likely to include the elderly, ill or infirm. Sensitive receptors also include schools due to the presence of children. When health impacts are assessed particular attention must be given to these sensitive groups.

8.3 STUDY AREA

The potential effects of any emissions are related to the level or dose of those emissions. The highest level will be closest to the proposed scheme and will nearly always decrease with increasing distance. Indeed for many possible emissions, for example noise and vibration, the effects are likely to be confined within 50-100metres of the proposed scheme. Some impacts such as air quality or effects due to traffic may have wider borders. Different chapters within the EIS have used different study areas for that reason. The study areas used in the different chapters have also been used in the Human Health assessment for that particular impact.

8.4 CONSULTATION

Extensive consultation has already taken place with members of the public and the Health Service Executive (HSE) and Institute of Public Health.

In particular the methodology of this human health assessment was discussed with the HSE, that is, making the assessment based on potential changes in the environment. They were supportive of this approach. In addition they identified the major social benefits for the scheme in general when operational.

Consultation with the public included open meetings, representations from public representatives and follow up meetings with specific interest groups on request, for example a board of management of a school. This process identified many areas of concern to them.

Amongst the health effects identified as being of concern during the construction phase were:

- Noise;
- Vibration;
- Electromagnetic Fields (EMF);
- Dust;
- Traffic;
- Rodent numbers – disturbance of the population;
- Potential for exposure of hazardous materials e.g. old landfills.

Amongst the health effects identified as being of concern during the operational phase were:

- Noise;
- Vibration;
- Electromagnetic Fields (EMF);
- Suicide;
- Violence.

8.5 HAZARD EVALUATION/LITERATURE REVIEW/IMPACT ASSESSMENT

In addition to the subjects identified by consultation, an initial literature search was carried out to identify other potential health effects associated with railway schemes similar to the proposed scheme. Particular attention was given to issues which have arisen in the Luas project, which while somewhat different still had great similarities to the proposed scheme.

As a result of the consultation phase and initial literature search, the following human health topics were assessed. The list is not meant to be exhaustive but rather identifies key areas of study. It is worth noting that all relevant environmental topics as detailed in Volumes 1 and 2 of this EIS were reviewed in this context. Only those topics with the potential to affect human health are discussed here. These include physical, psychosocial, chemical and biological hazards.

Physical hazards

- Noise (including nuisance noise);
- Vibration (including nuisance vibration);
- Air Quality (including construction dust);
- EMC (including radiation and magnetic interference);
- Soil and Geology (including radon).

Psychosocial hazards

- Human Beings (including nuisance, violence and suicide).

Chemical hazards

- Soil and Geology (including heavy metals, contaminants and exposed landfill sites).

Biological hazards

- Surface water and groundwater (including water contamination);
- Human Beings (including rodent borne diseases e.g. Leptospirosis).

A detailed literature review was then carried out for these subjects. In addition where relevant the construction and operational phases of the proposed scheme, each of which may have very different emissions, will be considered.

8.6 POTENTIAL HEALTH IMPACTS OF NOISE

During this section scientific terms such as dB and Leq are used. These are fully explained in the Noise chapter of this EIS (Volume 1, Chapter 12).

The health effects from noise impacts, is detailed under separate headings, according to the specific effects:

1. Noise-induced hearing impairment (general);
2. Noise-induced hearing impairment (schools);
3. Interference with speech communication;
4. Sleep disturbance;
5. Cardiovascular and psychophysiological;
6. Mental-health effects and effects on performance;
7. Effects of noise on residential behaviour and annoyance.

8.6.1 Noise-induced hearing impairment

Hearing impairment is typically defined as an increase in the threshold of hearing, that is a decrease in hearing acuity. It is assessed by threshold audiometry. It however only occurs above a certain noise level.

Data from the International Standards Organisation (ISO) and WHO states that hearing loss will not occur at noise levels below 70dB no matter how long the exposure continues. It is generally accepted in acoustic science that a receptor inside a building even with the windows open will experience noise levels about 15dB less than outside the building¹. This is a relatively conservative figure and modern built buildings may be significantly greater than this particularly in a relatively cold climate such as Ireland's. Allowing for 15dB attenuation that is a decrease in noise levels, for buildings with windows open this equates to an outside noise level of 85dB.

Impact assessment: noise induced hearing impairment

During the construction and operational phases of the proposed scheme noise levels sufficient to cause Noise Induced Hearing loss simply will not pertain outside of the construction site itself. The findings of the Noise chapters of this EIS (Volume 2, Chapter 4) confirm this in all areas of the proposed scheme. There will therefore no risk of noise induced hearing loss due to noise from environmental exposure.

8.6.2 Interference with speech communication

Noise interference can interfere with speech comprehension. These may include problems with concentration, fatigue, uncertainty and lack of self-confidence, irritation, misunderstandings, decreased working capacity, problems in human relations, and a number of stress reactions.

Particularly vulnerable to these types of effects are the hearing impaired, the elderly, children in the process of learning, and individuals who are not familiar with the spoken language.

The higher the level of the masking noise, and the more energy it contains at the most important speech frequencies, the greater will be the percentage of speech sounds that become indiscernible to the listener. The masking effect of interfering noise in speech discrimination is more pronounced for hearing-impaired persons than for persons with normal hearing.

As the sound pressure level of an interfering noise increases, people automatically raise their voice to overcome the masking effect upon speech (increase of vocal effort). This imposes an additional strain on the speaker. For example, in quiet surroundings, the speech level at one metre distance averages about 50dBA, but is 30dBA higher when shouting. However, even if the interfering noise is moderately loud, most of the sentences during ordinary conversation can still be understood fairly well. With raised voice (increased vocal effort) sentences may be 100% intelligible for background noise levels of up to 55dBA; and sentences spoken with straining vocal effort can be 100% intelligible with noise levels of about 65dBA.

These figures of course refer to ambient noise in the area of the conversation. For sensitive communication this is nearly always indoors. As stated the average noise attenuation inside a building, with the windows closed conservatively is 15dB. Of course with any environmental noise source, noise levels will be higher in gardens. However time spent in gardens is nearly always during the day. Other noise sources are much more common such as lawnmowers, traffic and other social noises. People in general are less sensitive to noise annoyance while, for example, gardening than when trying to sleep or watching television. Speech levels vary between individuals because of factors such as gender and vocal effort.

Impact assessment: speech communication

Most important communication takes place indoors, for example, in schools which is separately assessed below. A background noise level of 45dB Leq is very unlikely to interfere with communication. An occasional excursion above this level will also not interfere with communication. In the event of occasional words being misunderstood they will simply be repeated. In this respect railway noise, which by its nature is intermittent, is unlikely to interfere with communication.

Using the conservative 45 dB Leq threshold indoors this equates to a 60 dB Leq level outdoors with windows open based on the 15dB attenuation explained elsewhere. Attenuation will be significantly higher with windows closed. These average noise levels will not be experienced in the operational phase.

Construction noise can be of a more constant nature. It will however typically be for defined and relatively short periods of time. Temporary effects on communication may be experienced in areas identified as having a Leq significantly in excess of 60 dB. This means simple local mitigation measures such as closing windows will allow efficient communication.

Based on the predicted results no ongoing adverse effects either in the construction or operational phases of the proposed scheme are predicted.

8.6.3 Schools

The EPA (USA) suggested that sound pressure levels indoors in schools of 45dBA would be acceptable as this is compatible with 100% comprehension at normal speech levels¹.

This figure is also quoted by WHO but the latter body has also stated that ideal levels are as low as 35dB during teaching of young children².

This lower level has also been stated by ANSI³ (American National Standards Institute) as well as the British Standards Institute. It is important to note the purpose of WHO, ANSI and BSI was to give guidance to designers of schools. They do not state that the 45dB threshold was wrong but rather that the 35dB is ideal. It is certainly true that many if not most school rooms in this country are above this lower threshold. The key point is there is no evidence of any deleterious effect at 45dB. No organisation is stating that this level is less than satisfactory.

In the UK it is generally accepted that noise levels up to 65dB outside of the school are acceptable during the construction phase of a project (see the Noise chapters of this EIS (Volume 2, Chapter 4)). This is because of the relatively short duration of such phase, although it can persist for several years, and it allows for some simple measure, e.g. closing windows to improve attenuation. A lower 58dB level is used during the indefinite operational phase. (See the Noise chapters of this EIS (Volume 2, Chapter 4)). Because schools are largely unoccupied in Ireland during the warmer summer months, windows are likely to be closed most of the academic year. It is also assumed that these noise levels are applicable only during day time and when children are in school. Equally they only apply on days when children are in school and thereby do not include weekends and holiday time. The modelling, explained in more detail in the Noise chapters of this EIS (Volume 2, Chapter 4) has therefore used this 65dB level as the "Significant" level during the construction phase but the lower 58dB during the operational phase.

There are several studies on the effect of environmental noise on education. However most of these relate to airport noise and to a lesser extent traffic noise. There is far less evidence relating to rail noise. From studies available, school learning may be the factor most affected by environmental noise. Following exposure to aircraft noise, schoolchildren in the vicinity of Los Angeles airport were found to be deficient in proof reading, and in persistence with challenging puzzles⁴.

One of the most important studies on the effects of noise on school learning was performed by Hygge & Evans on Munich airport⁵.

Before the opening of the new Munich International Airport and the termination of the old airport, children near both sites were recruited into aircraft-noise groups (aircraft noise at present or pending) and control groups with no aircraft noise (closely matched for socioeconomic status). A total of 326 children (mean age 10.4 years) took part in three data-collection waves, one before and two after the switch-over of the airports. After the switch, long-term memory and reading were slightly impaired in the noise group at the new airport but significantly improved in the formerly noise-exposed group at the old airport. Short-term memory also improved in the latter group after the old airport was closed. At the new airport, speech perception was somewhat impaired in the newly noise-exposed group.

For the old airport before the switch the ambient noise levels were measured as 68dB (or 53dB indoors) prior to switch and 54dB (39dB) afterwards. The new airport schools went from 53dB (or 38dB) to 62dB (or 47dB). These figures were 24 hour levels. Assuming fewer flights at night it is certain that the daytime noise was even higher. It is also of note that uninsulated schools were chosen in all cases. Assuming that 45dB in the classroom is desirable this means that the school near the old airport was greatly above the desired levels before the move and dropped to well within the level with significant improvement. The school near the new airport moved from below the 45dB threshold to above this level. It may not be surprising therefore that the study showed what it did. A further inference is that if we control the noise indoors to 45dB there is no evidence of a deleterious effect on education.

The finding that children's cognitive skills can be affected by very high noise levels were given further credence by the RANCH (Road traffic and Aircraft Noise Exposure and Children's Cognition and Health)⁶.

While showing little new it suggests a small effect on reading comprehension in 9-10 year old primary school children across 3 countries. It also stated "Neither aircraft noise nor traffic noise affected sustained attention, self-reported health, or overall mental health." It was surprising that the study suggested significantly improved memory function in children exposed to high levels of traffic noise. This appears inconsistent with findings of other studies and intuitively difficult to understand.

Again there is little evidence railway noise, particularly of a light railway system, would be as significant as aircraft noise. These studies are quoted here because they are applicable to transport noise in general.

Impact assessment: schools

MN101

There are no schools likely to be affected within the study area that can be affected. Seatown School is predicted not to be affected.

MN102

A number of educational facilities are located in this area. These include Colaiste Choilm, St. Colmcille's Boys National School and Girl's National School.

Noise modelling does not predict a significant impact on these schools either during the construction or the operational phases.

MN103

There are no schools within the study area that are predicted to be affected

MN104

There are no schools within the study area that are predicted to be affected

MN105

There are a number of educational facilities in this section. These include Holy Spirit National School, St. Joseph's National School, Scoil an Tseachtar Laoch, Ballymun Senior Comprehensive School, The Virgin Mary School, Our Lady of Victories Schools and Ballymun Junior Comprehensive School and DCU.

For the construction phase noise modelling (see the Noise chapters of this EIS (Volume 2, Chapter 4)) predicts residual impacts, allowing for mitigation, at the library and schools on Ballymun Road in the order of 5dB. Again during the construction phase an impact is also predicted in the parts of the Our Lady of Victories Church on Ballymun Road that are used for educational purposes of 20dB. However the modelling predicts the impacts are not expected to last for more than about 30 days. Given this short duration a significant impact on education is very unlikely. Suggested mitigation might include not using the worst affected rooms for the short duration of the significant effects.

For the operational phase none of the educational establishments are predicted to experience significant effects.

MN106

There are a number of educational facilities in this section.

During the construction phase a significant impact on the educational buildings on St. Alphonsus Road (Lower) (MN106-C12). An impact is also predicted on St Patrick's College MN106-C11. This would have potential to interfere with education, although the construction phase is of limited duration. Mitigation measures might include performing noisiest work in breaks such as summer holidays or even moving some classes.

No impacts are predicted during the operational phase.

MN107

No significant effect is predicted on any educational institution in either the construction or the operational phase. Finlaters Church MN107-C1 is used in part for educational activities and this may suffer some impact but in overall terms this is very unlikely to have a significant effect on education.

8.6.4 Sleep disturbance

Sleep disturbance is considered to be a major environmental noise effect. It is however estimated that 80-90% of the reported cases of sleep disturbance in noisy environments are for reasons other than noise originating outdoors. Understanding of the impact of noise exposure on sleep stems mainly from experimental research in controlled environments.

Field studies conducted with people in their normal living situations are scarce. However most of the more recent field research on sleep disturbance has been conducted for aircraft noise.

Sensitive groups include the elderly, shift workers, persons especially vulnerable to physical or mental disorders and other individuals with sleeping difficulties.

There is evidence that habituation to night-time noise events occurs, and that noise-induced awakening decreases with increasing number of sound exposures per night. Studies have also shown that the frequency of noise-induced awakenings decreases for at least the first eight consecutive nights⁷.

In simple terms people get used to the noise. For the proposed scheme any possible effect will be during noisy work during the construction phase and during the operational hours of the proposed scheme when built.

As stated most of the published research has been related to aircraft noise but in a recently published study⁸ which studied some 23,000 subjects the authors concluded that at the same average night time noise-exposure level, aircraft noise is associated with more self-reported sleep disturbance than road traffic, and road traffic noise is associated with more sleep disturbance than railways. In other words railway noise is the least likely to affect sleep.

Of course people also sleep during the daytime, for example shift workers, but ambient noise levels are much greater at this time anyway so it is less likely that an additional noise source will have a significant effect. The assessment of impact on sleep is therefore based on night time noise. The Noise chapters of this EIS (Volume 2, Chapter 4) details the methodology used in modelling this. That chapter also explains the choice of "significant" effects in night time noise exposure.

Impact assessment: sleep disturbance

Levels of night time noise during the construction phase greater than the ambient levels or greater than 45dB are considered significant (see the Noise chapters of this EIS (Volume 2, Chapter 4). Obviously the construction period will be of limited duration. Effects of short duration are less likely to have a human health effect than ongoing noise sources.

For the operational phase the operational hours for Metro North are assumed to be:

- From Monday to Friday, from 0500 hours to 0100, and on Saturdays from 0600 hours to 0300 hours; and on Sunday from 0700 hours to 0030 hours.

Levels of night-time noise during the operational phase, between 2200 to 0800, in excess 48 dB L_{Aeq} are considered significant in so far as there is a potential effect on sleep (see the Noise chapters of this EIS (Volume 2, Chapter 4)). There is obvious overlap between these hours and the operational hours. As discussed above the nature of the noise is also relevant and with respect to transport noise railway noise is the least obtrusive.

Obviously when the impact on sleep is assessed, one considers an indoor environment where people actually sleep. This will therefore include all residences but also other buildings like hospitals, other residential health care facilities and prisons for example.

MN101

During the construction phase significant impacts over 1 to 2 nights only are likely at Ashley Grove, Seatown Walk South, Foxwood and the house east of the Tesco site. The short duration of these however minimises the potential for any health effect by impact on sleep.

During the operational phase, with mitigation measures proposed in the Noise chapters (Volume 2, Chapter 4) the potential effects are less significant and will not have a human health impact.

There are approximately 6 properties at Seatown Terrace (MN101-19) and 6 houses to the east of the R132/M1 junction with a “medium” impact from airborne metro noise and associated traffic noise respectively. At this level an effect on sleep is far less likely on an ongoing basis and can be mitigated, if necessary, by measures as simple as closing windows.

MN102

During the construction phase significant impacts are predicted at Nevinstown Lane/Dublin Road MN102-C9 junction during construction of Fosterstown Underpass, and at Dublin Road MN102-C6 during construction of Fosterstown Stop. This is likely to take 5 months. No night work is required in this section so no impact on sleep is predicted.

An impact assessed as medium is predicted at Travel Lodge (MN102_C5). At this level an effect on sleep is far less likely on an ongoing basis and can be mitigated, if necessary, by measures as simple as closing windows.

No significant effect is predicted from the operational phase.

MN103

A significant daytime effect is predicted at parts of the halting site on Naul Rd (MN103-C1) for 6 months during construction however no night time effect is predicted. During the construction and operational phases no other significant impacts are predicted on night time noise levels in this section and no human health impacts will result.

MN104

During the construction phase significant impacts are predicted at Santry Lodge (MN104 C3) during the actual working times and if these extend into night time hours an effect on sleep is possible. This is likely to be for a period of 11 months although the period of highest impact is considerably less. Limiting working hours to outside night-time hours will mitigate any effect on night time sleep.

No significant impact on sleep is predicted from the operational phase.

MN105

Concrete pours outside of core hours may be required for the underground stations. It may be necessary to carry these out at night.

At residential locations significant noise impacts are predicted at Ballymun Stop at James Connolly Tower flats MN105 C4 and Ballymun Civic Centre MN105-C5 and Ballymun Road MN105 C13,14, Albert College Road MN105 C15, Ballymun Road/ St Pappins Road MN105 C16 and Albert College Crescent MN105 C17.

Baseline noise levels are relatively high at night in this area (55 to 60dB) so residual noise impacts are likely to be lower than would otherwise be the case.

The duration of these concrete pours is very limited but is likely to have an effect on sleep in the residents of the areas identified. The potential for health effects will be mitigated by performing work if at all possible during the daytime and minimising the duration of the noisiest work. At any rate because of the very limited duration no human health effect is predicted.

During the operational phase no significant impacts are predicted due to noise levels in this section.

MN106

Concrete pours outside of core hours may be required for the underground stations. It may be necessary to carry these out at night. At residential locations very significant noise impacts are predicted at The Rise MN106-C5, Griffith Avenue MN106 C6 C7, St Josephs Ave C13 Leo Street MN106-C17, St. Alphonsus Avenue (MN106_C14), Mater Misericordiae Hospital (MN106_C15), Mater Misericordiae Hospital / Leo Street (MN106_C16) and Mater Private Hospital (MN106-C18) . Lesser but still relevant impacts are predicted above the criterion at Walnut Lawn/Walnut Rise MN106-C18. This activity is not likely to be standard practice and the assessment therefore represents a worst case scenario.

The duration of these concrete pours is very limited but is likely to have an effect on sleep in the residents of the areas identified. The potential for health effects will be mitigated by performing work if at all possible during the daytime and minimising the duration of the noisiest work. Because of this in all likelihood the residual impact in human health terms is negligible.

No significant impact is predicted in the operational phase.

MN107

Concrete pours outside of core hours may be required for the underground stations. It may be necessary to carry these out at night.

This has the potential to affect Westmoreland Street MN107-C10 and the Fitzwilliam Hotel MN107-C11. This however is not likely to have a human health effect.

During the operational phase no significant impacts are predicted noise levels in this section.

8.6.5 Cardiovascular and physiological effects

Acute noise exposures activate the autonomic and hormonal systems, leading to temporary changes such as increased blood pressure, increased heart rate and vasoconstriction. After prolonged exposure, susceptible individuals in the general population may develop permanent effects, such as hypertension and ischaemic heart disease associated with exposures to high sound pressure levels. Most of the studies are based on occupational studies with often very high noise levels, 90dB or greater however there have been some which have suggested a link to airport noise. In general these studies have not been statistically significant or not supported by other studies.

A German study showed an excess risk of hypertension and myocardial infarction related to aircraft and traffic noise but railway noise was not studied⁹. It also showed higher treatment rates for hypertension among residents exposed to higher road noise levels. The link between road traffic noise and hypertension was further supported by Bluhm¹⁰. In 1999, the WHO stated that the overall evidence available at the time suggested a weak association between long-term noise exposure and blood pressure elevation or hypertension, and that cardiovascular effects are associated with long-term exposure to A-weighted average sound pressure levels [dB(A)] ($L_{Aeq,24hr}$) throughout the day/night in the range of 65–70 dB(A)¹¹.

The HYENA (HYpertension and Exposure to Noise near Airports) study is a new study underway to further study this question. It is the first large multi-centre study designed to assess the effects of exposure to aircraft and road traffic noise on blood pressure and cardiovascular disease, as well as possible modifying effects of exposure to air pollution. Study airports are located in several different European countries offering a wide range of noise exposure, ensuring exposure contrast and cross-country variations (e.g., due to cultural and climate differences), which will be addressed in the analysis. It is not intended to study the effects of railway noise.

Of note is that when a “pubmed” search was performed, several references for cardiovascular effects with airport and traffic noise were found but none for railway noise link. This does not completely rule out any effect but at least suggests that the railway noise is the least likely transport noise to cause problems. Indeed by reducing traffic noise it is likely that the proposed scheme, if it is to have any effect on blood pressure and cardiovascular disease, it will be positive.

It is accepted that high stress levels are related to increases in blood pressure and increased risks of cardiovascular diseases. Being delayed in traffic is a significant source of stress. Increased waiting times are inevitable in the construction phase so it might be argued that there may be a temporary increase in stress levels in some affected areas. The extent of the delays will be lessened by the fact that much of the proposed scheme is away from main roads or underground. The duration of any disruption is also limited and anecdotal evidence from the construction of the Luas is that disruption is well accepted in the knowledge that it is of long term benefit. In the operational phase there is little doubt that there will be an overall beneficial effect on stress levels.

In summary then for published epidemiological studies the lowest level at which noise had an effect on ischaemic heart disease was 65-70 dB for Leq, 24hr. Even at these levels the results have been equivocal.

Impact assessment: cardiovascular and physiological effects

Based on the predicted results no adverse human health effects either in the construction or operational phases of the proposed scheme are predicted.

8.6.6 Mental health effects and effects on performance

Environmental noise is not believed to be a direct cause of mental illness, but it has been assumed that it accelerates and intensifies the development of latent mental disorder. Again there are very few studies of railways. Early studies showed a weak association between exposure to aircraft noise and psychiatric hospital admissions in the general population surrounding an airport. However, the studies have been criticised because of problems in selecting variables and in response bias.

Hardoy¹² hypothesised that there may be sustained autonomic arousal leading to an anxiety like state. There is no evidence of an increase in psychiatric illness per se. It should be again stated that the effect was small in health terms. Again there were no studies found directly related to railway noise.

Impact assessment: mental health effects and effects on performance

Based on the predicted results no adverse human health effects either in the construction or operational phases of the proposed scheme are predicted.

8.6.7 Effects of noise on residential behaviour and annoyance

Noise annoyance is a global phenomenon. It is estimated that at least 20% of the population of the EU live in areas of significant annoyance due to noise levels. A definition of annoyance is “a feeling of displeasure associated with any agent or condition, known or believed by an individual or group to adversely affect them”. However, apart from “annoyance”, people may feel a variety of negative emotions when exposed to community noise, and may report anger, disappointment, dissatisfaction, withdrawal, helplessness, depression, anxiety, distraction, agitation, or exhaustion. For airport noise, the most common reported effects are interference with rest, recreation and watching television. This is in contrast to road traffic noise, where sleep disturbance is by far the predominant complaint.

There are some publications on annoyance and railway noise. Lim¹³ studied community annoyance caused by exposures to railway noise in 18 areas along heavy railway lines in Korea. It should be noted that the noise levels associated with such railways are much higher than those related to a light metro system such as the proposed scheme. They found some levels of annoyance in those living very close (<50m) to railway lines and noted this was higher than in Europe as the residences were in general much closer to the lines. This study is of little relevance for the underground section of the proposed scheme but should be considered for surface sections if they are very close to residential areas.

In another study¹⁴ it showed that traffic rather than railway noise was identified as a significant problem.

Another paper¹⁵ described experiments to determine the subjective equivalence of railway noise and railway-induced building vibration, and hence the relative importance of the two stimuli. Six magnitudes of whole-body, vertical (z-axis) vibration and six levels of noise were presented simultaneously to each of 30 subjects in all 36 possible paired combinations. The stimuli were reproductions of the noise and vibration recorded inside a house during the passage of a train. The subjects were asked to indicate, after each presentation, which of the two stimuli (noise and vibration) they would prefer to be reduced. Not surprisingly they concluded the greater the volume of both vibration and noise the greater the annoyance. They came up with a formula that may be used to determine whether a reduction of noise or a reduction of vibration would be more beneficial to residents near railways. The total annoyance due to simultaneous noise and vibration was shown to depend on the magnitude of both stimuli.

The noise emissions from the construction and operational phases of the proposed scheme will be quite different. Construction, by its nature, will be time defined and may be for quite limited periods for any single receptor, for example in the case of tunnelling the boring machine moves daily. Higher noise levels may be associated with lesser effects if they are for relatively short periods of time. By contrast operational noise can be assumed to continue indefinitely so lesser effects may still be significant.

Impact assessment: effects of noise on residential behaviour and annoyance

Annoyance by its nature is subjective and is therefore difficult to assess objectively. It is of course related to many of the factors assessed above including effects on sleep and communication. This section on annoyance should be read as part of the overall noise assessment detailed above.

Noise contours have been suggested related to aircraft noise corresponding to high, moderate and low levels of annoyance, which are 69dBLeq, 63dBLeq and 57dBLeq respectively. However railway noise is in general much more readily accepted so it is inappropriate to use airport annoyance contours directly for a rail project.

The higher noise levels associated with construction will undoubtedly be of some annoyance as virtually all construction projects can be. This will be of limited duration and mitigation measures suggested in the Noise chapter of this EIS (Volume 2, Chapter 4) will reduce this. It is also true that people will accept higher levels of noise when they know it has an end point that is completion of construction. Human health effects are not predicted in the construction phase.

As no significant impact on communication or sleep and because the mitigation proposed in the Noise chapter of this EIS (Volume 2, Chapter 4) will reduce significantly noise emissions significant annoyance effects are not predicted for the operational phase.

8.7 POTENTIAL HEALTH IMPACTS OF VIBRATION (INCLUDING GROUND BORNE NOISE)

Vibration modelling is described in the Vibration chapter of this EIS (Volume 2, Chapter 5). This models groundborne noise, vibration effect in humans and vibration affecting sensitive equipment in health care facilities. Vibration sensitive equipment is located in the Mater Hospital, Mater Private Hospital, Rotunda Hospital and HARI Clinic. During the consultation process a meeting was held with the HARI clinic, part of the Rotunda Hospital group who expressed concerns that vibration might affect some of their activities. A literature search does not suggest any effect of vibration on human embryos but one article suggested a change in hatching time in chicken embryos deliberately exposed to vibration¹⁶. However this was not statistically significant and the vibration used was considerably in excess of anything that might be experienced in relation to the proposed scheme. An effect on human embryos at much lower levels of vibration is very unlikely.

Vibration in buildings can interfere with activities and affect human occupants in many ways. The quality of life can be reduced as also can working efficiency. There are many and complex factors determining human response to vibration, and there is also a paucity of consistent quantitative data concerning human perception of vibration and their reaction to it.

There are a wide variety of possible conditions and effects of human exposure to vibration. There are basically two kinds of vibration that effect people in buildings, namely:

1. Vibration transmitted to the human body as a whole through the supporting surface: through the feet when standing, the buttocks when seated, or the supporting area when reclining.
2. Vibrations of the building and the resulting reactions of the occupants from the gross structure vibration (whole-structure deformation), floor vibration (primarily vertical motion), and wall vibrations (primarily horizontal motions producing secondary noises or rattlings). Resulting reactions are typically fear of damage to the structure or its contents, startle, and interference with sleep, conversation, or other activities.

The human health effects of vibration are normally divided into:

1. Hand Arm Vibration Syndrome (HAVS);
2. Whole Body Vibration (WBV);
3. Other effects.

From an environmental perspective hand arm vibration can be discounted. As stated for noise this may be an occupational issue for some persons involved in construction but simply will not be an issue for the general public.

For whole body vibration recent legislation has introduced action levels and limit values for occupational exposure. To be vulnerable to WBV the human has to be in contact with a vibration surface, most typically seated or less frequently lying down. Even allowing for a 24 hour 7 day a week exposure the possible vibrations do not approach the levels defined in the Safety Health and Welfare at Work (General Applications) Regulations 2007. Therefore we can say that Whole Body Vibration will not be an issue for the general public.

The rest of this assessment will therefore concentrate on other potential health effects. The vibration emissions from the construction and operational phases of the proposed scheme will be quite different. Construction, by its nature, will be time defined and may be for quite limited periods for any single receptor, for example in the case of tunnelling the boring machine moves daily. Higher vibration levels may be associated with lesser effects if they are for relatively short periods of time. By contrast operational vibration can be assumed to continue indefinitely so lesser effects may be significant.

Certain activities particularly the tunnelling phase of construction may be associated with significant local vibration for a limited period of time. From a health perspective however it is very likely that any potential effect will be mitigated by the relative short duration of exposure. It is for example likely that no single residence will be exposed to significant vibration for prolonged periods as in simple terms the tunnelling will move day by day. Tunnelling is predicted to advance at a rate of 75m per week. Annoyance is probably the most likely effect.

Again there are few health studies in relation to human health and environmental vibration exposure, even less than for noise. A “pubmed” search revealed no relevant articles in English although again there are some articles on occupational exposure to vibration for railway workers.

Impact assessment: vibration

Mitigation measures have been proposed and this assessment is based on the residual impact after mitigation.

MN101, MN102, MN103, MN104

Low impact from construction vibration is predicted in this area, (see the Vibration chapters of this EIS (Volume 2, Chapter 5)). No impact on Human Health is therefore predicted.

Modelling predicts no significant effect from the operational phase either in terms of groundborne noise, vibration effect in humans and vibration affecting sensitive equipment. Based on this no adverse effect on human health is predicted.

MN105

There are likely to be medium vibration and groundborne noise impacts from the excavation of the cut-and-cover tunnel during the construction phase in a few houses closest to the proposed scheme. These are identified in the Vibration chapters of this EIS (Volume 2, Chapter 5). However given the relatively short duration of the works no significant human health impacts are predicted.

Modelling predicts no significant effect from the operational phase either in terms of groundborne noise, vibration effect in humans and vibration affecting sensitive equipment. Based on this no adverse effect on human health is predicted.

MN106 - Construction phase

The predicted vibration exposures are contained in the Vibration chapter of this EIS (Volume 2, Chapter 5).

During the construction phase at Corpus Christi school (not occupied at night) during the passage of the tunnel boring machine, the groundborne noise level is likely to be 46dB $L_{Amax,S}$. This is just around the level which would have the potential to interfere with education, (see Section 8.6.3) but given the relatively short duration a significant effect on education is not predicted.

South of Griffith Avenue a high impact is predicted in the residential area if tunnelling takes place at night, medium impact if tunnelling does not occur at night and so not affecting sleep. However given the relatively short duration of exposure a significant effect on human health is not predicted.

Near Bantry Road, a very high impact category is predicted for people in some buildings. Mitigation measures to limit the effect are suggested. However given the relatively short duration of exposure a significant effect on human health is not predicted.

Rock breaking will be required for the construction of Griffith Avenue Stop resulting in low impact by day, medium impact by night with the potential to affect sleep. Given the relatively short duration of exposure a significant effect on human health is not predicted.

There is a proposed cross passage at Home Farm Road which could result if unmitigated in a very high impact to Corpus Christi School and to the nearest residential buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

A proposed cross passage to the east of Ferguson Road could result, if unmitigated in a very high impact for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect on human health is predicted.

Under the Sports Ground of St Patrick’s College there is a proposed crossover and during the passage of the tunnel boring machine, the groundborne noise level in this area is likely to be 44dB $L_{Amax,S}$, medium impact if tunnelling takes place at night, low impact if tunnelling does not occur at night. Given the relatively short duration of exposure a significant effect on human health is not predicted.

In the area of St Patrick’s Schools in Millbourne Avenue and Drumcondra Library, and to the east of Chapelgate during the passage of the tunnel boring machine, the groundborne noise level in this area is likely to be up to 49dB $L_{Amax,S}$. This is just around the level which would have the potential to interfere with education, (see Section 8.6.3) but given the relatively short duration a significant effect on education is not predicted. With regard to the residential properties groundborne noise, high impact is predicted if tunnelling takes place at night with the potential to affect sleep, medium impact if tunnelling does not occur at night. Vibration is likely to be 0.1 KB_{Tr} , causing high impact at night, very low impact by day. Given the relatively short duration of exposure a significant effect on human health is not predicted.

The proposed cross passage near Woodvale Road could result (if unmitigated) in very high groundborne noise and vibration impacts for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

The proposed cross passage near Carlingford Road could result (if unmitigated) in very high impacts for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

The proposed cross passage under the Royal Canal could result (if unmitigated) in very high impacts for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

The proposed cross passage near Kenmare Parade could result (if unmitigated) in very high impacts for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

Construction vibration impacts on the Mater Hospital and the neighbouring Mater Private Hospital will arise both from the construction of the Metro stop box and from the construction of the Adult Hospital. It is predicted that the limit for sensitive equipment in the Mater and Mater Private Hospitals will be significantly exceeded for a period of around 10 weeks. Unless alternative tunnelling methods are found to be possible for some 400m, temporary alternative arrangements will be required for the most sensitive equipment in the hospital. Unmitigated this has the potential for a significant detrimental effect on human health.

Rock breaking may be required for the construction of Mater Stop and this too could result in limits for sensitive equipment being exceeded. Unmitigated this has the potential for a significant detrimental effect on human health.

Blasting for the Kenmare Parade cross-passage could also interfere with the operation of sensitive equipment at the Mater site and mitigation in the form of liaison between the site and the hospital will be required to ensure that blasts and critical use of the equipment do not occur simultaneously.

MN107: Construction phase

There are residential buildings immediately above the cross-passage at St. Joseph's Place and tunnelling could result if unmitigated in very high impact category for people in adjacent building. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

For the area south of Mater Stop including St. Joseph's Parade residential areas north of Parnell the Rotunda Hospital including the HARI Clinic, Ambassador Theatre, the Temple Theatre and the Gate Theatre in Cavendish Row significant effects are predicted. For example during quiet moments in a production in the Gate Theatre the noise from tunnelling will be clearly audible and intrusive. The main mitigation possible is liaison with the theatre managements, with as much advance warning as practicable. However no human health impacts are predicted from this.

For most of the tunnelling it is predicted that during construction vibration would be close to, but not exceed the limit advised for the operation of sensitive equipment at the Rotunda Hospital/HARI clinic, and mitigation in the form of liaison between the site and the hospital together with vibration monitoring will be required to ensure that use of the equipment is not adversely affected. Provided this is done no significant effect on human health is predicted.

However during the construction of the proposed cross-passage below O'Connell Street Upper this limit for sensitive equipment may be exceeded. Mitigation in the form of liaison between the site and the hospital will be required to ensure that blasts and critical use of the equipment do not occur simultaneously. Provided this is done no significant effect is predicted.

From Parnell Street to O'Connell Bridge sensitive receptors include hotels in O'Connell Street which could result (if unmitigated) in very high impacts for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

Drill and Blast techniques may be necessary for the construction of O'Connell Bridge Stop beneath the River Liffey which could result (if unmitigated) in very high impacts for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

The proposed cross passage near Princes Street North could result (if unmitigated) in very high impacts for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

From O'Connell Street to St. Stephens Green there are residential and academic buildings (including Trinity College) which could result (if unmitigated) in very high impacts for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

The passage of the tunnel boring machine in this area, the groundborne noise level in the nearest buildings of Trinity College is likely to be 45dB $L_{Amax,S}$. This is just around the level which would have the potential to interfere with education, (see Section 8.6.3) but given the relatively short duration a significant effect on education is not predicted.

The proposed cross passage near Wicklow Street could result (if unmitigated) in very high impacts for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

During quiet moments in a production in the Gaiety Theatre the noise from tunnelling will be clearly audible and intrusive. The main mitigation possible is liaison with the theatre managements, with as much advance warning as practicable. However no human health impacts are predicted from this.

At St. Stephens Green, blasting techniques are likely to be used for the excavation of the turnback loop which could result (if unmitigated) in very high impacts for people in adjacent buildings. Mitigation is suggested limiting the charge weight. Assuming this is done no significant effect is predicted.

MN106 and MN107 - Operational phase

Modelling predicts no significant effect from the operational phase either in terms of groundborne noise, vibration effect in humans or vibration affecting sensitive equipment. Based on this no adverse effect on human health is predicted.

It is noteworthy that a specific detailed study was carried out to assess vibration sensitive equipment in the Mater Misericordiae Hospital, Mater Private Hospital, Rotunda Hospital and the HARI clinic and no residual effect after mitigation is predicted.

8.8 POTENTIAL HEALTH EFFECTS OF RADON (SOIL AND GEOLOGY)

The Radiological Protection Institute of Ireland (RPII) has issued information on Radon¹⁷.

Radon is a naturally occurring radioactive gas which originates from the decay of uranium in rocks and soils. It is colourless, odourless and tasteless and can only be measured using special equipment. When radon surfaces in the open air, it is quickly diluted to harmless concentrations, but when it enters an enclosed space, such as a house or other building, it can sometimes accumulate to unacceptably high concentrations.

Radon decays to form tiny radioactive particles, some of which remain suspended in the air. When inhaled into the lungs these particles give a radiation dose which may damage cells in the lung and eventually lead to lung cancer.

Radon concentration is measured in becquerels per cubic metre of air (Bq/m³). The becquerel is a unit of radioactivity and corresponds to one radioactive disintegration per second.

The reference level for long-term exposure to radon in a house, above which the need for remedial action should be considered, is 200Bq/m³ (determined in accordance with RPII's standard protocol). Based on current knowledge it is estimated that in Ireland, for the population as a whole, a lifetime exposure (i.e. 70 yrs) to radon in the home at the Reference Level of 200Bq/m³ carries a risk of about 1 in 50 of contracting fatal lung cancer. This is approximately twice the risk of death in a road accident.

An article by Schmid¹⁸ suggested radon levels could be increased by the vibration associated with rail and traffic induced vibration. The effect however appears small and largely theoretical. Radon levels within the area of the proposed scheme are not particularly high. Analysis of the underlying geology in which the tunnels will be constructed indicates that there are no significant Radon generating materials though the presence of shales and limestones at depth may allow the transmission of radon. (See the Radiation and Stray Current chapters of this EIS (Volume 2, Chapter 6)).

Using the map produced by the RPII¹⁹ the city centre area is such that 1-5% of houses are predicted to have radon levels in excess of the 200Bq/m³ reference level. The remainder of the route has even lower level (<1%).

Purnell²⁰ proposed a strategy for assessment of radon exposure for workers during tunnelling work.

The RPII has issued separate guidance²¹ in respect underground working in this guidance an occupational exposure standard of 400 Bq/m³ has been set. The guidance recommends that a programme of monitoring is undertaken during construction activities and that remedial measures should be undertaken if this standard is exceeded, this is likely to be in the form of increased ventilation. In addition during the construction phase it is also recommended that monitoring is undertaken to evaluate the actual effects of the tunnel construction process on the migration of ground gases (including carbon dioxide, methane and radon) which may be mobilised depending upon the tunnel construction technique or associated dewatering activities.

In the operational phase a steady state will be reached, that is radon levels are unlikely to change significantly thereafter. Any change in background Radon levels will have been identified in the construction phase by monitoring and indeed it is very likely that the construction of the tunnel lining itself and ventilation requirements would be sufficient to mitigate any potential accumulation of Radon or other ground gases and is more likely to reduce radon levels rather than increase them. In effect the large tunnels, with significant air movement associated with moving trains, would help to disperse radon as opposed to leading to accumulation. The low background radon level and the relatively minimal disruption in geological terms in building the proposed scheme means potential changes in radon levels are very unlikely to be of significance.

Impact assessment: radon

The local geology makes a detrimental change in Radon levels unlikely. In the event that it would occur it will be detected in monitoring being carried out in the construction phase as detailed above. If necessary, mitigation measures will be put in place.

No residual negative impacts on human health because of increase in radon exposure are predicted in the operational phase.

8.9 POTENTIAL HEALTH EFFECTS OF ELECTROMAGNETIC INTERFERENCE AND RADIATION

Electromagnetic compatibility (EMC) is the branch of electrical sciences which studies the unintentional generation, propagation and reception of electromagnetic energy with reference to the unwanted effects that such energy may induce. Emissions, such as Electric and Magnetic Fields (EMF) are related to the unwanted generation of electromagnetic energy.

The World Health Organisation has issued considerable guidance on EMF²².

This guidance states that EMF is sometimes cited for potential health effects. Concerns expressed in the past include childhood leukaemia, brain tumours and other cancers. The concerns are normally related to high tension electricity transmission cables. Laboratory experiments have provided no evidence that electromagnetic fields are capable of producing cancer, nor do human epidemiological studies suggest that they cause cancer in general. There is however some epidemiological evidence that prolonged exposure to higher levels of power frequency magnetic fields is associated with a small risk of leukaemia in children. In practice, such levels of exposure are seldom encountered by the general public in Ireland. In the absence of clear evidence of a carcinogenic effect in adults, or of a plausible explanation from experiments on animals or isolated cells, the epidemiological evidence is currently not strong enough to justify the firm conclusion that such fields cause leukaemia in children.

Some non cancerous adverse health effects are claimed to be associated with power frequency electromagnetic fields. These include miscarriages, reproductive and developmental abnormalities, depression and suicide, allergy and neurological disease. However the Health Promotion Agency²⁷ in the UK stated in November 2007 that “there is little scientific evidence to support these claims and the current body of evidence does not show that exposure to EMF below guideline levels presents a human health hazard.”

Electric fields are created by differences in voltage: the higher the voltage, the stronger will be the resultant field. Magnetic fields are created when electric current flows: the greater the current, the stronger the magnetic field. An electric field will exist even when there is no current flowing. If current does flow, the strength of the magnetic field will vary with power consumption but the electric field strength will be constant. In terms of the proposed scheme the voltages will be low in relation to transmission cables.

Human health impact assessment: electromagnetic interference and radiation

Given the relatively low voltages and currents used in the proposed scheme no detrimental effects from EMC are predicted in the construction or operational phases of the proposed scheme.

8.10 POTENTIAL HUMAN HEALTH IMPACTS OF CONSTRUCTION/OPERATIONAL DUST (AIR QUALITY)

A very significant element of the proposed scheme is underground. Construction of this will involve tunnelling. There will be large amounts of material excavated. Other sections will involve cut and cover techniques and the rest will be above ground. Spoil removal is necessary for all of these methods and will generate some dust. This construction dust by its nature is quite heavy and disperses over a very confined area as it falls to ground rapidly. The nature of the dust will depend on the nature of the soil. As part of the soil and geology baseline assessment soil sampling was undertaken and is detailed in the Soil and Geology chapter of this EIS (Volume 2, Chapter 9). This reveals no residual impact from contaminants along the proposed alignment. This indicates that high levels of pollutants such as heavy metal will not be expected as this soil is moved.

The majority of the long term predicted impacts result from changes in road traffic. In some areas, the operation of the proposed scheme will give rise to reduced traffic on the road network, where car users switch from private car to rail. In other areas, the air quality may potentially be adversely affected by increases in traffic flows or congestion resulting from diverting away from restrictions on roads carrying the transit rail system.

The majority of the road links within the study area are predicted to experience an insignificant change in air quality as a result of the introduction of the proposed scheme. A minority of road links predicted to experience a more significant change, both positive and negative, have been identified in the Air and Climatic Factors chapters of this EIS (Volume 2, Chapter 12).

The proposed scheme is additionally expected to reduce CO₂ emissions from road traffic.

Dust in a very different, and lesser sense, will be associated with the operational phase in the underground section. There have been however some useful publications. Seaton et al²⁴ concluded:

“Concentrations of ultrafine particles are lower and of coarser (PM_{2.5}) particles higher underground than on the surface. The concentrations underground are well below allowable workplace concentrations for iron oxide and unlikely to represent a significant cumulative risk to the health of workers or commuters.”

Ripanucci²⁵ stated dust levels in the Rome underground were higher than on the surface but below those normally associated with a health effect.

Impact assessment:

construction/operational dust (air quality)

No detrimental effects are expected from the construction activities. No environmental release of pollutants such as heavy metals is predicted. With mitigation no detrimental effects from spoil removal is predicted.

Changes in traffic have been modelled for the construction and operational phases which overall suggest no significant detrimental effect in overall air quality during the construction or operational phases. No significant effects are expected from dust underground in the operational phase.

8.11 POTENTIAL PSYCHOSOCIAL HEALTH EFFECTS (HUMAN BEINGS)

Annoyance and railway noise is discussed above. Other factors deserving consideration include the issues of suicide and violence. These are issues likely to be largely related to the operational phase of the proposed scheme. The psychosocial impact of the construction is likely to be similar to any major construction scheme. While one might argue about annoyance effects if one is caught in increased traffic jams related to road closures to facilitate construction, the issue of traffic disruption is more properly dealt with in the Traffic chapter of this EIS (Volume 2, Chapter 7).

Suicide is a problem experienced by railway networks worldwide. O'Donnell²⁶ investigated the characteristic features of railway suicide, data were gathered from 23 metro systems around the world. The similarities in the nature of this problem across systems were striking. Universally the victims were young (aged less than 40 years); most incidents involved men; case fatality was generally less than 60%; there was no consistent seasonal variation in incidence; the peak time of day for incidents was 10.00–12.00; proximity to psychiatric institutions was possibly a risk factor. The article stated that this method of suicide may be reduced, but perhaps not the overall suicide rate, by environmental modification of the railway system such as preventing access to the lines.

In an article by Clarke²⁷ a number of strategies for reducing suicide were put forward including (i) reducing public access to the tracks; (ii) improving surveillance by station staff; (iii) facilitating emergency stops; and (iv) reducing speeds.

In another paper by Coats²⁸ it was stated that the presence of a pit in the track halved the number of deaths in individuals struck by a train.

Some modern systems limit public access to the track virtually completely, at least for the underground section. There are however other considerations in making such decisions such as access in the case of emergency or fire.

It should be stated that there is no evidence that the presence of an underground or for that matter surface railway increases the rate of suicide but it may affect the chosen method.

Violence is always possible where groups of people meet. This may be more likely late at night or in the presence of alcohol or drugs. The presence of Gardai, security staff and or the use of CCTV may be expected to reduce this risk. Obviously events in the London Underground highlighted the potential disastrous effects of terrorist attacks and elsewhere of a chemical attack in the confined space of an underground system. There is however no evidence that the presence or absence of a railway line have any effect on the nature or the amount of violence. This is dependent on society issues.

It is important to note that there are likely to be considerable psychosocial and societal benefits from having an effective public transport system. These include improvements in vehicle emissions with potential benefits for local air quality and global environmental concerns. There are also likely reduced stress levels in travelling by train rather than driving on overcrowded roads and seeking parking in busy and expensive airport and city car parks.

Impact assessment: psychosocial health

While suicides and attempted suicides (Parasuicide) is an issue for railways world wide there is no evidence that the presence of a railway increase the risk of suicide in any way. Therefore no significant change in suicide rate is predicted during the operational phase of the proposed scheme.

The overall impact of the proposed scheme in the operational phase on psychosocial health is likely to be beneficial.

8.12 OTHER POTENTIAL IMPACTS ON HUMAN HEALTH

8.12.1 Aspergillus fumigatus

Aspergillus fumigatus is a fungus and one of many microorganisms which bring about the everyday decay of leaves, wood and other organic matter in our environment. It may be found virtually everywhere on earth, and, although we are all exposed to it regularly, it does not normally cause disease. Our bodies' immune system normally acts as if it were an innocent visitor, unless it invades tissues. In that event, the immune system responses will protect us from infection, very much as it does from pathogenic bacteria or viruses.

Spores (also called conidia), one of the stages of the fungus' life cycle, are the resistant form of the fungus, and the form responsible for dispersal in the ambient environment. The spores are very light in weight and therefore are easily spread by air currents. Also, the spores' small size (2.0 to 3.5 micrometers average) allows them to gain access to the alveolar space in the lungs.

In the ambient environment, *Aspergillus fumigatus* is commonly found in a great range of sites and materials, including soils, mouldy grains, straw and hay, bark, woodchips, house dust, and sewage sludge. The spores are very common in bird droppings, and are found in dung of cattle, horses and sheep. Inhalation of spores is the most common route of human exposure.

Aspergillus fumigatus is a normal and integral part of the composting process, participating with other microbes in the final breakdown of compostable materials to a finished product, stabilized compost. The composting process is one of the most common sources of high levels of *Aspergillus*.

Aspergillus levels around composting centres have been extensively studied. As one might expect there is a significant drop in the concentration of *Aspergillus* air levels with increasing distance from the process. It is generally accepted that *Aspergillus* levels will be at background levels at greater than 200 m from the composting process.

Construction and renovations are associated with dust generation. In association with this there can be increased *Aspergillus* levels in air. The amount of the increase will depend on a number of factors including, duration and size of works, whether the activity is indoors or outdoors, with weather conditions and wind being additional factors to consider in the latter scenario. No one has yet demonstrated a clear dose-response curve, a threshold spore concentration, or duration of sensitization needed to cause any of the four disease entities.

While we do not have good data on infective doses of these organisms, it is reasonable to expect that increasing the potential dose increases the likelihood of eliciting a response, even in otherwise normal people. Therefore, in preventing or reducing health risks from *Aspergillus*, it is considered important to limit exposure to spores by utilising a set of best management practices.

There are individuals who, due to special circumstances, may be at higher risk of one of the four types of aspergillosis. For example, indoor sources of *Aspergillus* spp., including *A. fumigatus*, have been responsible for infecting high risk hospitalized patients, patients who are immunocompromised or suffer certain other serious illnesses. That being said it is impossible for any individual no matter how vulnerable to completely avoid exposure to *Aspergillus*. As stated *Aspergillus* is ubiquitous in the environment.

8.12.1.1 *Aspergillus* in immunocompromised

There is no doubt that the individuals most vulnerable to *Aspergillus* as an infective organism are the immunocompromised. These are often but not always hospital based. It is of course true that as well as being vulnerable to *Aspergillus* they are usually vulnerable to a multitude of other organisms as well.

Hospital outbreaks of invasive aspergillosis have become a well recognised complication of construction, demolition or renovation activities in or near hospital wards accommodating immunocompromised patients.

It is a cause of severe illness and mortality in these patients.

This was one reason that *National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction/Renovation Activities* were issued in 2002 by the National Disease Surveillance Centre (NDSC).²⁹

Amongst the recommendations in the Guidelines were:

- That hospital managers ensure that hospitals have an infection control committee with responsibility for drawing up a hospital policy for the prevention of invasive Aspergillosis.
- That when major construction work is planned, hospital managers ensure that a multidisciplinary team comprising hospital administrators, infection control staff, technical services staff, designers and relevant clinicians in high risk areas is established, and that policies and procedures are put in place to minimise the risk of invasive Aspergillosis that clearly outline the responsibilities of all personnel involved.
- That patients are risk assessed and divided into categories according to the degree of risk of invasive aspergillosis.

It also recommended that preventive measures be divided into construction and ventilation measures, infection control measures and chemoprophylaxis. It stated that construction and ventilation measures should consist of:

- Measures to reduce dust from construction areas.
- Measures to physically protect at-risk patients (for example physical barriers).

Infection control measures should include:

- The education of health care workers, project managers, contractors, design teams, health and safety supervisors, cleaning supervisors, patients and relatives of the patients on the risk of invasive aspergillosis and the steps that should be taken to reduce this risk.
- Cleaning procedures directed at reducing dust in clinical areas.
- The control of pedestrian, supply and construction-related traffic.

It is advised that a Construction Permit should be used and gives example of these permits.

With regard to environmental conditions for high risk patients the Guidelines stated:

Very high-risk patients (Group 4)

Patients at very high risk (Group 4) should receive maximum protection irrespective of the type/size of the building programme. All very high-risk patients should be nursed in HEPA (High Efficiency Particulate Air) filtered positive pressure rooms during the neutropenic period. If they are subsequently transferred to a ward the windows should be sealed and suitable air quality provided. The vast majority of these patients are in hospital. For the proposed scheme the vulnerable patients are in the Mater Misericordiae Hospital and the Mater Private Hospital. There are other healthcare facilities some of which treat cancer patients such as the HARI clinic but none of these are likely to be in a high degree of immunocompromise. Construction is by no means the only source of Aspergillus and the hospitals need to have adequate HEPA filters anyway. The Mater Misericordiae have already installed these and it is the stated intention of the Mater Private to do so in the coming months. Other health institutions such as the Rotunda may care for immunocompromised patients but on a much less frequent basis.

High-risk patients (Group 3)

Patients at high risk (Group 3) should receive protection if the area of treatment is juxtaposed or near the hospital construction area or if it is otherwise likely that Aspergillus-contaminated air may enter the area. High-risk patients should be nursed in a ward with sealed windows and suitable air quality. Again these patients are most likely to be in the hospitals referred to above.

Increased-risk patients (Group 2)

Patients at increased risk (Group 2) are usually dispersed throughout a hospital and therefore physical protection may be impractical but they are also less vulnerable so less in need of this. Consideration should be given to moving patients away from a construction area if it were particularly dusty and immediately adjacent (less than 50m).

Impact assessment: Aspergillus

All ground breaking construction work will have the potential to temporarily increase the ambient air levels of Aspergillus in the immediate environs, that is within 200m of the site. Within this 200m area however the highest levels are going to be within 50m. The proposed scheme is no different from any construction work in this respect. Other activities such as composting and even grass cutting can be associated with greater increases. For the vast majority of people this is not an issue. Some highly immunocompromised individuals are potentially vulnerable but these are usually in highly controlled environments in hospitals. The relevant institutions for this project are the Mater Misericordiae and the Mater Private Hospitals. Mitigation measures proposed in *National Guidelines for the Prevention of Nosocomial Invasive Aspergillosis During Construction/Renovation Activities* minimise the potential for any detrimental effect. If these are followed there is no significant risk of a detrimental effect.

8.13 LEPTOSPIROSIS (WEIL'S DISEASE)

Leptospirosis is caused by a spirochaete bacterium called *Leptospira* spp. that has at 5 different types causing disease, the most important being *icterohaemorrhagiae*, the cause of Weil's Disease.

Leptospirosis is transmitted by the urine of an infected animal, and is contagious as long as it is still moist. Although rats and mice are important primary hosts, a wide range of other mammals including dogs, deer, rabbits, hedgehogs, cows, sheep are also able to carry and transmit the disease as secondary hosts. The type of habitats most likely to carry infective bacteria are muddy riverbanks, ditches, gulleys and muddy livestock rearing areas where there is regular passage of either wild or farm mammals. There is a direct correlation between the amount of rainfall and the incidence of leptospirosis.

Humans become infected through contact with water, food, or soil containing urine from these infected animals. This may happen by swallowing contaminated food or water or through skin contact. The disease is not known to be spread from person to person and cases of bacterial dissemination in convalescence are extremely rare in humans. Leptospirosis is common among watersport enthusiasts in specific areas as prolonged immersion in water is known to promote the entry of the bacteria. This is not relevant for the proposed scheme as there is no water sports facility in the study area.

Prevention measures including good sanitation particularly rodent control as well as preventing infected animals from urinating in waters where humans have contact, disinfecting contaminated work areas, providing worker education, practicing good personal hygiene, and using personal protective equipment (PPE) when handling infected animals or tissues are important actions for prevention of the disease. Examples of PPE include gloves, face shields and rubber boots for workers who wade in rodent urine-contaminated water.

Impact assessment: Leptospirosis

The risks are related to rodent numbers. There are rodents everywhere. Construction work will result in breaking of ground and will expose some rodents for a short period of time. Nothing in the construction phase however will encourage an increase in rodent numbers. There is for example no food source to encourage population growth. The same is true for the operational phase although rodent control measures will be necessary in, for example, tunnels. Indeed with control measures in place during the construction and operational phases a reduction in rodent population is more likely. Overall because of no increase rodent population no significant impact on the incidence of Leptospirosis or its associated human health impacts is predicted.

8.14 GROUNDWATER AND SURFACE WATER

The Groundwater and Surface Water chapters of this EIS (Volume 2, Chapters 10 and 11 respectively) give a comprehensive assessment of potential impacts on groundwater and surface water from the construction and operational phases of the proposed scheme. Predictions are for a low significance impact on groundwater and surface water in all areas for both the construction and operational phases. There is no significant risk of contamination of potable water supplies which by and large comes from some distance away for the population around the proposed scheme.

Impact assessment: Groundwater

Based on the predictions detailed in the Groundwater chapters of this EIS (Volume 2, Chapter 10) no significant human health impacts arising from changes in groundwater are predicted for the operational or construction phases of the proposed scheme.

8.15 LANDFILL SITES

There are no licensed landfill sites along the proposed scheme. Anecdotal evidence has suggested that there may be unlicensed sites at some locations along the proposed scheme. However when boreholes were drilled at sites where these were suggested no evidence of same was identified. By their nature of being unlicensed it is impossible to predict with absolute accuracy that there will not be sites exposed during excavation but current evidence suggests that this is not likely.

In the event of a significant landfill site being exposed it will be a matter for the Environmental Protection Agency (EPA). Any mitigations measures required by the EPA will be instituted.

Impact assessment: landfill sites

Current evidence suggests that exposure of unlicensed landfill sites is not likely. In the event of it occurring necessary control measures as advised by the EPA will be instituted. With this no human health impacts are predicted.

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09

DIFFICULTIES ENCOUNTERED





This chapter of the EIS gives an indication of any difficulties encountered by consultants when compiling the Environmental Impact Assessment (EIA).

Difficulties in this regard may include technical deficiencies or lack of information. Overall issues encountered during the preparation of the EIS are detailed in full in the relevant baseline and impact assessment chapters of the EIS, where applicable. Some general issues are detailed below:

- access limitations to private and public property for groundwater sampling;
- access limitations to diverse habitat and faunal surveys at individual locations;
- availability of some planning and policy documents. The following documents were unavailable at the time of reviewing:
 - Fingal Biodiversity Plan
 - Swords Area Plan
 - City Markets Development Plan (between Henry Street and the new urban quarter of Smithfield) published February 2008-07-11
 - Draft Whitehall Framework Development Plan (on lands previously used as Port Tunnel Depot at the Junction of Swords Road and Collins Avenue) released February 2008.
- Unfavourable weather conditions which influenced the timing of ecological surveys

Specific data and survey assumptions are addressed in the individual environmental topic chapters.



10

HUMAN BEINGS: LANDUSE

- 10.1 Introduction
- 10.2 Baseline categorisation methodology
 - 10.2.1 Introduction
 - 10.2.2 Study area
 - 10.2.3 Baseline data
 - 10.2.4 Baseline categorisation criteria
- 10.3 Description and categorisation of the existing environment
 - 10.3.1 Description of the baseline environment
 - 10.3.2 Categorisation of the baseline environment





Section 39(2)(b) of the Railway Infrastructure Act, 2001 specifies that an environmental impact statement must contain a description of the aspects of the environment that are likely to be significantly affected by the proposed scheme. This chapter has been prepared in order to fulfil this requirement in respect of landuse.

10.1 INTRODUCTION

This chapter describes and evaluates the existing environment with respect of landuse in the area of the proposed scheme. Many topics in the EIS relate to landuse. These are dealt with under their specific topic headings and include: Architectural, Archaeology and Cultural Heritage; Noise; Vibration; Landscape; and Agronomy.

Prior to compiling this chapter, a number of planning and policy documents were reviewed to ascertain if the documents contain any plans, policies or objectives relating to landuse. The following documents have been reviewed:

- Regional Planning Guidelines (RPGs) for the Greater Dublin Area, 2004 -2016 (Dublin Regional Authority and the Mid-East Regional Authority, 2004);
- Fingal County Development Plan 2005-2011, (Fingal County Council (FCC));
- Preparation of Draft Swords Local Area Plan 2008-214 (Fingal County Council, 2007);
- Nevinstown – Residential Action Area Plan (Fingal County Council, 2001);
- Nevinstown ST1 Local Area Plan (Fingal County Council, 2002);
- Airport Local Area Plan (Fingal County Council, 2006);
- North Ballymun Local Area Plan (LAP) (Fingal County Council, 2005);
- Dublin City Development Plan 2005-2011, Dublin City Council (DCC);
- Masterplan for the new Ballymun, (Ballymun Regeneration Ltd., 1998) (as amended);
- Richmond Road Area Action Plan, (Dublin City Council, 2007);
- Preparation of Draft Local Area Plan for Phibsborough/Mountjoy (Dublin City Council, March/April 2007);
- The South Fingal Planning Study (Davis, 2004);
- Dublin Airport Public Safety Zone Study, (ERM on behalf of Department of Transport and the Department of Environment, Heritage and Local Government, 2005);
- Framework Plan for Parnell Square (Howley Harrington Architects in collaboration with Dublin City Council and Alan Sherwood (The Tourism Co.), 2005).

The results of this review are detailed in the Planning and Policy Context of this EIS (Volume 1, Chapter 4). The zoning objectives defined by Fingal County Council and Dublin City Council within the respective County Development Plans are detailed in Table 10.1 and Table 10.2 of this chapter.

Table 10.1 Fingal County Council Zoning Objectives

Zoning ref.	Description of zoning	Objective
RS	Residential (General)	To provide for residential development and to protect and improve residential amenity.
RS1	Residential (New communities)	To provide for new residential communities in accordance with approved local area plans and subject to the provision of the necessary social and physical infrastructure.
MC	Town Centre Facilities	To protect and provide for and/or improve town centre facilities.
SC	Physical and Social Character of Suburban Centres	To protect and enhance the special physical and social character of major suburban centres and to provide and/or improve urban facilities.
NC	Neighbourhood Centre Facilities	To protect, provide for and/or improve neighbourhood centre facilities.
GI	General Industry	To facilitate employment and related uses in industrial areas.
GI1	General Industrial Employment in New Industrial areas	To facilitate opportunities for general industrial employment and related uses in new industrial areas in accordance with an approved local area plan.
ST	Science and Technology	To facilitate opportunities for science and technology based employment.
ST1	Science and Technology and LAP areas	To facilitate opportunities for science and technology based employment, and associated and complementary uses in a high quality environment in accordance with an approved local area plan.
WD	Distribution, Warehouse, Storage and Logistics	To provide for distribution, warehouse, storage and logistics facilities which require good access to the major road network within a good quality environment.
DA	Airport Action Plan	To ensure the efficient and effective operation of the airport in accordance with an Airport Action Plan.
RU	Agriculture and Rural Amenity	To protect and provide for development of agriculture and rural amenity.
RV1	Development of Rural Villages	To protect the special character of rural villages and provide for improved village facilities and local housing need in accordance with approved local area plans and infrastructure provision.
RC	Settlement Clusters and Infill Development	To protect residential amenity and the character of settlement clusters and provide for small scale infill development to serve local needs.
RB	Agri-business Uses	To provide for and facilitate the provision of agri-business uses.
GB	Greenbelt Areas	To protect and provide for a greenbelt to demarcate the urban and rural area and provide for agriculture and amenity in a manner that protects the physical and visual amenity of the area.
HA	High Amenity Areas	To protect and improve high amenity areas.
OS	Open space and Recreational Amenities	To preserve and provide for open space and recreational amenities.

Table 10.2 Dublin City Council Zoning Objectives

Zoning Ref.	Description of Zoning	Objective
Z1	Residential (General)	To protect, provide and improve residential amenities.
Z2	Residential (Conservation Areas)	To protect and/or improve the amenities of residential conservation areas.
Z3	Neighbourhood Centres	To provide for and improve neighbourhood facilities.
Z4	District Centres (incorporating Prime Urban Centres)	To provide for and improve mixed services facilities.
Z5	City Centre (Mixed Use)	To consolidate and facilitate the development of the central area, and to identify, reinforce, strengthen and protect its civic design character and dignity.
Z6	Employment/Enterprise (Light)	To provide for the creation and protection of enterprise and facilitate opportunities for employment creation.
Z7	Employment (Heavy)	To provide for the protection and creation of industrial uses, and facilitate opportunities for employment creation.
Z7A	Employment (Heavy – excluding incinerator/waste to energy plant)	To provide for the protection and creation of industrial uses, and facilitate opportunities for employment creation.
Z8	Conservation Areas	To protect the existing architectural and civic design character, to allow only for limited expansion consistent with the conservation objective. To allow primarily residential and compatible office and institutional uses.
Z9	Amenity/Open Space Lands	To preserve, provide and improve recreational amenity and open space.
Z10	Inner Suburban (Mixed Use)	To consolidate and facilitate the development of inner suburban sites for mixed use development of which office, retail and residential would be the predominant uses.
Z11	Waterways Protection	To protect and improve canal, coastal and river amenities.
Z12	Institutional Land (Future Development Potential)	To ensure the existing environmental amenities are protected in any future use of these lands.
Z13	Housing Rejuvenation Areas	To seek the social, economic and physical rejuvenation of an area.
Z14	Framework Development Areas	To seek the social, economic and physical development and/or rejuvenation of an area with mixed use of which residential and 'Z6' would be the predominant uses.
Z15	Institutional Land (Long Term Institutional Use)	To provide for institutional and community uses.

10.2 BASELINE CATEGORISATION METHODOLOGY

10.2.1 Introduction

This section presents the methodology used to assess the baseline landuse environment. The methodology takes into consideration EPA guidance with respect to EISs (EPA, 2002; EPA, 2003).

The baseline evaluation included:

- A desktop study of existing available data;
- A field survey to identify current landuse and sensitive receptors.

10.2.2 Study area

The baseline landuse study area encompasses an area extending to 500m either side of the proposed alignment. The study area for the review of granted planning applications includes those applications located directly on or within 20m of surface elements of the scheme and areas of cut and cover or retained cut along the proposed alignment. Further details are provided in Annex A, Volume 3, Book 2 of 2.

Table 10.3 Study area

Aspect	Width of study area (on both sides of the alignment)
Landuse survey	500m
Review of planning permissions	20m (plus areas where temporary/permanent construction sites are located)

Table 10.4 Baseline data

Information required	Data source
Current landuse	
- Location and nature of developments within the study area	- Field survey to map current landuse undertaken in October 2006
Future landuse according to planning applications relating to a Grant of Permission for Development or a Grant of Outline Permission:	
- Within 20m of the centre line of the proposed alignment – Fingal County Council applications from Oct 2001 to January 2008 and Dublin City Council from October 2001 to January 2008	- DCC and FCC GIS database - The baseline landuse field survey completed October 2006 is used to inform the progress on all applications reviewed*
- Outside 20m of the centre line of the proposed alignment - applications relating to areas that are to be used for temporary or permanent construction sites	- Aerial Photography

* Applications that are known to be currently under construction or that are already built are not included as these are recorded as part of the field survey.

10.2.3 Baseline data

The data used to compile the baseline for this chapter is shown in Table 10.4.

The complete results of the planning applications search are included in Annex A, Volume 3, Book 2 of 2. Some of the more significant planning applications are outlined in Section 10.3 of this chapter and are illustrated on maps (Baseline Landuse) included in Volume 3, Book 1 of 2.

10.2.4 Baseline categorisation criteria

Categorisation of the baseline environment involves the allocation of overall 'functional values' to discreet areas within the study area. The functional value of the area is determined with reference to the 'importance' and 'sensitivity' of the area as well as any 'existing adverse effects' that impact on the area. Each of these terms is explained in detail in this section.

The study area has been divided into 37 landuse areas (LAs), which are defined with reference to the dominant landuse in that area. These LAs are described in Section 10.3. All LAs, from LA 01 to LA 37, are illustrated on maps (Baseline Landuse) provided in Volume 3, Book 1 of 2. Functional values are allocated to the LAs to indicate their overall importance and sensitivity.

Importance

Every landuse is important in its own right. In the context of this chapter, the relative importance of one particular landuse over another depends on the role each has in achieving the landuse policy objectives for the local area.

The places where people live can have a major effect on their quality of life. The protection of residential areas is therefore key to encouraging healthy and sustainable communities. Health and recreation facilities provide important services/facilities/spaces and help improve the lives of individuals and communities. Recreational landuses are also important and include areas zoned as 'open space' and/ or 'recreational amenity' areas in development plans and includes recreational areas within and used by schools. The role of greenbelt areas is important and is protected in planning policy. Greenbelts provide opportunities for recreational, amenity, agricultural resource, and as a source of open countryside for urban populations.

Educational landuses are also considered to be very important as they help develop the intellectual, social and artistic aspects of populations. Landuses such as art galleries, museums, libraries, theatres, concert halls can also contribute to the community, artistic, literary and social quality of life. Churches, cemeteries, features of historic and/or architectural importance and places of cultural and social significance can play a vital role in the development of communities within an area. They can also serve to promote and preserve the unique culture of an area.

The Government has ratified a number of international conventions relating to the protection, conservation and management of parks and heritage sites. These areas are designated for their amenity and heritage value. While benefiting/improving the overall environment, these areas can also help enhance the quality of life of communities through everyday social interaction, health benefits and recreation. Agricultural areas are considered important for local and regional economic, ecological and landscape uses.

Sensitivity

In the context of this assessment, landuse sensitivity is defined as the extent to which a landuse can accept change of a particular type and scale without unacceptable adverse effects on its functionality. Some landuses are more sensitive to changes than others. All permanent residential areas are considered to be highly sensitive to change. Generally, recreational/amenity areas, educational uses and residential areas have a low capacity to accommodate changes to landuse and therefore are considered to be very sensitive.

The functionality of a landuse is also sensitive to severance. Particularly sensitive landuses include those associated with emergency services and areas frequented by large numbers of people (e.g. recreational facilities, educational facilities, employment centres). Areas that are sensitive and that attract large numbers of people are often protected through planning policy mechanisms and specific zoning designations. Issues relating to traffic management in these areas are addressed in the Traffic chapters of this EIS (Volume 2, Chapter 7).

Some areas have capacity to accommodate limited changes to landuse. These areas are often purpose-built and only occupied during daytime hours and/or for limited period of time. Examples include commercial areas and areas of employment. Landuses in the study area are zoned for various purposes and it is the existing planning policy zoning that is considered when assessing the sensitivity of these areas. Industrial areas and areas of existing infrastructure are considered important however these areas generally, have a capacity to accommodate changes to landuse.

Existing adverse effects

The value of some landuses may be impacted upon by various external forces which contribute to the degradation of that landuse. These include very high levels of noise, vibration, traffic, air pollution etc. These existing effects are addressed in the relevant specialist chapters within the EIS. However, very significant adverse effects are recognised when assessing the functional value of landuses. For example, residential areas located in town centre locations or along primary transport routes where noise is present at higher levels than in suburban areas. These existing adverse effects can contribute to the reduction of the functional value of that landuse.

Functional value

The functional value of the LAs of the baseline environment is evaluated by means of a number of specific criteria to take into account the importance and sensitivity of different features of the environment. The criteria that have been defined are described in Table 10.5.

Table 10.5 Criteria for baseline categorisation

Criteria	Functional value
Landuses that have a low capacity to accommodate the type of change envisaged: <ul style="list-style-type: none"> - Residential areas; - Healthcare facilities including hospitals, childcare facilities and residential care homes; - Community uses such as art galleries, museums, libraries, theatres, concert halls; - Educational facilities including schools, colleges and lecture halls; - Religious areas including churches and cemeteries; - National, regional parks and heritage sites. 	Very high (V)
Landuses that have a capacity to accommodate limited changes to landuse: <ul style="list-style-type: none"> - Residential landuses with commercial, retail and/or office uses (i.e. mixed uses with a residential component); - Town/Inner city/local parks designated OS and Z9 in the Fingal County and Dublin City Development Plan respectively. These include areas used for recreational or amenity purposes; - Designated greenbelt areas; - Recreational areas associated with landuses such as schools with sports grounds and tennis grounds within educational or community grounds. 	High (IV)
Landuses that have a capacity to accommodate a degree of the type of change envisaged: <ul style="list-style-type: none"> - Commercial/retail uses/areas; - Office blocks/parks; - Hard landscaped areas including playgrounds, exterior areas of schools and green areas in residential areas; - Playing pitches and sports grounds; - Purpose-built structures for recreational uses e.g. sports stadium; - Golf courses. 	Medium (III)
Landuse that have a greater capacity to accommodate changes: <ul style="list-style-type: none"> - Retail warehousing and commercial storage areas; - Large retail outlet areas; - Light Industry uses; - Petrol stations, mechanic areas and/or garages; - Structures and areas associated with agricultural uses. 	Low (II)
Landuses that have a significantly greater capacity to accommodate the type of change envisaged: <ul style="list-style-type: none"> - Dublin Airport Zone; - Dublin Airport Safety Zones - Airport Red Approach Zones; - Existing infrastructure; - Industrial areas; - Existing noise prone areas (city streets); - Brownfield sites; - Paved areas including carparks; - Activity centres e.g. Go-karting track. 	Very low (I)

Table 10.5 is a guide only. Each landuse is assessed on its own merits using professional judgement and experience. The results of this assessment are detailed in Section 10.3 of this chapter and illustrated on maps (Baseline Landuse) included in Volume 3, Book 1 of 2.

10.3 DESCRIPTION AND CATEGORISATION OF THE EXISTING ENVIRONMENT

10.3.1 Description of the baseline environment

A summary description and categorisation of each of the LAs is outlined in Section 10.3.2. The landuse field survey was carried out between 2006 and 2008. Landuse has changed since that time and can be expected to change on a continuous basis in the future. In order to take these changes into account in the baseline description and evaluation, a review of the planning files of FCC and DCC was carried out in January 2008. The full results of this review are detailed in Annex A, Volume 3, Book 2 of 2. A number of the most significant applications are also detailed in this section. In this context, 'significant' applications are deemed to be those that relate to a development that will cover an area of more than 0.5 hectares and will result in a significant change in landuse.

Significant planning application developments are detailed from north to south along the alignment:

- The planning application site of Rohan Holdings Ltd. (planning reference number F05A/0174) is located in Swords Business Park, within the townlands of Swords Demesne & Seatown East, north of Bayer Diagnostics, on the R132, Swords, Co. Dublin. The planning application is for the development of four warehouse units on industrial zoned lands;
- The planning application site of Sizzles International Limited (Swords Pavilions Shopping Centre), (planning reference number F03A/1391) is located in the former 'Superquinn Site', Swords Shopping Centre, Dublin Street, Swords, Co. Dublin. The planning application is for the development of mixed use retail and residential development consisting of eleven single storey plus mezzanine retail units, a total of one hundred and twenty six apartments arranged around three courtyards in two, three and four storeys and ancillary works. Various planning applications relate to the development of this area and a full list of application numbers can be seen in Annex A, Volume 3, Book 2 of 2;
- The planning application site of Dublin Airport Authority (planning reference no. F06A/1248) is located in the Dublin Airport Development Area (DAA). The planning application is for the development of new airport terminal east of the existing terminal building adjoining Pier C and ancillary works. Various planning applications relate to the development of this area and a full list of application numbers can be seen in Annex A, Volume 3, Book 2 of 2;
- The planning application site of IKEA Irl. Ltd. (planning reference number F06A/0227) is located in the townlands of Balcurris, Ballymun and Sillogue, Ballymun, Dublin 11. The planning application is for the development of a large scale retail warehouse with ancillary development, restaurants and crèche facilities;
- The planning application site of Genetic Developments Ltd. (planning reference no. F05A/1510) is located at the junction of Ballymun Road and, Santry Avenue, Ballymun, Dublin 9. The planning application is for the construction of a mixed use development on a 1.3ha site, comprising of five blocks blocks, ranging from four storeys to six storeys in height, commercial and retail gross floor area comprising a six screen cinema (6246.6 sq.m.), a children's activity centre, a restaurant/bar, eight retail units, a crèche and a health and fitness centre, two hundred and thirty seven apartments, five hundred and fifty three car parking spaces, cycle parking and refuse storage for commercial and residential use and with access via the Old Ballymun Road. This general area is subject to numerous planning applications for retail, office, residential and recreational developments and ancillary works. The area is being developed as 'Northwood Village' and a full list of application references can be seen in Annex A, Volume 3, Book 2 of 2;
- The planning application site of Ballymun Regeneration Ltd. (planning reference PL03/115) is located on the Ballymun Road, Dublin 11. The planning application is for the development of student accommodation in seven blocks. Various planning applications relate to the development of this area and a full list of application references can be seen in Annex A, Volume 3, Book 2 of 2;
- The planning application site of Mater Campus Hospital Development Ltd. (planning reference number PL4929/03, PL2563/05 etc.) is located at the Mater Misericordiae University Hospital complex, bounded to the north by the North Circular Road, to the west by Berkeley Road, to the south by Eccles Street and to the east by the rear of the terrace of the existing houses fronting onto Leo Street, Dublin 7. The planning application is for the development, upgrade and extension of the existing Mater Misericordiae University Hospital including demolition and new build, and the relocation of the Temple Street Children's University Hospital within a new building in the Mater complex. The main works are proposed to be completed by 2010. Various applications for medical related facilities have been granted in this area and a full list of application references can be seen in Annex A, Volume 3, Book 2 of 2;

- The planning application site of the Board of Governors of Rotunda Hospital (planning reference PL2523/06) is located at the Rotunda Hospital, Parnell Square, Dublin 1. The planning application is for the development, extension and reconfiguring of the current carpark layout and associated pedestrian access routes, to up-grade the existing hospital entrance, and a first floor extension to the existing single storey. All proposed works are within the grounds of the Rotunda Hospital. A full list of application references can be seen in Annex A, Volume 3, Book 2 of 2.

10.3.2 Categorisation of the baseline environment

The functional value of the LAs within the study area is evaluated by means of a number of specific criteria which are shown in Table 10.5. The functional value that has been assigned to each LA is described in Table 10.6 of this chapter and illustrated on maps (Baseline Landuse) included in Volume 3, Book 1 of 2. The LAs are described from north to south along the alignment. Areas LA01-12 refers to policy/objectives from Fingal County Development Plan 2005-2011 unless otherwise stated.

**Table 10.6 Categorisation of the baseline environment
Area MN101:**

LA 01	Belinstown south to Balheary Demesne townland	Functional value: (V)
Location	- This LA comprises the agricultural lands located in the townlands of Belinstown South, Lissenhall Little and Balheary Demesne. The LA extends as far as the southern banks of the Broad Meadow River (running west to east into Malahide Estuary).	
Description	<ul style="list-style-type: none"> - The dominant landuse within this LA is agricultural (zoned GB and GI) and used for pasture, arable and amenity uses. The greenbelt zoning serves to demarcate and contain urban development and provides for recreational amenity. - There are a number of stand-alone residential dwellings and farm buildings in the LA. These landuses are important and sensitive to change. - Recreational uses include the Emmaus Retreat and Conference Centre which is under the patronage of the Christian Brothers and the Sisters of the Holy Faith. The grounds include mature, tree-line pathways, landscaped gardens and a river-walk along the Broad Meadow River. Both the Ward and the Broad Meadow Rivers and Estuary are zoned as High Amenity areas (HA - Fingal County Development Plan) and parts of the Broad Meadow River are designated as a Special Area of Conservation. - Lissenhall Bridge (bridging the Ward River) and Balheary Bridge (bridging the Broad Meadow River) are located to the east of R132. - The LA includes the heavily trafficked R132, which runs north-south through the LA and merges with the M1 to the northeast. 	
Existing Zoning(s)	Fingal County Council zoning objectives (Table 10.1) <ul style="list-style-type: none"> - GB, HA, RU, GI. Map Based local objectives (FC Development Plan, 2005): <ul style="list-style-type: none"> - 77: 'To provide for the improvement and extension of the riverside walk from [a] the Ward valley to Swords estuary and from [b] the estuary westwards along the Broad Meadow river including provision of a pedestrian link'. - 227, 228, 229, 230: 'To protect and preserve trees, woodlands and hedgerows' - 3621: 'To provide a footpath along the estuary north of Seatown Lane'. The entire area is included within the 'Study Area for Metro Terminus area'. - 3665: 'To provide a hotel and complementary uses to facilitate the viability of this protected structure'. - 373: 'Upgrade and provide for pedestrian path' (west along Broad Meadow River). - 1898: Study Area for Turvey Avenue lands (located to the east of the M1). - Study area for Metro Terminus area. 	

LA 02	Industrial and Business Uses: Lissenhall Area	Functional value: (II)
Location	- This LA comprises four separate areas along the R132 east and west of the alignment.	
Description	<ul style="list-style-type: none"> - This LA comprises the IDA Industrial and Swords Business Campus and a Business Centre as well as areas along the R132 that are used for light industry, distribution, warehousing and commercial business (zoned GI). Swords Waste Water Treatment Plant (zoned HA) is included in this LA. - The LA is not considered very sensitive to change due to the presence of mainly industrial and business uses but these are considered to be important landuses. An area of currently undeveloped land (zoned GI) is located adjacent to the Swords Business Campus bordering the southern banks of the Broad Meadow River. 	
Existing Zoning(s)	<p>Fingal County Council zoning objectives Table 10.1):</p> <ul style="list-style-type: none"> - GI, HA. <p>Map Based local objectives (FC Development Plan, 2005):</p> <ul style="list-style-type: none"> - 207: 'To protect and preserve trees, woodlands and hedgerows'. - The development plan refers to a 5 year cycle-way proposal within the LA. 	

LA 03	Lissenhall & Seatown Residential Areas	Functional value: (V)
Location Areas	- To the west of the alignment, the LA comprises the open space areas and residential areas in Lissenhall along the Ward River as far as Estuary Roundabout. To the east of the alignment there are residential and community landuses including Castlegrange and Seatown Park residential areas	
Description	<ul style="list-style-type: none"> - This LA consists of primarily residential community and open spaces zoned RS and OS. Residential areas include: Seatown Park, Castlegrange Estate, Nethercross Court and Seatown Villas estates. All areas are interspersed with landscaped open spaces. The dwellings are predominantly two-storey, semi-detached or terraced dwellings with some detached houses also present. - Recreational uses include: the Fingallian's GAA sports ground and clubhouse located to the east of the R132. A large amount of zoned open space within this LA to the west of the R132 is used for recreational purposes including sports grounds, areas for walking and parts of the Ward River Valley Regional Park (discussed in greater detail under LA 06). 	
Existing Zoning(s)	<p>Fingal County Council zoning objectives (Table 10.1):</p> <ul style="list-style-type: none"> - RS, OS, HA, MC. <p>Map based local objectives (FC Development Plan, 2005):</p> <ul style="list-style-type: none"> - 238: 'To provide for a Metro Station when required'. This objective relates to open space area west adjoining the R132. - 2407: 'To prepare a strategy for the Metro terminus which will provide for the optimum mix of uses' (objective relating to lands beside Fingallian's GAA sports grounds). - The development plan refers to a 5 year cycle-way proposal located along Ward River transecting the R132 at Estuary Roundabout and continuing eastwards to the banks of the estuary. - Parts of the LA are included within an area for which a Masterplan is to be developed. 	

LA 04	Scotchstone Bridge Business area and Fingal County Council Depot	Functional value: (III)
Location	<ul style="list-style-type: none"> - The LA comprises areas between 100-500m to the west of the R132 and the proposed alignment. The Fingal County Council Depot and Fire Station are located within this LA. 	
Description	<ul style="list-style-type: none"> - The lands in this LA are used for light industrial, business, residential and employment generating uses (zoned GI). It is characterised by large commercial, office and warehouse units with a limited residential component (zoned MC). 	
Existing Zoning(s)	<p>Fingal County Council zoning objectives (Table 10.1):</p> <ul style="list-style-type: none"> - GI, MC. <p>Map based local objectives (FC Development Plan, 2005):</p> <ul style="list-style-type: none"> - LA included within a designated Masterplan Area. 	
LA 05	Swords and Pavilions Shopping Centre and Nevinstown LAP Area (2001)	Functional value: (IV)
Location	<ul style="list-style-type: none"> - This LA includes areas 200m-500m west of the R132. The LA extends from North Street in Swords south to the Pavilions Shopping Centre and extends eastwards into agricultural lands (zoned MC) including the Nevinstown LAP lands (0-500m from the alignment). 	
Description	<ul style="list-style-type: none"> - Commercial, residential and mixed uses are the dominant landuse in this LA zoned MC. - The Fingal County Council headquarters office building marks the transition from old to predominantly newer and higher density town centre uses located along Main Street. The landuses are mainly commercial on the ground floor with either office or residential uses on upper floors. Residential apartment complexes are also located to the rear of the Main Street properties. - The Pavilions Shopping Centre is a major indoor retail and mixed uses development and includes: cinema and numerous retail stores. There are substantial carparking areas (both at ground level and multi-storey) in the LA. The Pavilions is (currently undergoing redevelopment) to include residential and high density mixed uses. The centre and cinema attract large volumes of people to the area for commercial and recreational purposes. - Fingal Community School is located off North Street and Seatown Road. Swords Castle is located off North Street. A community resource centre is located on Seatown Road and Swords Court House is located on North Street zoned MC. - Recreational uses include Swords Castle and open spaces located along the Ward River. This area is used for local amenity purposes within Swords town centre and is zoned OS. - Adjacent to the Pavilions Shopping Centre and the Malahide Roundabout is an area of land that is vacant and is currently zoned MC for town centre uses. - To the east of the alignment (adjacent to the Malahide Roundabout) is agricultural land zoned MC for town centre uses. - Further east is a new residential area and agricultural lands being developed in accordance with the Nevinstown LAP 2001. The 2001 LAP specifies that the area will include: residential uses, a primary school site and various urban parks. 	

LA 05	Swords and Pavilions Shopping Centre and Nevinstown LAP Area (2001)	Functional value: (IV)
Existing Zoning(s)	<p data-bbox="355 147 932 174">Fingal County Council zoning objectives (Table 10.1):</p> <ul data-bbox="355 197 560 224" style="list-style-type: none"> - OS, MC, GI, ST1. <p data-bbox="355 246 987 273">Map based local objectives (FC Development Plan, 2005):</p> <ul data-bbox="355 295 1254 956" style="list-style-type: none"> - 203, 204, 206, 213, 215 and 216: 'To protect and preserve trees, woodlands and hedgerows.' - 800: 'To provide for a carpark.' - 237: 'To promote the redevelopment of this prominent key corner site adjacent to Swords castle and County Hall, for civic uses in a manner, which will enhance the character and range of uses in the town core.' - 83: 'To conduct a study in conjunction with stakeholders to promote the development of a high quality street frontage along New Street, providing for a mixed use development incorporating a residential component and enhanced car parking provision at this.' - 242: 'To provide for a Metro Station when required' (zoned MC, currently agricultural land). - 254: Prepare a Local Area Plan for the integration of major town centre lands east of Swords By-Pass with the existing town centre including for transportation hub, retail and employment uses and the Swords Masterplan. - 3669: 'To provide for an appropriate mix of uses to be defined within a Local Area Plan/Master Plan'. Any residential component should not exceed 30% of the overall development. 	

LA 06	Part of the Ward River Valley Regional Park	Functional value: (V)
Location	<ul data-bbox="355 1093 1254 1153" style="list-style-type: none"> - Ward River and associated open space areas through Swords town 400m-500m west of the R132 and the proposed alignment. 	
Description	<ul data-bbox="355 1176 1254 1518" style="list-style-type: none"> - The Ward River Valley Regional Park is a distinct town centre amenity area of Swords. It is a linear park on the banks of the Ward River and covers an area of 89ha (220 acres) between Swords town centre and Knocksedan Bridge. The park is accessible to the public and features of interest include some 12th century fortifications, woodland habitats, wetlands and rolling grassland. There are viewpoints, picnic sites, a public playground, sports pitches and tennis courts. - Swords Town Park is an important regional and local amenity area and is open to the public during daytime hours. - The entire LA is an important for its historical, cultural and recreational amenity uses. It is zoned as a 'High Amenity Area' and is sensitive to change. 	
Existing Zoning(s)	<p data-bbox="355 1541 932 1568">Fingal County Council zoning objectives (Table 10.1):</p> <ul data-bbox="355 1590 427 1617" style="list-style-type: none"> - OS. <p data-bbox="355 1639 924 1666">Map based objectives (FC Development Plan, 2005):</p> <ul data-bbox="355 1688 1129 1753" style="list-style-type: none"> - Part of a zone of archaeological potential is located within this area. - Long term cycle way proposal is located along Ward River. 	

LA 07	Swords Residential areas	Functional value: (V)
Location	<ul style="list-style-type: none"> - This LA comprises residential areas (zoned RS) west of Seatown Roundabout and southwards as far as Malahide Road. The eastern edge of the LA includes parts of Drynam Road (southwest of the proposed alignment and of the R132) and lands at Dublin Street as far as Pinnock Hill Roundabout to include Carlton Court residential estate. 	
Description	<ul style="list-style-type: none"> - The landuses in this LA is predominantly residential and educational (zoned RS). The housing stock is well established in the area and is predominantly a mixture of two-storey detached and semi-detached houses with front and back gardens with well developed tree-lined streets interspersed with communal open spaces. These areas are highly sensitive to changes in landuse. - Coláiste Choilm school and sports ground are located west of the proposed alignment. St. Colmcille's Boys National School and Girls National School and associated open spaces are spread out over one area west of the alignment. - St Colmcille's church (zoned RS) and graveyard (zoned OS) is located along Chapel Lane, west of the proposed alignment. The burial ground area has a substantial number of mature trees. There is a specific objective within the FCC Development Plan, 'to protect and preserve trees, woodlands and hedgerows' within the burial ground (map based objective number 210). The same objective is given within an open space area close to Seamount View (residential area) on the eastern side of the proposed alignment. - Educational and religious areas are important community, recreational and amenity landuse areas. The landscaped areas with the LA are also important local recreational and amenity spaces. - Dublin Street developments have an existing exposure to adverse effects due to the street's use as one of the main access route to Swords town centre and also the streets proximity to the R132. There is existing severance noted between residential areas, schools and shops due to the R132. 	
Existing Zoning(s)	<p data-bbox="555 1077 1134 1099">Fingal County Council zoning objectives (Table 10.1):</p> <ul style="list-style-type: none"> - RS, OS. <p data-bbox="555 1173 1187 1196">Map based local objectives (FC Development Plan, 2005):</p> <ul style="list-style-type: none"> - 191, 192, 194, 195, 200, 210, 211, 212, 214: 'To protect and preserve trees, woodlands and hedgerows'. - LA is included in a proposed Masterplan area. - There are a number of long term cycle way proposals for the area. - There are a number of road proposals - Quality bus corridor proposal 	

LA 08	Swords Business Park	Functional value: (II)
Location	- Seatown Roundabout south to Malahide Road 0-500m east of the proposed alignment.	
Description	- The LA contains large purpose-built units used for business, light industry and employment generating uses.	
Existing Zoning(s)	Fingal County Council zoning objectives (Table 10.1) - GI Map based local objectives (FC Development Plan, 2005): - 2807: 'To promote high standards of urban design of development on lands adjoining the M1 motorway.' - 217: 'To protect and preserve trees, woodlands and hedgerows.' - LA is included in a proposed Masterplan Area. - Long term cycle way proposal is designated within the LA.	

Area MN102:

Parts of LA05 and LA07 described in Area MN101 extend into Area MN102

LA 09 A	Fosterstown and Nevinstown LAP ST1 lands	Functional value: (III)
Location	- East of the alignment to include: Airside Business Park and Airside Retail Park (zoned GI) and Nevinstown ST1 LAP (2002) lands.	
Description	- This LA comprises business, employment, retail/ commercial, car show rooms, light industrial and warehousing uses zoned GI and ST1. The Airside Business Park (zoned as GI) is bounded by some undeveloped land to the south. Airside Retail Park (east) is a purpose-built retail warehousing area with large retail units, office developments, and surface car-parking areas. - The Nevinstown ST1 LAP (2002) relates to lands within this LA and includes zoning provisions for: 'medium mixed uses', 'technology and logistics', 'science and technology' some of which are being developed on the ground.	
Existing Zoning(s)	Fingal County Council zoning objectives (Table 10.1): - GI, ST1. Map based local objectives (FC Development Plan, 2005): - 'To protect and preserve trees, woodlands and hedgerows.' - 'To protect and/or provide institutional uses on open lands.' - A Quality Bus Corridor (QBC) and road is proposed along the R132. - Indicative potential light rail corridors are shown in the maps of the area. - The development plan refers to a 5 year cycle-way proposal - east of Pinnock Hill Roundabout and east and west of Nevinstown junction.	

LA 09 B	Fosterstown and Nevinstown residential areas	Functional value: (V)
Location	- West of the alignment to include residential areas (zoned RS and RS1) and east of the alignment to include the Nevinstown new residential area (zoned ST1).	
Description	<ul style="list-style-type: none"> - The Fosterstown/Nevinstown area is developing as a new residential area with capacity for additional zoned development for residential purposes on existing agricultural lands. - To the west of this LA is: existing residential development and agricultural lands zoned lands RS and RS1. Existing residential areas consist of semi-detached two-storey dwellings, with some areas currently under construction. A petrol station is located along the R132 surrounded by open lands both zoned RS. - The Swords Veterinary Hospital is located east off Pinnock Hill Roundabout, with a residential dwelling adjoining the site zoned GI. - To the east of this LA: Hotel along Swords Road and Lakeshore Drive zoned GI and ST1 respectively. The Tara Winthrop Private Clinic (Nursing home) recognised as a sensitive landuse and zoned ST1. There are a number of scattered single storey dwellings located within this LA. The existing agricultural lands are earmarked in planning policy for future development for residential and open space uses and are therefore included in this LA. - Existing recreational uses in this LA include sports ground to the rear (east) of single storey residential properties on the R132. 	
Existing Zoning(s)	<p data-bbox="555 824 1129 851">Fingal County Council zoning objectives (Table 10.1):</p> <ul style="list-style-type: none"> - ST1, RS, RS1. <p data-bbox="555 913 1187 940">Map based local objectives (FC Development Plan, 2005):</p> <ul style="list-style-type: none"> - A Quality Bus Corridor (QBC) and road is proposed along the R132. - Indicative potential light rail corridors. - The development plan refers to a 5 year cycle-way proposal - east of Pinnock Hill Roundabout: and, east and west of Nevinstown junction. - Parts of the ST1 LAP (2002) lands are zoned for residential and open space uses and are included in this LA. - 3670: 'To permit dance hall/discotheque and nightclub' – Currently zoned ST1. 	

LA 10	North of Dublin Airport Zone	Functional value: (IV)
Location	<ul style="list-style-type: none"> - This LA relates to areas within 500m east and west of the proposed alignment. This includes parts of Fosterstown South and Nevinstown East. Nevinstown area to include all lands east and west of the proposed alignment extending southwards as far as Cloghran Roundabout, east and west along the Naul Road. 	
Description	<ul style="list-style-type: none"> - The majority of the LA is zoned as a greenbelt area (GB) between Fosterstown/ Nevinstown and Dublin Airport Zone and is being used for agricultural purposes. - A limited number of scattered single dwellings houses are located off the R132 within the GB area. A halting site is located along the Naul Road (north side). Kilronan House and Equestrian Centre is located to the east of the proposed alignment with mature trees surrounding the residence. - There are a number of commercial units to the east of the R132 and the National Show Centre. A commercial pre-cast concrete development is located to the west of the R132 and proposed alignment. - The Forrest Little Golf Club is located west of the alignment and zoned OS. 	
Existing Zoning(s)	<p>Fingal County Council zoning objectives (Table 10.1):</p> <ul style="list-style-type: none"> - GB, GI, OS. <p>Map based local objectives (FC Development Plan, 2005):</p> <ul style="list-style-type: none"> - Quality Bus Corridor Objective and road proposal along R132. - Long term cycle way proposal - along the Naul road. - Indicative potential light rail corridors transecting the LA. - Areas around the Naul Road are included within the Airport Safety Zone and Red Approach Zones. 	

Area MN103:

LA 11	Dublin Airport Zone	Functional value: (I)
Location	<ul style="list-style-type: none"> - Areas 0-500m east and west of the alignment from the Naul Road (in the north) extending south to unnamed road known locally as 'Collinstown Lane/Southern Airport Perimeter Road' that links the R132 with the R108. 	
Description	<ul style="list-style-type: none"> - Landuses include: Dublin Airport core aviation development zone - ancillary aviation related development zone, runways/taxiways, apron related development and proposed new terminal areas to the west of the existing main terminal. - Multi-storey and at-grade car parking is provided in a number of areas throughout the LA. The Irish Helicopters facility is located west of the proposed alignment. - All of the landuses associated with Dublin Airport are not very sensitive to landuse change. - There is a limited number of residential/hotel areas in this LA. A halting site is located to the west of the proposed alignment, south of Naul road. These landuses already experience existing high levels of noise and disturbance. - There are large open green areas within the airport area to the east of the proposed alignment. - The entire Dublin Airport area is an important social and economic landuse (zoned DA) and can accommodate changes to the LA. 	

LA 11	Dublin Airport Zone	Functional value: (I)
Existing Zoning(s)	Fingal County Council zoning objectives (Table 10.1):	
	<ul style="list-style-type: none"> - DA. 	
	Map based local objectives (FC Development Plan, 2005):	
	<ul style="list-style-type: none"> - 2044: 'To provide for Traveller Accommodation at existing Naul Road site'. - Many parts of this LA are within Airport Safety Zones and Red Approach Zones. - 'Indicative Potential Light Rail Corridors' transecting the area are indicated on maps - Indicative 'Rail proposal' extending from south and terminating at Dublin Airport terminal area. - Various road developments are proposed for this area. - A long term cycle way proposed along Naul road. 	

Area MN104:

LA 12	North and South of the M50 Motorway	Functional value: (III)
Location	<ul style="list-style-type: none"> - LA extends 0-500m east and west of the alignment from an unnamed road (known locally as 'Collinstown Lane/Southern Airport Perimeter Road' which links the R132 with R108). Land north of the M50 includes, the Tesco distribution centre (east of the alignment) and agricultural and industrial lands west of the alignment. 	
Description	<ul style="list-style-type: none"> - Landuses to the north of the M50 are dominated by open fields and arable agricultural land and various recreational uses (zoned ST1) to include: Go-Karting track to the east of the alignment, Balcurris Sports grounds, Cumann Parnell and Páirc Ciceam Baile Munna (to the west) and the Royal College of Surgeons sports grounds and gym located in the new Santry Demesne/Geraldstown house area and Sillogue Golf Course, (zoned OS). - Purpose-built light industrial/ warehousing buildings including a concrete recycling facility exist in the area (zoned GI). Ballymun Industrial Estate is located off St. Margaret's Road. The Ballymun NCT test centre is located off the R108 west of the alignment. Tesco's Distribution Centre is zoned GI and the airport long-term at-grade car park (zoned ST) is also located to the east of the alignment. 	
Existing Zoning(s)	Fingal County Council zoning objectives (Table 10.1):	
	GI, ST, ST1, OS, WD.	
	Map based local objectives (FC Development Plan, 2005):	
	<ul style="list-style-type: none"> - 122: 'To ensure the provision of development with a high standard of landscaping and finish along this important road frontage'. - 791: 'To provide for traveller accommodation'. - 1238: 'Employment node' Ballymun townland north of M50. - 3695: 'To prepare a Local Area Plan for these lands and to ensure that no development is commenced until funding for a Metro Link from Dublin City Centre to Dublin Airport is in place and a final alignment has been determined'. - 3696: 'To provide for an appropriate mix of uses to be defined within a Local Area Plan/Master Plan. Any residential component should not exceed 30% of the overall development'. - 4912: 'To provide for a car park'. - LA within Airport Safety Zone and Red Approach Zones (FCC). - Indicative rail corridor transecting LA east-west, extending north and terminating at Dublin Airport. - Various 'road proposals' are indicated on development plan maps. - 'Indicative potential light rail corridors' located in LA. 	
Source(s)	- North Ballymun Local Area Plan 2005.	

Area MN105:

LA 13	Ballymun Town Centre/Main Street	Functional value: (IV)
Location	<ul style="list-style-type: none"> - This LA comprises areas within 130m of the alignment to the east and within 500m of the alignment to the west. The LA extends from Santry Avenue southwards along Ballymun Road (R108) as far as the Ballymun leisure centre and swimming pool to the west and Ballymun civic centre to the east. 	
Description	<ul style="list-style-type: none"> - The existing landuses comprise high density mixed uses, commercial, residential and community uses. The LA is undergoing a major regeneration which includes creating a new town centre for Ballymun. Existing major landuses in the LA include swimming pool and civic buildings, hotels, office blocks, student accommodation, bank, shopping centre (proposed to be redeveloped), civic centre/community centre, St. Pappin's Church, youth centre and new and existing residential areas including 1970s prefabricated tower blocks. - The regeneration plan that includes this LA is currently being implemented. The existing low-rise Ballymun Shopping Centre and the existing residential prefabricated buildings are awaiting redevelopment. - Recreational uses include a swimming pool, youth centre, nursing home, civic office, hotels, gyms and open space/amenity areas. - Residential areas and community uses are the most sensitive landuses in this area. 	
Existing Zoning(s)	<p data-bbox="347 851 1013 884">Dublin City Council landuse zonings objectives (Table 10.2):</p> <ul style="list-style-type: none"> - Z4. - Parts of this LA are included in a designated Prime Urban Centre ('PUC 3'). - Within the Ballymun Masterplan, 1998 (as amended), landuse zonings allow for a range of uses including: offices and related development, shopping and service centre facilities, neighbourhood facilities, open green space and recreation, new housing, new housing private developments, mixed use residential, offices, employment, retail, flexible business space and educational landuses. 	

LA 14	Northwood area and Ballymun Residential Areas	Functional value: (V)
Location	<ul style="list-style-type: none"> - This LA includes areas within 500m to the east and west of the proposed alignment. The LA extends from Balbutcher Lane and Santry Avenue southwards as far as Ballymun Junior Comprehensive School to the east of the alignment and Ballymun Senior Comprehensive School to the west of the alignment excluding the Main Street area. 	
Description	<ul style="list-style-type: none"> - This LA is predominantly residential in nature with commercial, retail and educational uses also. There is a small amount of agricultural lands in the northern part of the area. - A number of one-off residential dwellings such as Santry Lodge and St. Anne's House (with mature woodland areas and hedgerows) are located east of the alignment zoned RT1 and NC in this area. Continuing southeast much of the area is being developed as part of a new village 'Northwood' zoned RV1. At present there are new commercial, office and residential estate areas with neighbourhood facilities developed in part of the area. The residential units built to date comprise mainly semi-detached houses with back gardens and off-street parking. Some sites are currently under construction. All residential areas have an existing exposure to adverse effects due to close proximity to the M50. - The LA includes residential areas to the east and west of the alignment and Ballymun Town Centre. To the west, this LA includes Poppintree, Ballcurrish gardens and Sillogue residential estates. To the east, it includes Coultury Park and Shangan residential areas. The LA comprises both new and old residential estates and of note are the 1970's prefabricated flats still in existence. Many of these flats are now either vacant/derelict, spine blocks awaiting redevelopment as part of the Ballymun Masterplan. Much of the LA has been developed as high quality, low density residential areas as part of the ongoing Ballymun Masterplan Regeneration project. These units include four to six storey residential/apartment developments, terraced and semi-detached two/three-storey dwelling/townhouse developments. All of the residential areas are considered to be of High functional value. Many of the residential areas in this LA are located close to the R108 and have existing exposure to adverse effects. - To the west of the proposed alignment, educational and community uses within the LA include Holy Spirit National School, Ballymun Recreation Centre, Holy Spirit Church and library, St. Joseph's National School, St. Joseph's Church, Scoil An tSeachtar Laoch and Ballymun Senior Comprehensive School. To the east of the proposed alignment, educational and community uses within the LA include Ballymun Community centre, the Virgin Mary School, Virgin Mary Church and Ballymun Junior Comprehensive School. All educational landuses are considered to be of Very high functional value. - Recreational uses include a number of public parks that have been redeveloped as part of the regeneration of this LA as higher quality, more usable public amenity spaces. These include Poppintree Park, Coultury Park, Shangan Park and other smaller neighbourhood spaces. A number of neighbourhood/community centres and pitches have also been developed and these provide opportunities for important recreational uses by communities. 	

Existing Zoning(s)

Fingal County Council landuse zoning objectives (Table 10.1):

- NC, SC, RS, RV1.

Map based local objectives (FC Development Plan, 2005):

- 121: 'To provide for and permit tourism infrastructure and leisure uses.'
- 124: 'To ensure the provision of development with a high standard of design and finish along this important road frontage.'
- 131: 'To provide for and permit tourism infrastructure and leisure uses.'
- 3243: 'To provide a grade separated interchange on Ballymun Road at the western entrance to Santry Demesne, serving also the ST1 zoned lands to the west.'
- 276: 'Development shall be in accordance with Ballymun Regeneration Ltd Masterplan as amended.'
- 272: 'To permit office campus-style development...and create a landscaping buffer zone between residential and industrial zoned lands. All development shall be subject to the requirements of the Irish Aviation Authority.'
- 139: 'To provide for a business park type development and uses associated with this.'
- 251: 'To promote intensive employment uses on 'ST' zoned lands at Santry.'

Dublin City Council landuse zoning objectives (Table 10.2):

- Z4, Z6.
- Parts of this area are included in a designated Prime Urban Centre ('PUC 3')
- Indicative road scheme and bridge proposed on development plan maps transecting Ballymun Road from Balbutcher Lane to Shanagan Road.
- There are a number of objectives and recommendations included within the Ballymun Masterplan 1998, 2004 (as amended) Ballymun Regeneration Ltd. DCC. Some of these objectives relate to: parks and urban design objectives, mixed uses, increasing accessibility and permeability to/from and within the areas. Ballymun Road, or the 'Main Street' in the Masterplan is described as becoming 'radically altered into a traffic calmed shopping street'.

LA 15	South of Ballymun as far as Griffith Avenue: Residential Areas	Functional value: (V)
Location	<ul style="list-style-type: none"> - This LA comprises areas within 500m to the east and west of the proposed alignment. This LA extends from south of Ballymun Senior Comprehensive School and Shanliss Road southwards along Ballymun Road (excluding DCU and Albert College Park) including all residential areas to the east and west as far as Griffith Avenue. 	
Description	<ul style="list-style-type: none"> - This LA is primarily an established residential area (zoned Z1) comprising of mainly two-storey detached dwellings with front and back gardens and tree-lined streets. The Church of Our Lady of Victories is located to the east of the alignment. Our Lady of Victories infant school (zoned Z15) is located to the west of the alignment. All of the residential and community uses in this LA are of Very high functional value. - There is a petrol station (zoned Z1) to the west of the alignment along the R108 (Ballymun Road), shops and neighbourhood facilities are also present (zoned Z3). There are neighbourhood facilities located between Ballymun Road and St. Mobhi Road (zoned Z3 and Z1) which create an 'island' to meet Griffith Avenue. - Recreational uses include Riverside Tennis Club, Glasnevin Lawn Tennis Club and sports grounds associated with school uses (zoned Z9 and Z15). 	
Existing Zoning(s)	Dublin City Council zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z1, Z2, Z3, Z9, Z12, Z15. 	

Area MN106:

LA 16	Dublin City University (DCU), Albert College/Hamstead Park and Elmhurst Convalescent Home Areas	Functional value: (V)
Location	<ul style="list-style-type: none"> - This LA comprises areas within 500m to the east and west of the proposed alignment. Areas to the west of the proposed alignment include: DCU park/sports ground areas, St. Michael's House Special School and St. Clare's home. Areas to the east of the proposed alignment include: Dublin City University (DCU), Albert College Park, Hillside Farm, Elmhurst Convalescent Home and the surrounding open spaces as far south as Griffith Avenue. 	
Description	<ul style="list-style-type: none"> - Educational landuses in this LA include the Dublin City University campus (zoned Z15) (lecture halls, libraries, open spaces and sports grounds) and St. Michael's House Special School. All educational landuses are of Very high functional value. - Health related landuses include a medical clinic, Sean Cara Community Unit, St. Clare's Home, the HSE Northern Area facility for older persons, Hampstead Private Hospital and Elmhurst Convalescent home (zoned Z12). All health-related landuses are of Very high functional value. - Recreational uses include open spaces and football pitches at Albert College Park and surrounding recreational areas. DCU recreational and sports ground areas, Riverdale tennis grounds (zoned Z9) and the Helix Theatre located off Collins Avenue are also recognised to be important recreational areas in this LA. - Hillside Farm is also located in this LA (zoned Z12). 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z9, Z12, Z15. 	

LA 17	Griffith Avenue south as far as Tolka River Valley.	Functional value: (V)
Location	- This LA comprises areas within 500m to the east and west of the proposed alignment. The LA extends from Griffith Avenue south as far as Tolka River Valley to the east and west of the alignment excluding St Patrick's College.	
Description	<ul style="list-style-type: none"> - The LA comprises primarily established residential areas and includes a mixture of two-story terraced and detached dwellings (zoned Z1). Educational landuses within this LA include Scoil Caitríona (Z15), Coláiste Caoimhín (schools) and grounds (zoned Z15). The Corpus Christi Girls National School (Home Farm Road) and church (Griffith Avenue) is zoned Z15. The LA also includes Drumcondra Library and a credit union on Millbourne Avenue (Zoned Z1). All of the residential and educational landuses within this LA are of Very high functional value. - Other landuses within the LA include the Department of Defence and a number of pubs, dentist, doctor's surgery and various other neighbourhood facilities along Drumcondra Road Upper (zoned Z4). A dentist and doctor's surgery is also present on Griffith Avenue. - Recreational uses include Na Fianna GAA sports grounds (Z15), school sports grounds, tennis grounds (zoned Z9), Home Farm Football Stadium. Tolka Park Football Stadium is located east of the alignment with an open access sports ground (soccer) adjacent to aforementioned stadium (all zoned Z9). The lerne Social Sports Club with Pitch and Putt, sports centre and clubhouse located west of the alignment (zoned Z9). - The Richmond Road Area Action plan proposes mixed use landuse changes to the area to include the redevelopment of Tolka Park Stadium and surrounding areas. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z1, Z4, Z9, Z15. - Specific objective relates to the completion of a Masterplan for part of this area; located around Tolka Park Stadium and includes some surrounding lands that are identified in the Richmond Road Area Action Plan (Dublin City Council, 2007). 	

LA 18	St. Patrick's College	Functional value: (V)
Location	- St. Patrick's College Campus within 350m to the east of the proposed alignment.	
Description	<ul style="list-style-type: none"> - St. Patrick's College (zoned Z15) includes educational landuses such as lecture halls, lecture theatres, various educational buildings, Drumcondra Education Centre and Educational Resource Centre. St. Patrick's National School and Junior School are located within the boundary of the LA and are accessed from Millbourne Avenue. - The grounds also include residential landuses (ten blocks of 4-storey on-campus student accommodation) and religious landuses (a church). All of these landuses are of Very high functional value. - Recreational landuses within the area include sports grounds. The sports grounds are important amenities and concurrent with the college uses. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z15 	

LA 19	Tolka River Valley	Functional value: (V)
Location	- The Tolka River and Griffith Park located within 500m east and west of the alignment.	
Description	<ul style="list-style-type: none"> - Griffith Park is to the west of alignment and serves as an important local amenity area. - The river and park are included in a designated Conservation Area (DCC). 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z9, Z11. - The Draft Richmond Road Area Action Plan (April 2007) proposes a number of potential river crossings (Map 13 of the Area Action Plan) over Tolka River- however this proposal is subject to specific redevelopment proposals. 	
LA 20	Clonliffe College Estate/Holy Cross College	Functional value: (V)
Location Areas	500m east of the alignment Clonliffe College Estate/Holy Cross College.	
Description	<ul style="list-style-type: none"> - Holy Cross College grounds comprise extensive open grounds with mature trees and green spaces open to the public during daytime hours. - There are sports grounds, religious and educational spaces and buildings on site. - The 'Archbishops House' is set in mature landscape setting accessed from Drumcondra Road. The main access to the estate is from Drumcondra Road and Clonliffe Road. - The area is highly important and sensitive due to its educational, religious and amenity uses. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z12 with provision for a linear park along the River Tolka. - The Richmond Area Action Plan (2007) identifies a development area of c.6.85 hectares for the development of a Master Plan. The Urban Design Proposal for the area indicates: potential residential and mixed use development into the future, and includes parks/plazas along Tolka River area, linked with pedestrian and cycle routes within and around the area. 	
LA 21	Drumcondra, Phibsborough and Mountjoy Residential areas	Functional value: (V)
Location	- The LA comprises residential areas and community uses around Drumcondra village up to 500m east and west of the proposed alignment, Drumcondra village itself is not included.	
Description	<ul style="list-style-type: none"> - The dominant landuses in this area is residential and community uses. Some of the residential dwellings in this LA are included within the Z2 zoning designation applicable to Conservation Areas (DCC) and are of low density mainly 1 or 2-storey terraced dwellings. These residential areas are considered to be of Very high functional value. - St. Vincent's Centre for the Deaf is located within this LA. Pedestrian access to this centre is provided from Drumcondra Road Upper. St. Columbus National School and Church on Iona Road are both located to the west of the alignment on the edge of the study area. - The National Council for the Blind in Ireland, a support service for people experiencing eyesight difficulties, is located on Whitworth Road. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z1, Z2, Z3, Z6, Z9. 	

LA 22	Drumcondra Road Lower	Functional value: (IV)
Location	- Drumcondra village and Drumcondra Road within 50m east and west of the proposed alignment.	
Description	<ul style="list-style-type: none"> - This LA comprises predominantly residential, retail and commercial uses (zoned Z1, Z2 and Z4). The suburban/intercity elevated rail line transects Drumcondra Road Lower from east to west and runs over commercial and retail based landuses. - A number of residential landuses are located within this LA. Drumcondra Road Lower (street recently redeveloped) includes neighbourhood facilities consisting of shops, cafes, restaurants and pubs with residential uses on upper floors. Drumcondra village is a heavily trafficked urban centre in Dublin City and has existing exposure to adverse effects such as noise. These areas of mixed use residential are important and sensitive areas. - There is a small amount of vacant land adjacent to the industrial units on the southern banks of the Tolka River. - St. Vincent's Centre for the Deaf fronts onto Drumcondra Road and is zoned R1. This educational facility is considered to be important and sensitive. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z1, Z2, Z4. 	

LA 23	Royal Canal	Functional value: (V)
Location	- Royal Canal 0-500m east and west of the proposed alignment.	
Description	<ul style="list-style-type: none"> - The Royal Canal is a designated Conservation Area (DCC) and is zoned Z9. The area is a local amenity and walkway with various bridge crossings over the canal and the adjoining railway track. - The train tracks located parallel and north of the canal are used for railway connections between Dublin and the North West of Ireland. - Binn's Bridge crosses the canal on Drumcondra Road. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z9, Z11. 	

LA 24	Mountjoy Prison and environs	Functional value: (IV)
Location	- Mountjoy Prison and environs north of North Circular Road and west of the proposed alignment.	
Description	<ul style="list-style-type: none"> - The area is used for institutional uses and comprises Mountjoy Prison and Garda Station. An Garda Síochána station and offices are accessed via North Circular Road. - St. Patrick's Institution for juvenile offenders is also located within this area. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z1, Z15. - Area included in the Phibsborough/Mountjoy Local Area Plan, Pre-Draft Consultation March/April 2007. Initial indication is that the site is to be redeveloped for high-density mixed uses development. 	

Area MN107:

LA 25	Phibsborough and Mountjoy residential areas, Mater Hospital and Parnell Square	Functional value: (V)
Location	<ul style="list-style-type: none"> - Areas 0-500m east and west of the proposed alignment. This LA includes Phibsborough village and residential areas, Mater Hospital and surrounding residential areas, Temple Street Children’s Hospital, Mountjoy Square and environs, Parnell Square, Rotunda Hospital and surrounding landuses. 	
Description	<ul style="list-style-type: none"> - The LA is a mixed use area comprising predominantly residential and educational landuse with supporting neighbourhood and community facilities and spaces. Phibsborough village has been designated as a P.U.C. (Prime Urban Centre zoned Z1 and Z4). A Local Area Plan for the Phibsborough/Mountjoy area is currently being developed by Dublin City Council. The residential areas around Phibsborough urban centre are mainly two storey, red brick, terraced houses much of which are included in Z2 zoning for Conservation Areas. There are a number of Dublin City Council residential/flat complexes in the area (zoned Z1) namely along Dorset Street, beside Temple Street and Hardwick Place. The Dominic Street area (currently being redeveloped) was formerly council flat complexes and has a specific objective in the Development plan under Z13 that relates to housing rejuvenation areas. All residential areas within this LA are considered to be important and very sensitive. - The Mater Hospital and ground level car-parks (zoned Z15) are also located in this LA and many of the surrounding Georgian buildings are used for health related activities (zoned Z8 and Z2). Temple Street Children’s Hospital (zoned Z15). All health facilities are considered to be important and very sensitive. - Dublin Institute of Technology’s main building is located on Bolton Street (zoned Z15) and is a major educational landuse in the LA. There are various buildings within the area that are also used for educational purposes and many of them within close proximity to Bolton Street. Belvedere College (zoned Z8) is also located within the LA. All educational landuses are considered to be important and sensitive. - Various neighbourhood facilities are located within the LA (zoned Z4) including: shops, pubs, restaurants, cinema facing onto Parnell Street. Mountjoy Square public park (zoned Z9) is surrounded by three and four storey Georgian buildings (with basements (zoned Z8 and Z2). Many of these buildings are used for office, commercial and residential uses - A number of impressive Monuments and Structures are located in this LA: Georgian buildings used for residential and mixed use, the Rotunda Hospital, the Gate Theatre, the Ambassador Cinema/Theatre and the Temple Theatre (mixed/recreational uses and zoned Z8). - Other recreational and community uses include: Berkley Park, Broadstone Park and Royal Canal in Phibsborough, Blessington Street Reservoir and park area (zoned Z9 and Z11), Parnell Square Park/Garden of Remembrance (zoned Z9), the James Joyce Museum, the Hugh Lane Municipal Art Gallery (zoned Z8), St. Joseph’s Church and the cinema on Parnell Street (zoned Z15). Mountjoy Square public park (zoned Z9) and comprises a square shaped public park and playground with crèche facilities on site. - Parnell Square is surrounded by Georgian style, three and four storey houses (with basements) of mixed uses to the north, east and west of the Square. To the south are the grounds of the Rotunda Hospital and the Gate Theatre both zoned Z8 and used for institutional/civic and community/recreational uses respectively. Parnell Square East is also zoned Z8 and used primarily for mixed uses to include: office with commercial and residential uses. 	

LA 25	Phibsborough and Mountjoy residential areas, Mater Hospital and Parnell Square	Functional value: (V)
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2):	
	<ul style="list-style-type: none"> - Z1, Z2, Z4, Z8, Z9, Z11, Z15. - Phibsborough village P.U.C current zonings is Z4 'to provide for and improve mixed services facilities'. - A City Children's Garden and crèche is planned to be located beside the Rotunda Hospital and Garden of Remembrance. - The Parnell Square Framework Plan sets out a number of urban design proposals. 	
Source(s)	<ul style="list-style-type: none"> - Dublin City Development Plan 2005, Dublin City Council. - Framework Plan for Parnell Square, Dublin City Council. - Phibsborough/Mountjoy Local Area Plan, Pre-Draft Consultation March/April 2007. 	

LA 26	O'Connell Street to College Street	Functional value: (IV)
Location	<ul style="list-style-type: none"> - 0-100m east and west of the proposed alignment from Parnell Square in the north extending southwards over O'Connell Bridge (the River Liffey) to College Street. 	
Description	<ul style="list-style-type: none"> - This LA includes O'Connell Street: One of Dublin City Centre's main thoroughfares. The Monument of Light or as it's known locally the 'Spire of Dublin' is 120 metres in height and is sited within the median reserve on O'Connell Street between the Henry/Earl Street North axis. O'Connell Street is criss-crossed from east to west by various streets. Landuses on these streets comprises a mixture of mainly retail, commercial and office uses with a limited residential component. The Luas Red Line transects the LA east-west along Abbey Street Middle and Lower with Abbey Street Luas stop also included in this LA. - The O'Connell Bridge is a distinct period bridge, built in the late 18th century, crossing the River Liffey. It is an important crossing point for pedestrians and vehicles. - The O'Connell Street Redevelopment Project and Integrated Area Plan has seen the recent refurbishment of the streetscape and achievement of many of its objectives such as improvements in paved areas, landscaping features and aims to improve existing buildings and landuse through redevelopment. The former Carlton cinema site (currently derelict) is awaiting redevelopment and preliminary plans suggest development of: hotel, residential, retail with emphasis on restaurants, bars and other leisure facilities and a new public square on site). - O'Connell Street contains impressive buildings from the late 18th and 19th century. Landuse along the street include the Gresham Hotel, Carlton Cinema, Dr. Quirke's Emporium (amusement arcade), Clery's Department Store, Wynn's Hotel, the G.P.O. (General Post Office) and various other commercial/office based uses. Newer buildings are also present on this street. Examples include the Dublin Bus offices, the former Eircom building and Schuh retail store (shoe shop) (zoned Z5). - Landuses in this LA include commercial/retail uses on ground floors with office type uses on upper floors or vacant properties. - The area provides an important transport route for both pedestrian and vehicular users. Many large sites in this area are currently vacant and awaiting redevelopment. - LA26 also includes Westmoreland Street and D'Olier Street. Both streets include a range of landuses, including commercial, retail, business, offices and hotels. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2):	
	<ul style="list-style-type: none"> - Z5. 	

LA 27	Henry Street and environs	Functional value: (IV)
Location	- 30-500m west of the proposed alignment, from Parnell Street to the Quays of the River Liffey.	
Description	<ul style="list-style-type: none"> - This LA includes the primary retail and shopping area on the north side of Dublin City, located along and extending off Henry Street - pedestrian street. The Ilac Shopping Centre (with underground parking) is located in this LA and is currently undergoing redevelopment with mainly retail and commercial uses being constructed with some upper floors developed for residential uses. - This LA includes Arnotts Department Store, a flagship retail store with an underground car-parking area. This site is currently awaiting a decision from An Bord Pleanála relating a planning application for the redevelopment of the existing store and the majority of the surrounding block, for mixed use development and ancillary works (planning reference-PL5170/06). - Other retail and commercial units are on Moore Street, Abbey Street and the Quays and many other standalone retail outlets (The LA includes over the shop high density residential apartments notably along Parnell Street, off Moore Street and between Abbey Street and the Quays, these areas have an existing exposure to adverse effects mainly attributed to traffic and mixed use town centre activities in the area. A number of hotels, hostels and apartments are located within the area including Jury's Hotel on Parnell Street. - There are a many Georgian style buildings along the quays used for mixed uses. - Recreational uses include Wolfe Tone Memorial Park (zoned Z9). 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z5, Z9. 	

LA 28	Gardiner Street and Customs House environs	Functional value: (IV)
Location	- 20-500m east of the proposed alignment from Parnell Street to Customs House Quay.	
Description	<ul style="list-style-type: none"> - A number of educational buildings are located on Marlborough Street including the Dublin Institute of Technology educational buildings and the Department of Education and Science headquarters (zoned Z5). Larkin College secondary school is located on Sean MacDermot Street. All educational landuses are important and very sensitive. - Mixed use developments with a residential component are common within this LA. Much of the northern section of Gardiner Street is used for residential uses and comprises: Dublin City Council flats, new apartment developments and terraced Georgian streets. James Joyce Street runs parallel to Gardiner Street and comprises new high-density apartment and office blocks. Many developments have commercial premises on the ground floor with residential units on upper floors. All residential areas are considered to be very important and sensitive. - The Pro-Cathedral on Marlborough Street is used for religious and community uses. The Customs House is a distinctive period building located along the northern banks of the River Liffey. This building is currently used by the Department of Environment Heritage and Local Government as offices. It is zoned Z8 with the grounds Z9. Gardiner Street and Customs House area is included in Dublin City Councils Conservation Area in recognition of their unique contribution and importance to the heritage of the city. - Transport links within this LA include the DART line on the western edge of the LA running from Connolly Station to Tara Street and the Red Luas Line transecting the LA along Abbey Street. - Other landuses within the area include commercial/retail and hotel/hostel uses on Gardiner Street and Sean MacDermot Street. The Irish Life Centre is located between Talbot Street and Abbey Street and houses the Irish Life Building as well as office, commercial and retail/commercial type developments. Much of the surrounding area is used for commercial/retail on ground floor with offices/hostels/residential uses on the upper floors. The Abbey Theatre is located on the corner of Abbey Street and Marlborough Street south of the existing Luas Red Line. The theatre is surrounded by office, educational and commercial type uses. - Recreational uses include Sean MacDermot Park and the Abbey Theatre. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2):	
	- Z5, Z9.	

LA 29	River Liffey and Quays	Functional value: (V)
Location	- The LA comprises the River Liffey and quays, 500m east and west of the proposed alignment from Ormond Quay Upper to Customs House Quay on the north quays: and from Wellington Quay to Georges Quay on the south quays.	
Description	<ul style="list-style-type: none"> - The River Liffey and its quays is a designated Conservation Area. 'The establishment of riverside quays with buildings facing onto the river was the single most important intervention in shaping the city' (DCC, 2005). The period buildings overlooking the Quays are included within a designated Conservation Area in Dublin City Development Plan. - A boardwalk on the north banks of the river has been erected in recent years and this acts as city centre recreational and leisure area as well as a pedestrian route. There is also a leisure docking area located on Bachelors Walk. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2):	
	- Z11.	
	- A future bridge crossing is indicated between Burgh Quay and Eden Quay.	

LA 30	Burgh and Georges Quay and areas south of River Liffey	Functional value: (IV)
Location	<ul style="list-style-type: none"> - The LA extends from the River Liffey (to the north) to Pearse Street (to the south). The western edge of the LA is bounded by Hawkins Street and the LA extends east along the quay as far as Lombard Street. 	
Description	<ul style="list-style-type: none"> - This LA includes the southern quays fronting on to the River Liffey at Burgh Quay and Georges Quay and is within a designated Conservation Area (DCC) and zoned Z5. - Two to three storey buildings are used for mixed uses (commercial and/or residential uses). - The LA consists primarily of ground floor commercial/retail uses with offices on upper floors. The dominant landuse in the area is multi-storey office developments. - Pearse Street Garda Station and Fire Station are located within the LA. The DART rail line from Tara Street station southwards to Pearse Street station transects the LA north south and crosses over a number of small brownfield sites located under the line of the DART train route. - Recreational uses include the Screen Cinema and Markievicz leisure centre that includes a public swimming pool. 	
Existing Zoning(s)	<p>Dublin City Council landuse zoning objectives (Table 10.2):</p> <ul style="list-style-type: none"> - Z5. 	
LA 31	Trinity College Dublin	Functional value: (V)
Location	Grounds of Trinity College within 500m to the east of the proposed alignment.	
Description	<ul style="list-style-type: none"> - Trinity College is an important centre of education, culture and amenity use and is important and sensitive both nationally and locally. - The dominant landuse within this area is educational. The area comprises faculty buildings, libraries (some with basement levels i.e. library spaces/lecture theatre spaces) and laboratory areas (zoned Z8). - Trinity College Library houses the Book of Kells among other national treasures. The majority of the buildings within the grounds are a mixture of classical and modern architectural styles. - The LA contains sports grounds and open space areas and cobbled pedestrian streets (zoned Z9). It is a busy pedestrian thoroughfare from College Green to Nassau Street and a major tourist attraction. 	
Existing Zoning(s)	<p>Dublin City Council landuse zoning objectives (Table 10.2):</p> <ul style="list-style-type: none"> - Z8, Z9. 	

LA 32	Temple Bar and environs	Functional value: (IV)
Location	- Up to 500m west of the proposed alignment including the Temple Bar area, Dublin Castle and surrounding landuses.	
Description	<ul style="list-style-type: none"> - The landuses within this LA comprise retail, commercial (entertainment) and office uses with residential components. The area has developed as one of Dublin's unique cultural, tourist and recreational quarters attracting large volumes of tourist to the area. - The Temple Bar and Dame Street area is included in a designated Conservation Area. This area has a very distinctive retail/commercial and late night recreational landuse with redbrick, low-scale, buildings intimate streets and cobbled and/or pedestrian pavements. - Residential landuses in this area is limited to primarily over the shop units/ apartment developments. There is a range of hotels and hostels in the area. The area has two pedestrian squares which act as focal points in the city's 'cultural quarter'. - Dublin Castle is used for national, judicial, educational, recreational and office type uses. Within the castle walls large open space cobbled spaces exist. The neighbouring landuses include high density apartment buildings with retail/commercial units on ground floor and office blocks. - Large parts of this LA are included in the Conservation Area in recognition of its unique contribution and importance to the heritage of the city. - Recreational uses include: Dublin Castle, museum and open spaces, Temple Bar Square, Meeting House Square, the IFI Cinema, and various theatres, art houses and galleries. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2):	
	- Z5.	

LA 33	Grafton Street and environs	Functional value: (IV)
Location	- South Great George's Street extending east to Dawson Street, bounded by Dame Street to the north; and St. Stephen Green North and King Street to the south.	
Description	<ul style="list-style-type: none"> - The predominant use in this LA is retail and commercial which in itself can accommodate change. Georges Street and Grafton Street areas are distinctive retail/commercial areas. Grafton Street is south Dublin City centre's main pedestrian high-street shopping area. The area has numerous retail outlets, boutiques, restaurants, bars with mainly office uses overhead. Significant redevelopment is currently being carried out in an area near to the Gaiety Theatre where a mixed use high-rise retail and commercial development is under construction. - The residential component in this LA is limited. It includes hotels, hostels and apartments over shops/offices. - The entire LA is zoned Z5. - Recreational uses include the Gaiety Theatre, various shops, pubs and clubs within the area. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2):	
	- Z5.	

LA 34	Leinster House	Functional value: (V)
Location	- Kildare Street extending to Merrion Street Upper 200-500m east of the proposed alignment.	
Description	<ul style="list-style-type: none"> - The landuses and buildings within this LA are of national and local significance and importance. - The area is dominated by nationally important buildings used for civic and cultural purposes. Examples include Government buildings such as Leinster House and various offices of Government departments located on Merrion Street Upper. The Department of Agriculture, Fisheries and Food is located on Kildare Street. The National Library of Ireland, National Museum of Natural History and National Gallery of Ireland are also included with this LA. - The LA is located within a designated Conservation Area in recognition of its unique contribution and importance to the heritage of the city. - Other uses in the LA are primarily commercial and office, with a limited residential component. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z5, Z8, Z9. 	
LA 35	St. Stephen's Green	Functional value: (V)
Location	- St. Stephen's Green.	
Description	- St. Stephen's Green is a large inner city park enclosed on all sides by railings. It is a period landscaped park with tranquil gardens, pond and walkways. It is intensively used by residents, tourists and people who work in the area as a daytime recreational amenity area and as a pedestrian thoroughfare. Access points are provided on all sides.	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z9. 	
LA 36	St. Stephen Green West Environs	Functional value: (IV)
Location	- Areas within 500m to the west of the alignment extending from Aungier Street east to St. Stephen's Green.	
Description	<ul style="list-style-type: none"> - The landuses in this LA are primarily commercial, retail and neighbourhood facilities with limited upper floor residential units. The dominant streets in this LA are Aungier Street, Wexford Street and Camden Street. To the rear of these streets, landuses are primarily residential and mixed use developments. The area has examples of older housing stock built by Dublin Corporation. - Aungier Street, Wexford Street and Camden Street are included in a Conservation Area. The former Mercer Hospital site a landmark building ending the vista of South King Street, Stephen's Green North and Merrion Row is also located in this LA. - The buildings fronting onto St. Stephen's Green West are used primarily for commercial and office uses. - The Royal College of Surgeons and the Dublin Institute of Technology are major third level education providers located in this LA. 	
Existing Zoning(s)	Dublin City Council landuse zoning objectives (Table 10.2): <ul style="list-style-type: none"> - Z5, Z8, Z9 	

LA 37	Harcourt Street and environs	Functional value: (V)
Location	<ul style="list-style-type: none"> - Areas from 30m to the west of the alignment and from 500m to the east of the alignment. This LA comprises Harcourt Street, the Iveagh Gardens and the environs of St. Stephen's Green east areas. 	
Description	<ul style="list-style-type: none"> - The LA comprises mixed uses including educational, commercial, retail, office, residential and open space areas. - This area comprises primarily office and commercial uses including shops, cafes, hotels and restaurants along Harcourt Street and St. Stephen's Green south. A large hotel is located along Earlsfort terrace zoned Z6. Period buildings along Harcourt Street and St. Stephen's Green South (zoned Z8) enclose the Iveagh Gardens (period inner city park). The gardens have various walkways, gardens, water features and bedding areas and open spaces and serve as an important inner city amenity area. The gardens are accessed from a number of pedestrian routes: From Harcourt Street via Stable Lane; from behind the National Concert Hall; and from Hatch Street. - The National Concert Hall (zoned Z8) is located to the east of Iveagh Gardens fronting onto Earlsfort Terrace and is an important recreational landuse. - Leeson Street and Merrion Row primarily comprise mixed use developments with mainly commercial/retail ground floor uses with offices on upper floors. The landuses along St. Stephen's Green east are primarily office uses and are zoned Z8. This area is included within a Dublin City Council Conservation Area (DCC). - The Luas Green Line (Sandyford to St. Stephen's Green) is located in this LA running along Harcourt Street terminating at St, Stephen's Green West. 	
Existing Zoning(s)	<p>Dublin City Council landuse zoning objectives (Table 10.2):</p> <ul style="list-style-type: none"> - Z4, Z6, Z8, Z9. 	