

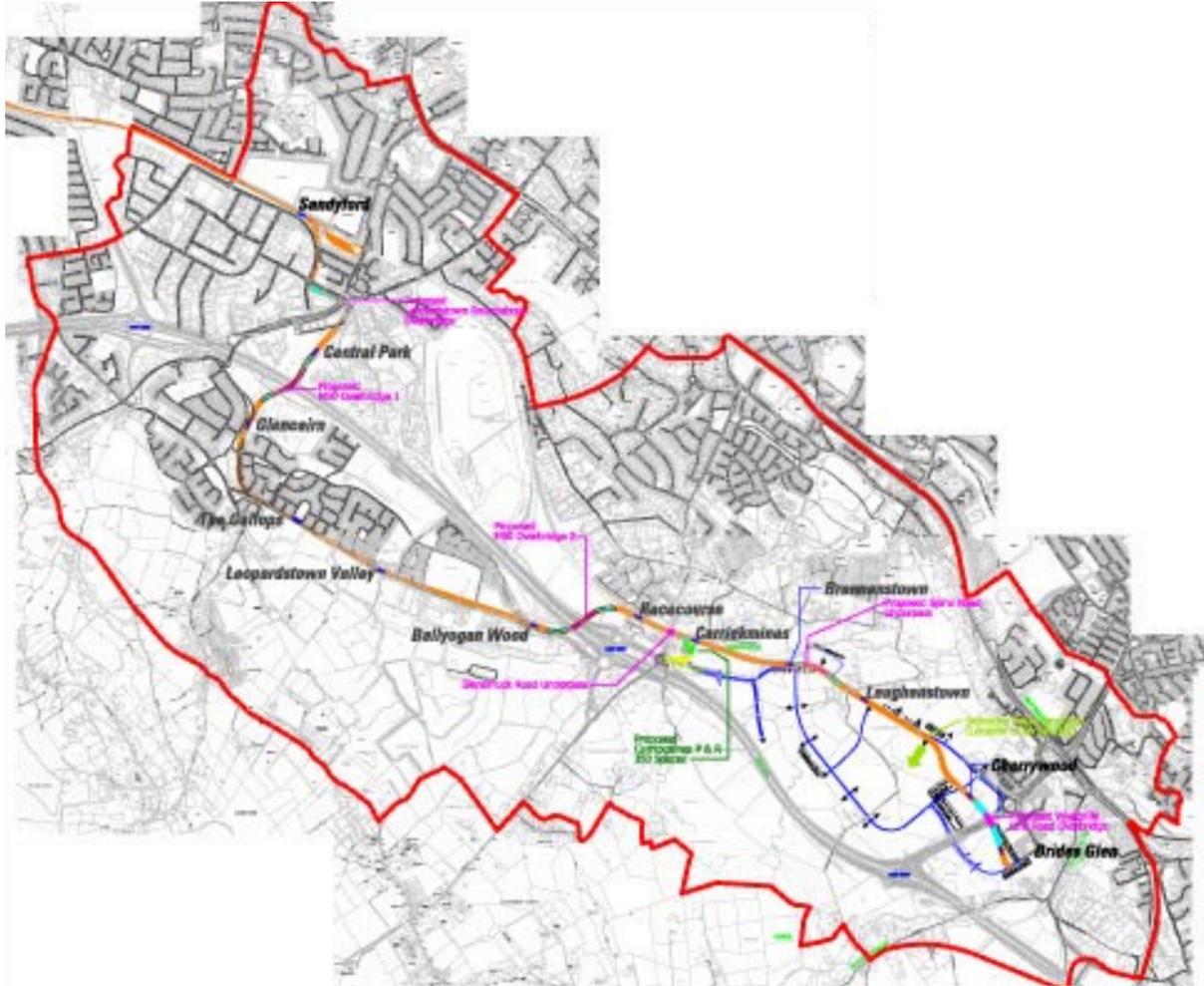


Dublin Light Rail Environmental Impact Statement

Line B1

Sandyford Industrial Estate to
Cherrywood

Volume 1



Volume 1

Sandyford Industrial Estate to Cherrywood

ENVIRONMENTAL IMPACT STATEMENT

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

Volume 1 Chapters 1, 2, 3, 4, 5, 6, and 8

Volume 2 Chapter 7 (Environmental Impact – Areas 13 to 15)

Volume 3 Chapter 9 (EIS Non-Technical Summary)

This Environmental Impact Statement (EIS) relating to Line B1 of the Dublin Light Rail Transit (Luas) Project is set out in nine Chapters, titled as follows:

Chapter 1 Introduction

Chapter 2 Public consultation

Chapter 3 Consideration of alternatives Luas line B1

Chapter 4 Description of the proposed Luas line B1 alignment

Chapter 5 Aspects of the environment considered

Chapter 6 Interactions

Chapter 7 Environmental impact – areas 13 to 15 inclusive

Chapter 8 Difficulties encountered in compiling this EIS

Chapter 9 Non-technical summary

The preparation of an Environmental Impact Statement requires the co-ordination and synthesis of associated yet diverse elements of the overall assessment. To facilitate this process, a schematic structure is used in order to provide a coherent documentation of the various aspects of the environment. An outline of the Grouped Format structure of the Environmental Impact Statement is detailed below.

1 Receiving Environment (Baseline Situation)

A description of the specific environment into which the proposal will fit, taking account of other developments likely to occur. The particular aspects of the environment are discussed in terms of their context, character, significance and sensitivity.

2 The Characteristics of the Proposal

A projection of the specific “load” on the particular aspects of the environment which the proposal would be likely to generate. This is set out at the commencement of each of the three individual areas in Volume 2.

3 The Potential Impact of the Proposal

- The potential impact of the proposal also comprises a general description of the possible types of impacts which proposals of this kind would be likely to produce.
- This includes a consideration of the “Do-Nothing” impact. The “Do-Nothing” impact describes the environment as it would be in the future if no development of any kind is carried out.

4 Remedial or Reductive Measures

A description of any specific remedial or reductive measures considered necessary and practicable resulting from the assessment of potential impacts described at (3a) above.

5 The Predicted Impact of the Proposal

- An assessment of the specific direct and indirect impact of the proposal arrived at by adding to the receiving environment (as in (1) above), the loading of the proposal (as in (2) above) and the remedial or reductive measures (as in (4) above).
- Also considered is a “Worst Case” scenario, arising where a development, or its mitigation measures substantially fail.

6 Monitoring

A description of any monitoring of effects on the environment which might be necessary in both the construction and operational phases, covering the monitoring methods, and the agencies responsible for their implementation.

7 Reinstatement

Where required, a description of reinstatement measures and the agencies responsible for their implementation.

ENVIRONMENTAL IMPACT STATEMENT STUDY TEAM

The Environmental Impact Statement was prepared on behalf of the Railway Procurement Agency (RPA) by a study team led by RPS McHugh Planning & Environment, who were responsible for the overall study management and co-ordination as well as for Land Use Planning and Development, Demography and Employment, Property, Local History and Interactions. The other members of the study team are as follows:

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Railway Procurement Agency (RPA),

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Railway Procurement Agency (RPA),

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Envirocon Ltd., environmental consultants,

The landscape, buildings of artistic, historical and architectural merit

Mitchell and Associates, landscape architects,

J.M. McConville, consultant arborists,

Arc Digital Photographic Ltd.

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Railway Procurement Agency (RPA)

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Arc Digital Photographic Ltd.

Railway Procurement Agency (RPA)

AVAILABILITY OF THE EIS

Copies of this Environmental Impact Statement 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
Dublin Transportation Office, Hainault House, Floor 3, 69-71 St.
Stephen's Green, Dublin 2.

The EIS may be purchased as a complete document for a sum of €50.00 (Volumes 1, 2 & 3).

Alternatively, reports on each of the three individual Areas of the Line B1 alignment discussed in Chapter 7 (Volume 2) of the EIS dealing with particular areas and topics may be purchased individually for a sum of €10.00 each.

Copies of Volume 1 may be purchased for €30.00 each.

Copies of the Non-Technical Summary (Volume 3) of this EIS may be purchased at any of the above locations for a sum of €3.00 each.

A CD version of the whole EIS (Vol 1; Vol 2 Area 13, 14 and 15 and NTS) for €5.00.

This EIS is also available to download through the RPA website at www.rpa.ie

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Introduction

1.1 THE BACKGROUND TO THE LUAS

The concept of Light Rail Transit (LRT) for Dublin is in accordance with the Government policy that all development should take place in a sustainable manner. The continued economic growth and competitive position of Dublin, in a national and international context, depends on the success of transportation and communications strategies to encourage and maintain growth, while preserving and improving the quality of life. National and urban transportation policy must achieve the following:-

- Reduce environmental impact
- Maximise transport efficiency
- Preserve the natural environment by minimising emissions
- Manage land-use issues to address infrastructural impacts
- Enhance social and quality of life indicators

The European Union and its policies are an important factor in national strategic development and it is critical that national policy be compatible with EU policy. It is the policy of the EU, particularly in an urban context, to design and organise urban living around sustainable modes of transport; promoting inter modality and the use of best practice.

The concept of LRT is also compatible with the EU policy of achieving a better balance in the usage of different transport modes in the city. Member states supported by the EU are required to provide high quality, attractive public transport

modes as an alternative to the private car for travel in an urban context.

The Dublin Transportation Initiative (DTI) Final Report of 1994 recommended that a three line Light Rail Transit system would form the core public transport element of a multi-mode transportation strategy for Dublin. The recommended LRT system involved the provision of modern tramways operating overground between Tallaght, Ballymun and Dundrum via the city centre. The three line LRT system was shown to have a sound economic and financial basis and was judged to make a significant contribution to the attainment of DTI strategic transportation and related land use objectives. The methodology included an assessment of the performance of the proposal under various land-use scenarios, including some options that were less than optimal.

The provision of Luas, the LRT system for Dublin is compatible with the other measures and strategies recommended as part of the DTI strategy including:-

- the implementation of traffic calming measures and the development of traffic-free environmental cells within the city centre area of Dublin.
- the promotion of inter-modality throughout the public transport network.
- Improved accessibility of the city centre and its attractions to the population.



One of the key recommendations of the DTI Final Report was that the DTI Strategy should form the first phase of an ongoing transportation planning process. The Dublin Transportation Office was set up in 1995 to carry out that transportation planning process. The 'Platform for Change Document, published by the DTO, notes that growth to date has far exceeded the projections in the 1995 DTI strategy. The population of the original DTI area, for example, has grown faster than was predicted in the DTI strategy. The population predicted for 2001 was actually exceeded in 1997. The total population of the Dublin Transportation Office area, as defined in the 'Platform for Change' document, grew by 9.2% between 1996 and 2002. Kildare and Meath saw the highest growth rates, with 21.4% and 22.1% respectively. The number of households in the DTO area grew by 14.2% between 1996 and 2002, while the number of one or two person households increased by 19.4% over the same period.

GDP grew by 79% between 1991 and 1999, compared to a DTI forecast of 38%. Unemployment rates are now less than 5% as compared to a rate of 17% that was forecast for 2001 and a rate of 12% for 2011. Car ownership rates have also exceeded expectations and car ownership per 1000 population was 342 in 1999, higher than the DTI forecast for 2001 which was 288. In 2002, car ownership levels stood at 392 per 1000 population. Car ownership in the GDA is expected to increase to 480 cars per 1000 population by 2016.

The consequence of this higher than expected growth is that

Dublin faces a rapidly increasing demand for travel. The proposed Luas Line B1 extension, and the eventual upgrade of the Green Line to a metro, form part of the DTO strategy aimed at servicing this demand.

The proposed Line B1 alignment will run from the Sandyford Stop at the north-eastern corner of the Sandyford Industrial Estate, across the lands at Central Park and the alignment of the South Eastern Motorway (SEM), before following the alignment of the planned Murphystown Parallel Access Road and Ballyogan Road, and crossing the SEM alignment and along the former Harcourt Street Railway alignment at Carrickmines. At Brennanstown, it runs through lands at Laughanstown, and beyond to Cherrywood and Bride's Glen

1.2 THE PROPOSED LUAS LINE B1

The proposed Luas Line B1 comprises the installation and operation of an LRT system between Sandyford Industrial Estate (Blackthorn Avenue) and Cherrywood. As such, it comprises an extension of the existing Luas Green Line (Line B) which operates between St. Stephen's Green and Sandyford Industrial Estate.

The components of the proposed Luas Line B1 alignment include double track, tram stops, associated structures and sub-stations, and an overhead electricity supply. These features enable a modern tram system to operate at grade. It is proposed to use the standard European gauge of 1435mm,

which is the same as the existing Luas Green Line and Red Line. The minimum width of the double line bed is about 6.8 metres, and 3.6 metres for single line bed. It is segregated with at-grade crossings where it traverses roads.

Power supply to the trams is from 750 volt direct current (DC) overhead cables, a minimum of 6 metres above ground, in areas where road traffic is present. These are supported by cantilevers attached to poles adjacent to the Luas Line B1 alignment. There are five substations serving the Luas Line B1 alignment, (including the existing sub-station within the Sandyford Depot). The substations transform and rectify alternating current (AC) to 750 volt direct current (DC).

The trams will be 40 metres in length and 2.4 metres in width. They will have a low floor height to maintain standards of accessibility to cater for all customers including persons with mobility impairment.

Tram normal load capacity, at a density of 5 persons per square metre standing, is about 310 persons. General service frequency is initially proposed to be at 5 minute intervals during peak periods and 12 to 15 minute intervals during off peak periods. Higher frequencies on shorter sections may be provided as the service develops. Approximate journey time between Sandyford Industrial Estate and Cherrywood is 19 minutes.

In addition, the approximate journey time along the Green Line between St. Stephen's Green and Sandyford Industrial Estate is 22 minutes.

The Luas stops are designed to accommodate 40 metre trams. On the Luas Line B1 alignment, all stops have two lateral platforms, one on either side of the two tracks. Unless there is a specific constraint, minimum width is 3 metres for a lateral platform. Platforms will be low level with a typical height of 280mm above street level and with ramps to facilitate easy access.

1.3 THE LUAS LINE B1 PREFERRED ROUTE ALIGNMENT

The Luas Line B1 is a generally segregated system for approximately 7.6 kilometres, from the Luas Stop at Sandyford to Bride's Glen in the southern portion of the Cherrywood Science and Technology Park. For ease of local identification and interest, in this EIS the length of the line has been divided into three Areas. These Areas are numbered 13-15, a continuation of the Area numbering system established in the Dublin Light Rail Line A, B, C and C(s) EIS's, which contained Areas 1-12. The environmental impact of the Luas Line B1 alignment in each of these areas is set out separately in individual books numbered 13 to 15, and which collectively make up Chapter 7 of this EIS.

A description of the Luas Line B1 alignment with reference to each of these three Areas is as follows:-

AREA 13 Sandyford Industrial Estate to Murphystown Road

The line diverges from the Sandyford Stop south-eastwards along Blackthorn Avenue; eastwards along Burton Hall Road; across the Brewery Road/Leopardstown Road roundabout via a new bridge structure; along the south-eastern boundary of the lands of Central Park; across the SEM and Leopardstown Valley via a new overbridge; to the northern end of Murphystown Road within the grounds of the existing properties Glencairn and Clonlea House.

AREA 14 Murphystown Road to Ballyogan Wood

From Murphystown Road, the line continues parallel to the alignment of the planned Murphystown Parallel Access Road; parallel to the northern side of Ballyogan Road to the eastern end of this public carriageway in the vicinity of the existing Ballyogan Wood residential scheme. The proposal includes the upgrading and re-alignment of Ballyogan Road.

AREA 15 Ballyogan Wood to Bride's Glen

From the Ballyogan Wood scheme at the eastern end of Ballyogan Road the line continues north-eastwards across the SEM and eastern boundary lands of Leopardstown Racecourse, eastwards along the reservation of the former



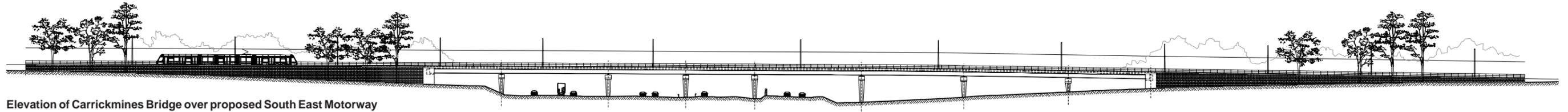
Photomontage of Luas Line B1 Glencairn Stop



Photomontage of Luas bridge over the Leopardstown Road / Brewery Road roundabout



Photomontage of Luas Line B1 Leopardstown Valley stop



Elevation of Carrickmines Bridge over proposed South East Motorway

Harcourt Street Railway alignment via Carrickmines; across currently open and undeveloped lands at Laughanstown to the planned Plaza within the proposed Cherrywood District Centre; southwards to Bride's Glen in the southern portion of the Cherrywood Science and Technology Park. A 350 space park and ride facility is proposed adjacent to the Carrickmines stop.

1.4 LUAS STOPS

There are 11 stop locations proposed along the Luas Line B1 alignment. These are as follows:

AREA 13

Central Park
Glencairn

AREA 14

The Gallops
Leopardstown Valley

AREA 15

Ballyogan Wood
Racecourse
Carrickmines
Brennanstown
Laughanstown
Cherrywood
Bride's Glen

The stop to be provided to serve Leopardstown Racecourse, is intended primarily to operate on event days. This stop, known as Racecourse, will be located between Ballyogan Wood and Carrickmines Stop on the alignment of the former Harcourt Street Railway, immediately to the south of the houses off Brighton Court.

1.5 LUAS LINE B1 ALIGNMENT CONSTRUCTION PHASE

The Construction Phase of Luas Line B1 is estimated at some thirty eight months. Construction works are expected to commence at a number of locations along the overall route, simultaneously. The upgrading and re-alignment of Ballyogan Road will be required to occur prior to the construction of Luas Line B1 in this area. The construction of the Line B1 alignment will require the provision and/or diversion of utilities. This work is estimated to take some 18 months in total.

It is proposed to approach the engineering works in lengths of up to 1km as may be appropriate in built-up suburban locations, reinstating each section as it is completed, as far as practicable.

There are a number of locations along the Luas Line B1 alignment where earthen ramps are required. These will be constructed at an early point within the Construction Programme in order to allow time for settling of material.

It is proposed to construct the Luas Line B1 alignment in sections applying a coherent construction programme, so as to facilitate access to existing premises and residences in a manner to be agreed in detail on site prior to construction commencing. In less developed and undeveloped locations, it will be possible to construct more extensive sections of the Luas Line B1 alignment because of the nature of the surrounding area and the existing land uses.

A number of temporary construction compounds and assembly areas have been identified along the Luas Line B1 alignment and are detailed under Section 3.4 and 4.2.

1.6 LEGISLATIVE BACKGROUND TO THE EIS

1.6.1 TRANSPORT (RAILWAY INFRASTRUCTURE) ACT 2001

This Environmental Impact Statement has been prepared pursuant to Section 37(1) of the Transport (Railway Infrastructure) Act, 2001 which states that:-

"(1) The Agency, CIE or any other person with the consent of the Agency, may apply to the Minister for a Railway Order.

(2) An application under subsection (1) shall be made in writing in such form as the Minister may specify and shall be accompanied by-

- (a) a draft of the proposed Order,
- (b) a plan of the proposed railway works,
- (c) in the case of an application by the Agency or a person with the consent of the Agency, a plan of any proposed commercial development of land adjacent to the proposed railway works,
- (d) a book of reference to a plan required under this subsection (indicating the identity of the owners and of the occupiers of the lands described in the plan) and,
- (e) a statement of the likely effects on the environment (referred to as an Environmental Impact Statement) of the proposed railway works."

The Introduction to the Act sets out its main purposes as follows:-

"(1) establish a new independent, commercial, statutory public body to be known as the Railway Procurement Agency whose main function will be the procurement of new railway infrastructure;

(ii) allow private sector participation in the construction, operation and maintenance of new railways;

(iii) repeal the Transport (Dublin Light Rail) Act, 1996, and re-enact its provisions in a modified form, to provide a single statutory railway order procedure; and

(iv) provide for the regulation of light railways when running on-street".

This EIS contains the information specified in Section 39 which sets out the information that must be contained in an EIS submitted by an applicant for a railway order. The following information is mandatory and is incorporated into this EIS:-

- a description of the proposed railway works comprising information on the site, design and size of the proposed railway works. (S.39.1(a))
- a description of the measures envisaged in order to avoid, reduce and, if possible, remedy significant adverse effects,(S.39.1(b))
- the data required to identify and assess the main effects which the proposed railway works are likely to have on the environment,(S.39.1(c))
- 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, (S.39.1(d))
- a summary in non-technical language of the above information,"(S.39.1(e))

In addition the following matters shall also be included:-

- a description of the physical characteristics of the whole proposed railway works and land-use requirements during the construction and operational phases , (S.39.2(a)(i))

- an estimate by type and quantity, of the expected residues and emissions (including water, air, soil pollution, noise, vibration, light, heat and radiation) resulting from the operation of the proposed railway works, (S.39.2(a)(ii))

- a description of the aspects of the environment likely to be significantly affected by the proposed railway works, including in particular:- (S.39.2(b))

human beings, flora and fauna, (i)

soil, water, air, climatic factors and the landscape, (ii)

material assets, including the architectural and archaeological heritage and the cultural heritage, (iii)

the inter-relationship between the matters referred to above,

- 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- (S.39.2(c))

the existence of the proposed railway works, (i)

the use of natural resources, (ii)

The emission of pollutants, the creation of nuisances and the elimination of waste, (iii)

and a description of the forecasting methods used to assess the effects on the environment. (iv)

- an indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant in compiling the required information, (S.39.2(d)).

- a summary in non-technical language of the above information. (S.39.2(e)).

An important paragraph is inserted at the end of Section 39(2) of the Act. This states that the information in an EIS is to be prepared, "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".

Section 39(4) provides that:-

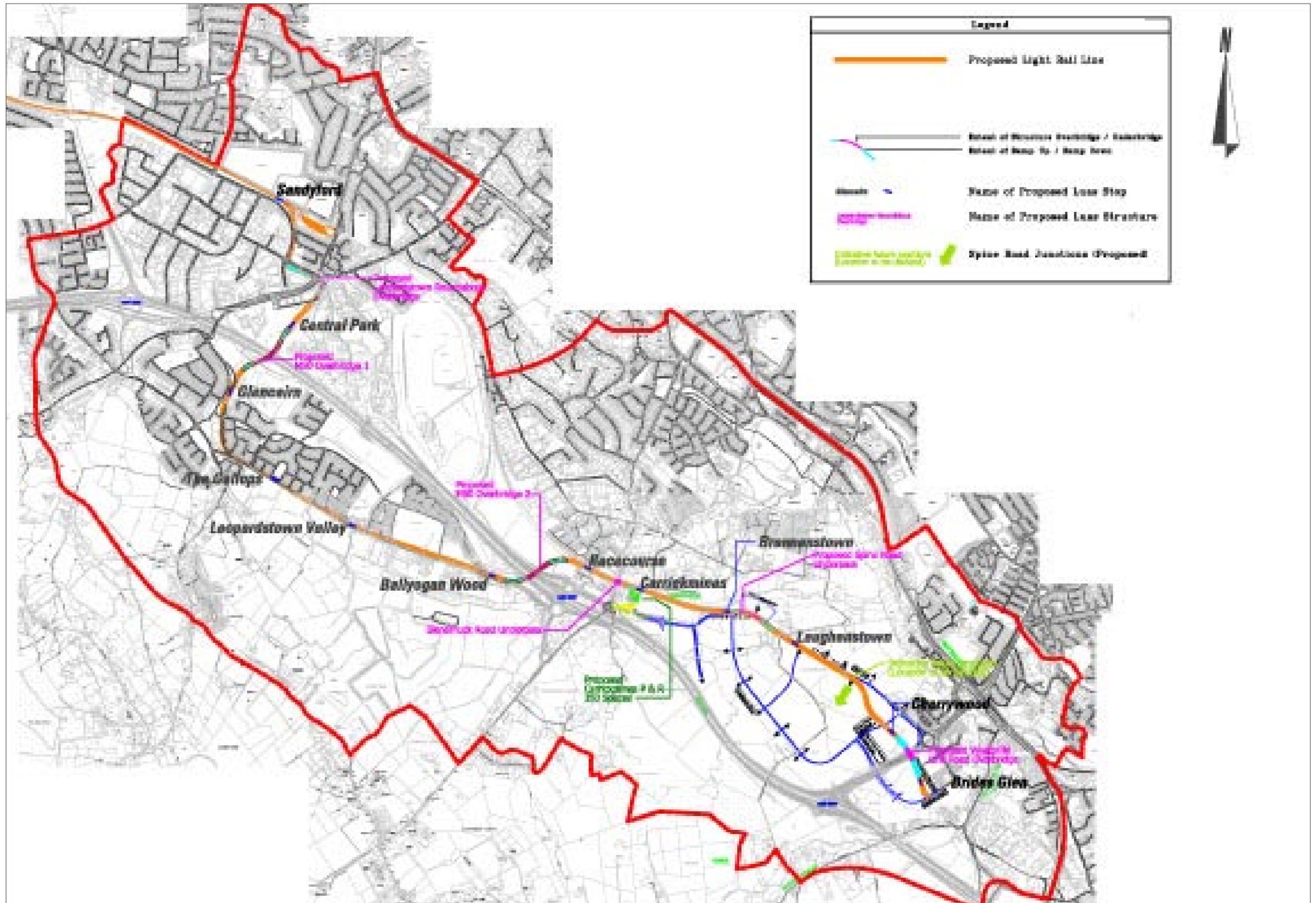
"The European Communities (Environmental Impact Assessment) Regulations 1989 to 2000, and the Local Government (Planning and Development) Regulations 1994 to 2000, and the Act of 2000 and any regulation made thereunder in relation to the effects on the environment shall not apply to anything done under an order made under this Act".

Whilst the EIS process under the 2001 Act is specific to light rail developments, account was taken in preparing this EIS to the "Advice Notes on Current Practice (in the Preparation of Environmental Impact Statements)" which was issued by the Environmental Protection Agency in 2003 and also to the "Guidelines on the Information to be Contained in Environmental Impact Statements" published by the Environmental Protection Agency in 2002.

This results in additional factors being addressed such as, for instance, protected structures along the route alignment.



The Luas Tram at the Simon H. Perry Memorial Bridge



Route of the Luas Line B1 Alignment

Public Consultation

2.1 PUBLIC CONSULTATION LINE B1

This Chapter outlines the public consultation initiatives taken by the Railway Procurement Agency (RPA), the former Light Rail Project Office (LRPO) of CIE, in respect of the planned Luas Line B1 alignment, and the main issues identified to date. It should be noted that consultation is ongoing and further initiatives will be taken during the course of the project.

2.2 CONSULTATION INITIATIVES

Public consultation was initiated in November 2000, by means of the distribution of a newsletter and the publication of newspaper notices, as detailed below.

Newsletter

In November 2000, 5,500 newsletters were distributed to all addresses in the vicinity of the route options for the Luas Line B1 alignment which had been identified following preliminary assessment. This newsletter included a map showing possible route options and a list of key issues to be considered in identifying the best overall route option. It also confirmed the interest of the LRPO in obtaining the views of interested parties and representative organisations. Copies of the newsletter were also sent to elected representatives and media organisations.

The newsletter was accompanied by a Freepost postcard for return by the recipient indicating their willingness to participate in public consultation in relation to the Luas Line B1 alignment. It also provided recipients with an opportunity to communicate views and preferences. Approximately 250 postcards were returned by early March 2001.

A second newsletter, dated March 2001, was issued advising of the route options and variants which remained under examination at that point in time. The variants referred to emerged during the course of public consultation.

In September 2001, a further update letter was posted to all consultation participants whose details had been entered on

a database advising that design efforts had by now focused on the preferred route alignment.

Newspaper Notice

Newspaper notices (approximately A4 size) were published in national and local newspapers in November and December 2000. Again, this provided interested parties with an opportunity to indicate their willingness to participate in public consultation in relation to the planned Luas Line B1 alignment, by means of a Freepost cut-out section. Approximately 200 cut-outs were returned.

Correspondence & Telecoms

A significant number of letters and e-mails were received from interested parties. A significant number of telephone calls in respect of the planned Luas Line B1 alignment were also received.

Meetings

In January 2001 meetings with interested parties commenced focusing initially on route selection. In most instances these meetings were arranged on the initiative of the RPA. Round table meetings were held with interested parties including:-

- Representatives of Woodford Residents' Association,
- Representatives of Tudor Lawns Residents' Association,
- Representatives of Glencairn/The Gallops Residents Association,
- Representatives of Clonlea House.
- Representatives of Residents of The Chase (Brewery Road)
- The Management of the Childrens' Sunshine Home
- The Leopardstown Valley Residents Association,
- The Ballyogan Development Group and Estate Management Forum,
- The Meadowfields Residents, Association
- The Marketing Institute,
- Eurologic Ltd.,
- FAAC Electronics Ltd.,
- Leopardstown Park Hospital
- The Industrial Development Agency of Ireland (IDA)

Public Meetings were held with the following residents groups:-

- Woodford Residents
- Tudor Lawns .
- Residents of Ballyogan Road area
- Residents of Brennanstown Vale
- Residents of Leopardstown Abbey

Communications also took place with residents of other areas in less immediate proximity to the planned Luas Line B1 alignment, including those of Torquay Road, Brighton Road, and The Hedgerows. A significant number of meetings also took place with individual interested parties.

A preliminary analysis of the preferred route option identified that five residences in the vicinity of the Luas Line B1 alignment might be significantly impacted upon, in that acquisition of all or some of their residences might be necessary. Discussions took place with all of the owners of these properties. The number of residences significantly impacted upon was reduced as plans were developed taking account of possible impacts.

Discussions have taken place with all of the owners of residences which will have to be acquired to facilitate Luas Line B1. In particular, the owners of Clonlea House, Carrickmines Station House and No. 27 Woodford. The impact of Luas Line B1 on these properties is addressed in the Property section of this EIS.

Throughout the process there was extensive consultation between the RPA, Dun Laoghaire Rathdown County Council, Dublin Corporation (as it then was), the National Roads Authority, the ESB, Bord Gais Eireann, Bus Atha Cliath and engineering and architectural firms acting on behalf of developers so as to ensure the feasibility, compatibility and acceptability of the proposed Luas Line B1 alignment.

2.3 ISSUES RAISED DURING THE PUBLIC CONSULTATION PROCESS

Preference for Ballyogan Road Routing

A review of the response cards received reveals that most respondents who expressed a preference for the Ballyogan Road routing option reside in the vicinity of the Ballyogan Road alignment as shown on the map which accompanied the newsletter. The main reasons cited to support their expressed preference were:-

- The inadequacy of the existing public transport available to them
- The need for high quality public transport to serve existing and future developments
- Relative catchment density of the Ballyogan corridor
- The pressure which would be imposed on roads in the vicinity of the alignment of the former Harcourt Street Railway in the event of that alignment being chosen, as intending passengers drove or were driven to Luas stops

Preference for Routing on the former Harcourt Street Rail Line

Similarly, most respondents who expressed a preference for a routing along the alignment of the former Harcourt Street Railway reside in the vicinity of that alignment as shown on the map which accompanied the newsletter. The reasons cited in support of this particular routing were more varied and included:-

- Lower capital cost
- More direct alignment
- Perceived avoidance of requirement for road space
- Nostalgia
- Personal convenience

It is notable that amongst those supportive of a routing along this alignment there is a clear perception of a need for bus feeder services and park and ride facilities to allow

passengers from locations outside the walk-in catchment to avail of Luas services.

Those interested in the provision of services to areas east of Cherrywood generally favour the alignment of the former Harcourt Street Railway as the most direct route. In this context, correspondence indicating a preference for this alignment was received from Bray UDC, Wicklow County Council and the Seaview Residents' Association (Shankill).

Some amount of card respondents did not express a preference for any of the options as shown on the map which accompanied the newsletter. Suggestions included:

- Routing along the South-Eastern Motorway (SEM)
- Development of both routes
- Extension to Cherrywood via the alignment of the former Harcourt Street Railway and a "spur" from Cherrywood to Ballyogan.

The key issues raised in relation to the proposals included:-

- visual impact,
- noise impact,
- acquisition of property,
- boundary treatment,
- park and ride facilities, and.
- pedestrian access to stops, and
- anti-social behaviour
- traffic and safety concerns

Open – Day December 2004

Following the initial extensive phase of public consultation efforts focused on progressing agreements with the main property developers along the proposed alignment. As these consultations and negotiations progressed plans for the alignment were fine tuned.

In December 2004 the RPA organised a public open-day. The purpose of which was to update members of the public in relation to the status of plans for the line. The open-day was held in the County Hall, Dun Laoghaire. Members of the

public were notified by means of national newspaper notices and letters sent to persons included on the RPA's Line B1 Database. The open-day was very well attended and members of the RPA were on hand to discuss any issues raised by attendees. The open-day gave rise to subsequent correspondence in which RPA sought to inform and clarify.

At each and every step of the consultation process it was made clear that the RPA was ready and willing to consult with interested parties in an open and professional manner; It was also made clear that interested parties should not forego the opportunity to inspect plans and other documents accompanying the Railway Order Application as these might include changes or additional information which might be of interest. The process of consultation is ongoing and has served to confirm the generally positive acceptance and enthusiasm for the establishment of the Luas Line B1 alignment, and the Dublin Luas Light Rail Transit system in general. The proposals which constitute the subject matter of this environmental impact statement reflect the contribution of those who opted to participate in their development and the RPA's preparedness to accommodate ideas, views and concerns as far as is reasonably practicable and appropriate.

Considerations of Alternatives - Luas Line B1

3.1 INTRODUCTION

This chapter outlines the approach taken in the comparative evaluation of alternative Luas Line B1 routes and the selection of the preferred route on the basis of these comparative studies.

An environmental impact statement must include an outline of the main alternatives studied and an indication of the main reasons for the chosen project, taking into account the environmental effects. This requirement arises under section 39 of the Transport (Railway Infrastructure) Act, 2001, which give effect to the requirements of the European Directives on environmental impact assessment. The purposes underlying this exercise comprise of the following:

- to identify and take into account the likely significant environmental effects;
- to ensure that all reasonable alternatives to the location or design of the development are taken into account; and
- to implement best practice in design and safety.

With respect to the proposed Line B1, the following sections discuss the rationale for the extension of the Luas Green Line to Cherrywood, the route identification and design process and a description of how the routes were assessed.

In 1999 Peter Bacon and Associates in association with McHugh Consultants and Steer Davies Gleave prepared An Economic and Planning Assessment of an Extension of Luas Line B (Luas Green Line) from the Luas Sandyford Stop at Brewery Road to Cherrywood on behalf of Dun Laoghaire Rathdown Chamber of Commerce. That report examined the feasibility of an extension of the Luas Green Line from Sandyford Industrial Estate to Cherrywood. The study also examined the case for a subsequent further extension to Shankill to link with the existing DART line. This report was prepared in conjunction with the Dublin Transportation Office.

The 1999 Report examined:-

- alternative alignments, taking account of social, economic and transportation considerations, with a view to including

the preferred alignment for the Cherrywood extension in the Government Transport Programme;

- the feasibility of the Sandyford Industrial Estate to Cherrywood link in financial and transportation terms including evaluation of capital contribution/subsidy that might be required from the business community;
- comparison of the merits of the route via Stepside as against the alignment of the former Harcourt Street Railway line;
- in outline, consideration of the arguments for further extension of the Luas between Cherrywood and Shankill.

The 1999 Bacon Report on Luas Line B1 concluded that private funding for the project would be required and that the Stepside alignment would result in a strong benefit stream. The Stepside alignment would also provide reasonable access to potentially greater resident and working populations than would the former Harcourt Street rail alignment. The proposed route for the Luas Line B1 alignment via Stepside would facilitate achievement of the planning and development policies and objectives of the Dun Laoghaire Rathdown County Development Plan 2005-2010, such that in overall terms there would be a significant contribution towards realising the socio-economic development potential of the area. The Report also confirmed that there is considerable scope for establishing a public private partnership to enable the project to proceed in the short term without imposing any significant financial constraints on Government that might inhibit or detract from other prioritised extensions of the Luas system.

Following on from the 1999 Bacon Report, a consortium of private developers, which subsequently formed into a company called Rathdown Light Rail Ltd. (RLRL) commissioned the then Light Rail Project Office of CIE to carry out a study to further examine the feasibility of extending the Luas Green line to Cherrywood. As part of this study a detailed analysis was carried out to determine the optimum routing and design options for such an extension. The outcome of this analysis is presented below.

3.2 EVALUATION

In identifying route options for consideration, regard was had to:-

- previous work - in particular that carried out by the Dublin Transportation Office (DTO), Dun Laoghaire Rathdown County Council and by Bacon & Associates in association with Steer Davies Gleeve and McHugh Consultants on behalf of the Dun Laoghaire Rathdown Chamber of Commerce;
- relevant statutory plans, strategies and policies, taking account of established objectives, existing and proposed developments ;
- observations from on-site inspections;
- the likely significant environmental effects of each alternative;
- comments received during the public consultation exercise initiated in November 2000.

The route options and associated sub options were developed and evaluated by a multi discipline team in consultation with Dun Laoighaire Rathdown County Council (DLRCC) and interested parties/other relevant stakeholders. During the evaluation of options, the following assessment criteria were used:

- engineering Feasibility and safety;
- likely effect on communities, the natural environment and the built environment;
- socio-economic return;
- compatibility with the Development Plans of DLRCC and the plans, strategies and policies of other relevant agencies
- views expressed by other interested parties during the public consultation phase;

Alignment Options

Two broad routing options with sub options associated with

one of them were identified, namely:-

- option A which was a routing along the Old Harcourt Street Railway(OHSR) Line;
- option B which was a routing along the Ballyogan Road.

A detailed analysis was initially carried out on option B as many sub options presented themselves along this route. These sub options were compared in order to arrive at an emerging preferred route for Option B. This was then compared with Option A. The preferred route for Luas Line B1 then emerged. This preferred route was developed to Railway Order Application Stage. An outline of this analysis is presented below.

3.2.1 OPTION A: VIA THE OHSR ALIGNMENT

Option A comprises a route along the OHSR Alignment. It commences at the Luas Sandyford Stop, Brewery Road of the existing Green Line adjacent to the Sandyford Reservoirs and crosses both Brewery Road and Leopardstown Road at grade. The alignment then runs adjacent to sports grounds and behind the rear gardens of residential properties on Torquay Road before crossing the Northern entrance to Leopardstown Racecourse (Westminster Road) at grade. An apartment complex (the Hedgerows) has been constructed on a section of the route, close to this entrance. However, it would be possible to accommodate the alignment by acquiring part of the garden area.

The alignment continues along the old railway bed and passes under the Glenamuck Road. It would be necessary to demolish an extension to the station house at Carrickmines in order to accommodate the Luas Line. This extension has been built on the formation of the old railway line.

From the area of the South Eastern Motorway SEM Carrickmines Interchange, the route continues on via Brennanstown and Laughanstown and terminates at the proposed Town Centre in Cherrywood. The section from Carrickmines to Cherrywood is common to both options and

is considered in greater detail below within Option B.

There was no obvious benefit or necessity to deviate to any significant degree from the original alignment identified during the study.

3.2.2 OPTION B: VIA BALLYOGAN ROAD (STEPASIDE ALIGNMENT)

This option is a routing via Central Park, Ballyogan Road and thence to follow the OHSR line as per option A from Carrickmines to Cherrywood. The following paragraphs form descriptions of the various sub options which were considered before arriving at a preferred routing for Option B and contain commentaries on which critical factors were relevant to each sub option.

3.2.2.1 SUB-OPTIONS CONSIDERED FOR OPTION B

3.2.2.1.1 Sandyford Depot to Central Park

Sub-Option 1: Via Brewery Road

A key consideration in the appraisal of the Brewery Road sub option has been the requirement to negotiate a crossing of the Brewery Road roundabout. It was not a feasible option to cross this critical roundabout at grade due to the effect this would have on road traffic. Further, DLRCC were strongly opposed to crossing this junction at grade. One advantage of the at-grade solution is that it minimizes the potential visual impact on the Woodford estate.

An elevated solution would have created a significant adverse environmental impact on Woodford Estate. It would also have created problems with accommodating the elevated structure and the then proposed realignment of Brewery Road within the existing road width. This realignment is now complete. A tunnel option was also considered. This would have been very expensive and would have involved significant relocation of utilities. Also, greater traffic disruption would arise during the construction stage. Overall it was concluded that significant problems existed

with routing the alignment to Central Park from Sandyford via Brewery Road.

Sub-Option 2: Via Blackthorn Avenue/Burton Hall Road

It was not considered feasible to lay the track at grade across the roundabout formed by Brewery Road and Leopardstown Road because of its effect on traffic.

An option to cross the roundabout via an elevated structure was considered. The alignment would be accommodated on the South side of Burton Hall Road, placing it about 40 metres from the rear of the nearest houses in Woodford. This was considered to be less visually intrusive on Woodford. This degree of separation and the backdrop of tall buildings would allow the construction of a ramp, which would not give rise to a serious visual impact on adjacent residences. Operationally, this is the shortest route from the Depot to the roundabout.

In a similar manner to the Brewery Road option the possibility of providing an underpass at the Leopardstown Road / Brewery Road roundabout was considered. This would have been a very expensive option and it would have involved significant relocation of utilities. Also greater traffic disruption would arise during the construction stage. Design of Block E of the Central Park scheme and the Luas Line B1 alignment which follows a reservation along the eastern boundary of the lands are coordinated and compliment each other. This minimises visual impact of the scheme.

Sub-Option 3: Via Leopardstown Road

This alignment involves running at grade across Brewery Road, thence along the OHSR Line to Leopardstown Road and then turning to the right to run along at the eastern side of Leopardstown Road. This alignment reduces the impact on traffic on the Leopardstown Road / Brewery Road roundabout and offers a dedicated stop for the Leopardstown Racecourse and IDA South County Business Park. However, a crossing of Leopardstown Road in front of the existing Sunshine Children's Home would be at an unfavourable angle. It would be an expensive option in terms of property acquisition and its effect on adjacent property. In addition, operationally this is the longest route with increased

journey time and reduced performance. Also, it involved crossing two major roads at grade.

Sub-Option 4: Via Burton Hall Road Cul-de-Sac

This sub option consists of an alignment along Blackthorn Avenue from the Sandyford stop and crosses the intersection with Burton Hall Road on a grade-separated structure before continuing southwards along the Burton Hall Road cul-de-sac. It runs on an elevated structure southwards over the Langdon's and Carroll's properties and Burton Hall and crosses Leopardstown Road via an elevated structure into the western lands of Central Park. This sub-option would involve the provision of an elevated stop at the western end of the Central Park scheme, before continuing on the elevated structure across the lands of Central Park, and ultimately to the Bridge over the SEM. This option would require the removal of an existing educational building.

Two further variations were initially considered in respect of this sub-option. The first comprised an at-grade alignment along Blackthorn Avenue and across the intersection, before rising on the elevated structure along the cul-de-sac and entering the grounds of Burton Hall as described above. The second sub-option comprised a ramp and elevated structure commencing on the eastern side of Blackthorn Avenue, with a grade separated crossing of Burton Hall Road and a further crossing of the cul-de-sac before continuing into Burton Hall, and onto Central Park, as described above.

The at-grade variation was rejected primarily on the grounds that the ramp required would adversely affect access to the premises on the cul-de-sac, with planning permission granted on two of these sites (Carroll's and Langdon's) for high-density office-based industrial use. The grade-separated variation would involve a significant capital cost, due to the length of the elevated structure and the provision of an elevated stop at Central Park, requiring the incorporation of access ramps and elevators for mobility impaired persons. In addition, the property acquisition costs to facilitate these sub-options would be substantial. Further costs would be incurred in relocating existing utilities from the western side of Blackthorn Avenue, which were deliberately installed at this location in anticipation of the Line B1 alignment running on the eastern side of the carriageway.

There would be significant visual impact associated with the elevated structure. This would impact upon the resident, working and visiting populations of the area, including the occupants of the office buildings of the cul-de-sac and the St. John of God facility at Burton Hall, which is a protected structure. In addition, whilst these options would serve Central Park, they would be less attractive in serving the South County Business Park and Leopardstown Park Hospital to the south and south-east. Moreover, the design of Block E of the Central Park scheme was revised on the premise that the Luas Line B1 alignment will follow a reservation along the eastern boundary of the lands. These sub-options could not link to this reservation.

Conclusion

Having considered these four sub-options for the section from Sandyford to Central Park it was concluded that overall, the best option was to route the line from Sandyford via Blackthorn Avenue, crossing Burton Hall Road at grade, ramping up at the south side of Burton Hall Road and crossing the Leopardstown Road/Brewery Road roundabout via a bridge and thence to the roof of a car park in Central Park which had been designed to accommodate the Luas.

3.2.2.1.2 Central Park to Murphystown Road (SEM Crossing)

Having decided to route the line via Burton Hall Road the obvious alignment to choose was the one which was reserved for the Luas under the planning permission which was granted for the Central Park Development. The main consideration as the line proceed southwards is how best the cross the SEM avoiding Murphystown Castle and Glencairn House. Both tunnel and bridge options were considered for the crossing of the SEM.

Sub Option 1: Tunnel

A tunnel option was considered attractive for the following reasons: The Motorway is constructed in cut, running parallel to the ravine Taking account of the topography of the area and the permitted gradients for Luas the length and subsequent cost of the tunnel would have been prohibitive when compared to an elevated option. Also it was assumed that the motorway would be completed prior to the

commencement of the Luas Line B1 construction and a cut and cover option for the tunnel would not be acceptable to road authorities.

Sub Option 2: Overbridge

An analysis of the surrounding environment, and in particular the general topography of the area and the existence of underlying hard granite, made the option to bridge over the SEM a more attractive one when compared with a tunnel.

Conclusion

Due to the topography of the area and taking account of the evolving local environment, crossing the SEM from Central Park via an overbridge was chosen as the preferred option.

3.2.2.1.3 Murphystown Road to OHSR Alignment

The alignment at the commencement of this section is constrained by Murphystown Castle and Glencairn House. In this particular area it was also necessary to give consideration to the Roads Objective of Dun Laoghaire-Rathdown County Council namely to construct a section of new roadway known as the Murphystown Parallel Road. This would lie between Murphystown Road and Ballyogan Road and the opportunity would be taken to upgrade Ballyogan Road. It was considered desirable that the Luas alignment and new and upgraded roadways run parallel with each other. To accommodate both alignments Clonlea House a protected structure, which is located immediately to the South of Glencairn House would have to be acquired and demolished. This is due to insufficient space between Mount Eagle Park on the west side and Glencairn House and Glencarin View on the east side. An alternative alignment in this area would have a greater impact on other houses, it would have been necessary to demolish up to eight houses.

In relation to the alignment along the Ballyogan Road, two sub options were considered, one to run the line at the Northern side of the road and the other to run it at the Southern side.

Sub-Option 1: Northern side of Ballyogan Road

This sub option would involve realigning Ballyogan Road

over a length of approximately 1 km including the provision of signalised junctions at all roads giving access to the housing development at this side. At the eastern end of Ballyogan Road it would be possible to place the Luas alignment off the roadway in the existing open space.

Sub-Option 2: Southern side of Ballyogan Road

This sub-option lessens the need for redesigning two existing traffic junctions and the realignment of Ballyogan Road as part of the Luas Line B1 alignment works. However, it requires two obtuse crossings of Ballyogan Road, which would be undesirable; one at the intersection of Ballyogan Road with the planned Murphystown Parallel Access Road, and the second crossing in the vicinity of the eastern end of Ballyogan Road to follow the alignment to Glenamuck Road. Such crossings are undesirable as both would require signalisation for safety purposes and this would have further negative impacts for both road and Luas traffic on Ballyogan Road.

Also, in accordance with DLRCC development plan, it is proposed to develop the south side of Ballyogan Road and this would create the need for further at grade crossings of the Luas line in order to accommodate such development.

Conclusion

Sub-Option 1 was selected on the basis that it avoided the two at grade crossings of Ballyogan Road and that the south side of the roadway is due to be developed as per the DLRCC development plan. This effectively negated the initial advantage of the routing at the south side. Also, it was decided in conjunction with DLRCC, to incorporate the upgrading of Ballyogan Road into the B1 project in order to avoid duplication of costs which would arise if both projects proceeded independently.

3.2.2.1.4 Ballyogan Road to Carrickmines (SEM Crossing)

This section relates to a routing of the line from the Ballyogan Road across the South Eastern Motorway to join the Option A alignment on the OHSR line. Two sub options were examined.

Sub Option 1 Cross SEM to the west of Carrickmines Interchange

The advantage of this option would be that it provided a completely segregated alignment for Luas and it avoided a zone of archaeological interest in the Carrickmines area.

Sub Option 2 Cross SEM via the then proposed Interchange and proposed spine road

This would involve using the proposed interchange at Carrickmines. The geometrical constraints associated with this layout would be difficult to overcome and it would not be an efficient operating system as the trams would integrate with road traffic using the interchange. DLRCC have made it clear that they opposed to using the interchange.

Conclusion

An independent crossing of the SEM to the west of the Carrickmines Interchange was considered optimal mainly on the basis that it was not possible to efficiently operate a Luas line over the interchange at Carrickmines.

3.2.2.1.5 Carrickmines to Cherrywood

No sub option of this route was identified. The alignment of both Options A and B was common between Carrickmines and Cherrywood.

3.2.2.2 PREFERRED ROUTE FOR OPTION B

Having considered all the sub options fully the following is a description of the preferred route for option B which was then compared with option A in order to arrive at an optimum routing for Line B1. This route option runs southwards along Blackthorn Avenue from the Luas Sandymount Stop, eastwards along Burton Hall Road to the Leopardstown Road / Brewery Road Roundabout. It crosses the roundabout by means of an overbridge, and then runs along the boundary between Central Park and the Leopardstown Park Hospital. It then crosses the SEM, which is currently nearing completion, and the Leopardstown Valley by means of an overbridge. It skirts the western boundary of "Glencairn" before linking to Murphystown Road.

The proposed Luas Line B1 alignment then follows the line of the planned Murphystown Parallel Access Road within the

western portion of The Gallops residential development, and links to the northern side of Ballyogan Road. Ballyogan road will be re-aligned to the south to facilitate the insertion of the Luas alignment on its northern side. From Ballyogan Road, the route re-crosses the SEM by means of an overbridge, and rejoining the alignment of the OHSR at a point to the west of Glenamuck Road. It generally follows this alignment through Brennanstown and Laughanstown before crossing under the planned Cherrywood Spine Road to the proposed new District Centre at Cherrywood. It runs through the proposed district centre at Cherrywood using a viaduct which also takes it over the Wyattville link road and on to the terminus at Bride's Glen.

3.2.3 SUMMARY OF EVALUATION OF OPTION A AND OPTION B

3.2.3.1 INTRODUCTION

The evaluation of route options and sub options discussed here was assessed against a wide range of criteria centring on the public interest. These Criteria included:-This set of criteria included:

- engineering Feasibility and safety;
- socio-economic return;
- likely impact on communities, the natural environment and the built environment; compatibility with the Development Plans of DLRCC and other relevant agencies;
- views expressed by other interested parties during the public consultation phase.

To facilitate this, the public was consulted, a socio economic assessment was carried out and the town planning implications of the Ballyogan and OHSR routings with particular emphasis on the current Development Plan and relevant Area Action Plans were considered. The conclusions of the study are summarised below.

3.2.3.2 PUBLIC CONSULTATION

Of particular relevance to the comparative assessment of Option A and Option B, are the views of respondents to the newsletters and newspaper notices initiated as part of the Luas Line B1 public consultation process.

Preference for Option B

Most respondents who expressed a preference for a Ballyogan Road routing reside in the vicinity of the Ballyogan alignment. The main reasons cited to support their expressed preference were:-

- the existing poor level of public transport available to them; and
- the need for high quality public transport to serve existing and future developments.

Generally, residents of the OHSR Corridor who expressed a preference for a Ballyogan routing cited relative catchments density. Notably a number of such respondents indicated that on a personal convenience basis they would have expressed a preference for an OHSR routing and a number also suggested that an OHSR routing would lead to severe pressure on the road system in the vicinity of the OHSR as intending passengers drove or were driven to Luas stops from outside the walk-in catchments.

Preference for Option A

Most respondents who expressed a preference for an OHSR routing reside in the vicinity of the OHSR alignment. The reasons cited in support of an OHSR routing were more varied and included:

- lower capital cost;
- more direct alignment;
- avoidance of requirement for road space;
- nostalgia;
- personal convenience.

It was notable that amongst those supportive of an OHSR routing there was a clear perception of a need for bus feeder services and park and ride facilities to allow passengers from beyond the walk-in catchments to avail of Luas services.

3.2.3.3 LAND USE PLANNING

From a land use planning and development perspective, the Development Plan clearly supports the logic of accommodating new resident and working populations in this overall district of Carrickmines/Cherrywood and Stepside within the Dun Laoghaire Rathdown County. The central transport infrastructural requirement for unlocking the development opportunities remains the C-Ring Motorway. This section of the Motorway is now effectively completed and should open to traffic in 2005. However, private transport alone cannot support the land use development of this area, and the Luas will play an important role in facilitating modal shift to public transport.

In this area of Dun Laoghaire Rathdown current transportation accessibility and mobility is poor in terms of public transport provision (there is a very limited number of bus routes) and the quality of the road network. In this regard the implementation of the Luas extension, along with the complementary new road network developments and augmentation of bus services will create new transportation capacity. In land use planning terms it must equally be noted that there remains strong un-met need for new residential and employment accommodation in Dun Laoghaire Rathdown County. The zoning objectives for the Stepside and Cherrywood areas will contribute to achieving a greater balance between accommodation need and supply. In this regard there is a clear requirement to see these areas developed sooner rather than later.

Pursuit of the option for extending Luas to Cherrywood using the route of the OHSR alignment would militate against the successful implementation of the range and scale of new development proposed for Stepside as set out in the DLRCC development plan. The OHSR alignment, between Leopardstown Road and Glenamuck Road, runs alongside a one-sided residential development, which is established a quite low-density form. Beyond Glenamuck Road and towards the Cherrywood area the two options (i.e. via Stepside and via the original OHSR alignment) would share the same corridor.

In conclusion therefore, the alignment option via Stepside

would provide access to a modern public transport system to significantly greater new resident and working populations than the alignment along the original Harcourt Street corridor.

3.2.3.4 TRAFFIC

Following a preliminary traffic assessment of Options A and B it was concluded that with Option A the OHSR alignment, there would minimal interaction between road vehicles and trams. With respect to Option B (Stepaside Route), it was concluded that, although there would be greater interaction between trams and road vehicles, it was considered that acceptable levels of safety and capacity could be obtained to meet the requirements of both options.

3.2.3.5 CULTURAL HERITAGE

Using the record of monuments and the existing archaeological knowledge base, a desk study was completed. This identified sites and land areas of archaeological importance and potential along the Luas Line B1 route options. Given the landscape through which the proposed routes pass, the context of the monuments and their relationships to adjacent sites and the surrounding zones of archaeological potential were considered.

Of the two options the OHSR alignment route option requires the least mitigation for archaeological impacts as utilising existing infrastructure. Option B runs through several archaeological sites and ameliorative measures would be required to safeguard archaeological features along the route.

All recorded archaeological monuments are protected by national monuments legislation. In all cases, avoidance of archaeological sites and their surrounding areas of interest is the preferred mitigation measure.

Option B requires that Clonlea House, which is a protected structure on Murphystown Road, be demolished. This is required to accommodate the Luas B1 alignment and the widening of Murphystown Road.

Visual Impact

The preferred route for Option B is considered to be less visually intrusive on Woodford and the working and visitor population of Central Park.

3.2.3.6. THE PREFERRED ROUTE

Based on the comparison of the various route and design options and sub-options referred to above, Option B with the preferred sub-options detailed above was identified as the preferred route and design. This evolved into the proposal that is now the subject of the application for a Railway Order for Luas Line B1, and which is now the focus of this EIS.

3.3 LUAS STOP LOCATIONS

The rationale behind the Luas Line B1 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 Luas Line B1 alignment and, ultimately to the overall Luas network. Thus, their siting, number and level of associated facilities (including Park and Ride) are critical. The linkage between stops and associated transport and land use facilities determines the level of mobility for passengers.

The location of stops has been appraised on the basis of catchment accessibility (which will determine the actual number and location of stops along the Luas Line B1 alignment), and mobility (which looks at how mobile the target population becomes once on the network – i.e., where does the network link to; how does it interchange; what would population options for mobility be without access to the Luas Line B1 alignment – e.g. alternative means of undertaking the journey).

The consideration of stop locations also has to take account

of the existing and planned future development of the catchment area of the Line B1 alignment, particularly in the Stepside and Cherrywood/Rathmichael areas. Thus, stop locations need to be considered not only in terms of how they can serve existing development to the optimum extent, but how they can also serve, and integrate into, the planned future development of the wider catchment area. Traffic and safety issues are also a primary consideration in determining stop locations.

3.4 STRUCTURES AND LANDTAKE

3.4.1 LANDTAKE

The Luas Line B1 alignment project is predicated on the philosophy that the amount of landtake and the number of properties affected along the route should be kept to a minimum. This has guided the landtake process over the course of the route selection period.

For example, the final preferred route alignment follows existing or planned future transport corridors or reservations to the greatest possible extent, in order to limit the number of private landtakes required, and in particular, to avoid demolishing existing habitable dwellings. The Luas Line B1 alignment between Laughanstown and Cherrywood runs in immediate proximity to the planned alignment of the Carrickmines-Cherrywood Spine Road, in order to minimise the amount of segregated lands between these two route corridors.

Alternative locations were considered for the provision of temporary construction compounds and assembly areas. These are required to be located in immediate proximity to the Luas Line B1 alignment, and in areas which can provide access thereon. In particular, it was considered essential to locate such sites in immediate proximity to the locations of the planned bridges (see below), and to Ballyogan Road which is to be re-aligned as part of the overall development proposal.

Moreover, these sites should ensure the minimum impact on existing private property in the vicinity of the Luas Line B1 alignment. The final preferred location of temporary construction compounds and assembly areas reflects the considered optimum locations for these essential facilities.

The temporary construction compounds and assembly areas are located as follows:

- The Sandyford Depot on the northern side of Blackthorn Avenue.
- To the north of the Luas Line B1 alignment on the southern side of Burton Hall Road, within the existing property of FAAC Electronics Ltd.
- Immediately to the north of the SEM in the vicinity of the planned Leopardstown Luas Bridge
- On lands to the north of Murphystown Road, immediately to the west of the Luas Line B1 alignment, in the vicinity of the property Glencairn.
- On lands to the east of Murphystown Road, south of Glencairn.
- Immediately east of the public playing fields on the northern side of Ballyogan Road, and extending to the western boundary of the Ballyogan Wood residential development
- At Carrickmines, on the eastern side of the Line B1 alignment, immediately north of the SEM alignment
- In the vicinity of the intersection of the Luas Line B1 alignment with the planned Carrickmines-Cherrywood Spine Road.

3.4.2 BRIDGES

Four new bridge crossings are proposed along the Luas Line B1 alignment; one over the Leopardstown Road/Brewery Road roundabout, two over the SEM alignment, one at

Leopardstown and the other at Ballyogan (Carrickmines) and one over the Wyattville Link Road. In addition, the proposed development requires the upgrading of the existing Glenamuck Road bridge to facilitate the Luas alignment crossing by means of an underpass.

Alternative bridge design proposals were considered by the Design Team. The guiding philosophy behind the design was the requirement to ensure a functional structure, particularly in cognisance of the fact that the bridges cross major public road corridors, with resulting constraints such as required sightlines and clearance levels from the road carriageway below. It was also considered essential to ensure a construction and assembly method for the proposed bridges which would ensure a minimal disruption to traffic flow along what will be particularly busy road routes.

It was also considered essential to ensure a cost-effective yet visually aesthetic bridge design solution. In particular, the planned bridge over the Leopardstown Road/Brewery Road roundabout will be highly visible, and has required an appropriate design to successfully incorporate it into the existing physical environment. The other bridges will span the SEM and, whilst having a lower overall visual impact, have still required a high level of design.

Grade Separated Crossing of Cherrywood Spine Road

It was considered from an early stage that an at-grade intersection of the Luas Line B1 alignment with the Cherrywood Spine Road would not be appropriate, on account of the projected large volume of vehicles which would be using this new road.

Alternative forms of grade-separated crossing considered were by means of an overbridge, or by an underpass. Factors determining the preferred alternative included an analysis of the topographical survey of the area, the need to minimise visual and landscape impact and cost-effectiveness.

The preferred alternative was for a grade-separated underpass under the planned alignment of the Cherrywood Spine Road. The topographical survey found that existing ground levels in the area favoured an underpass option. In

addition, this alternative would have lower associated costs than an overbridge alternative, and a much lower visual impact.

Grade Separated Crossing of the Wyattville Link Road

It was similarly considered inappropriate to cross the Wyattville Link Road at grade on account of the projected large volumes of traffic which would be using this new road.

An overbridge was considered the only viable solution given the topography of the area and the need to link the Cherrywood Luas stop and the Bride's Glen Luas stop with the planned new District Centre and evolving Science and Technology Park, respectively. The proposed overbridge as a design solution has become reinforced given that the Wyattville Link Road is substantially complete and has been constructed at-grade.

3.4.4 SUBSTATIONS

The provision of sub-stations is an essential component of the Luas Line B1 alignment, as they are the source of power for trams and stop facilities. A power simulation for the Luas Line B1 alignment carried out by the RPA concluded that five Luas sub-stations would be required to serve the route in addition to the existing sub-station located within the Sandyford Depot. It is important to provide for the retention of sufficient power to serve the operation of the Luas Line B1 alignment in the event that one of the sub-stations malfunctions or must be shut down for essential maintenance works.

Another primary consideration is that the substations are constructed at locations which will ensure the minimum visual impact and intrusion on the existing landscape. In particular, it was considered appropriate, where possible, to locate the sub-stations in proximity to planned Luas stops, in order to minimise the impact of the planned new built form on the existing environment.

In reference to the above factors, the final proposed substation locations are:-

- Immediately proximate to the Glencairn stop
- In the southwest corner of the public playing pitches, adjacent to the alignment on the northern side of Ballyogan Road
- Immediately proximate to the Carrickmines Stop
- Adjacent to the alignment near the Cherrywood Stop.

An existing substation at the Sandyford Depot will also serve the Luas Line B1.

3.5 USE OF LAND

The proposed development comprises the provision of a light rail alignment, including associated structures, between Sandyford Industrial Estate and Cherrywood/Rathmichael.

It is reasonable to assume that in the absence of the provision of this facility, which is an objective of the Statutory Development Plan and associated adopted and Draft Action Plans, the alternative use of the land on which it is to be located would reflect the current use occurring thereon. However, much of these surrounding lands are intended to accommodate new residential, commercial and employment-related land uses, and thus will alter from their current undeveloped state. In addition, the lands of the Luas Line B1 alignment along the northern side of Ballyogan Road are the subject of a previous Compulsory Purchase Order associated with the upgrading of this road which is an Objective of the Statutory Development Plan.

Description of the Luas Line B1 Alignment

4.1 DESCRIPTION OF THE LIGHT RAILWAY WORKS - LUAS LINE B1

4.1.1 DESCRIPTION OF THE PROPOSED ALIGNMENT

The Luas Line B1 alignment comprises an extension of the Green Line from St. Stephen's Green to Sandyford Industrial Estate, which commenced operation in June 2004. Luas line B1 commences at the Sandyford stop on Blackthorn Avenue at the north-eastern part of the Sandyford Industrial Estate. The Sandyford Luas Depot is located immediately to the east of the Sandyford stop. The existing Sandyford stop comprises a public transport interchange, with facilities for bus and taxi setdown/take-off, as well as a "kiss and ride" pull-in area. There will be three additional sidings at the existing Sandyford Depot on the reservoir side included as part of this scheme, which formed part of the original Line B order, however they were not constructed and the powers of the order have expired.

The Line follows the southward curve of Blackthorn Avenue along its eastern side, towards Burton Hall Road. This requires the alignment to traverse the western portion of the existing property at 27 Woodford, immediately to the east of Blackthorn Avenue. A pedestrian path will be created parallel to the eastern side of the alignment along Blackthorn Avenue.

The Luas Line B1 alignment crosses Burton Hall Road at grade, at the junction with Blackthorn Avenue. This is facilitated by the new traffic management measures which were undertaken on behalf of Dun Laoghaire-Rathdown County Council. This involved the signalling of the junction of Burton Hall Road with Blackthorn Avenue and a one-way westbound movement on Burton Hall Road, west of this junction. There is no right-turn onto Blackthorn Avenue from Burton Hall Road. Consequently, Blackthorn Avenue has become one-way southbound.

The Luas Line B1 alignment then turns to the south-east, and ascends a ramp along the southern side of Burton Hall Road.

This ramp will facilitate a grade-separated bridge crossing of the Leopardstown Road/Brewery Road roundabout. This will ensure that there will be no conflict with the significant levels of existing and forecasted vehicular traffic at this location. The Luas Line B1 alignment then turns south-westwards and enters a reservation at the north-eastern corner of the Central Park development on the southern side of Leopardstown Road, and runs adjacent to the southeastern boundary of the permitted extension to this scheme.

The Luas Line B1 alignment generally follows the boundary between the lands of Central Park and the lands of the Leopardstown Park Hospital to the south-east. This requires the demolition of the existing boundary wall, and its reinstatement further to the south-east, within the lands of the Hospital. It also requires the removal of a line of mature trees along the existing boundary, with the provision of replacement planting in this area. In this regard, it was originally intended that the Luas Line B1 alignment would follow the south-eastern boundary of the Central Park lands, but at a location such as not to require the demolition of the boundary wall or removal of the existing trees. In pursuit of this, prior to the lodgement of the planning application for the Central Park Scheme, now permitted, the former Light Rail Project Office of CIE (refer to Section 1.2 of this EIS) undertook consultations with the Applicants in order to ensure the inclusion of a Luas reservation within the lands. However, the final permitted scheme for Central Park did not provide a sufficient reservation width to accommodate the Luas Line B1 alignment. Following construction of a number of buildings in the north-eastern portion of the lands, there is no other option but to run the Luas Line B1 alignment within a corridor including the area of the existing boundary wall and trees.

A stop is to be located within the Central Park development in the vicinity of a planned central plaza area. Pedestrian access will also be provided to this stop from the Hospital lands and to the existing IDA South County Business Park to the east. The variation in existing land levels between the two sites will require a ramping of this pedestrian access from the lower lands of Leopardstown Park Hospital. Pedestrian access to the stop will also be available from Leopardstown Road.

South of the Central Park Stop, the Luas Line B1 alignment ascends a ramp and links to a planned overbridge over the reservation of the South-Eastern Motorway (SEM), and the Leopardstown Valley, immediately to the south of the Motorway. This overbridge will be approx. 250m in length, with additional ramping structures on either side totalling a further approx. 150m. The bridge will link to the southern side of the valley at a point to the north-west of the existing ruins of Murphystown Castle, an archaeological site of some significance. It continues southwards, and passes across the entrance to "Glencairn". The insertion of the Luas Line B1 alignment in this area will require some demolition and reinstatement works to the existing wall fronting this property.

The Luas Line B1 alignment links to the northern end of the existing narrow Murphystown Road, on its eastern side. It is an objective of the Planning Authority to ensure the construction of the alignment of the planned Murphystown Parallel Access Road. Preliminary plans of this road have been referred to in selecting the preferred Luas Line B1 alignment, such that it follows the eastern side of this planned new carriageway. A stop and substation are to be located within the existing property of 'Clonlea House' a Protected Structure. This dwelling will require to be demolished to facilitate the provision of the Luas Line B1. However, it should be noted that demolition would be required in any event to accommodate the planned Murphystown Parallel Access Road, which is a Statutory Roads Objective of the current Dun Laoghaire-Rathdown County Development Plan.

The Luas Line B1 alignment follows the reservation of the planned Murphystown Parallel Access Road within the western boundary of the residential estate "The Gallops". It will run southwards, along the eastern side of the planned new road alignment, in the vicinity of that portion of the residential development known as "Glencairn Heath". However, it should be noted that the construction of the Murphystown Parallel Access Road is not an element of the proposed Luas Line B1 scheme. The Luas alignment will then follow the south-eastern curve of the planned new road, and will link to the existing Ballyogan Road, running along its northern side.

Ballyogan Road is a central link within the designated area of the Stepside Action Plan 2000, as adopted by Dun Laoghaire-Rathdown County Council (It should be noted in this regard that Luas Line B1 is also a primary transportation objective of this Action Plan). The western end of Ballyogan Road has been significantly upgraded and re-aligned. The insertion of the Luas Line B1 alignment parallel to the northern side of Ballyogan Road will require the re-alignment of the remainder of this carriageway. It is also a Six Year Roads Objective of the current County Development Plan to ensure the upgrading of this road. Primarily this will involve a widening of the carriageway, and its southern re-alignment, with associated provision of footpaths, verges and cycleways on either side of the road. This realignment and improvement work forms part of this Railway Order application and will be delivered as per the requirements of the Road Authority.

The northern side of Ballyogan Road comprises the southern boundary of "The Gallops" (Glencairn) residential scheme. A stop is proposed at a central point along this southern boundary, in the vicinity of Glencairn Crescent. A gated pedestrian access will be provided to the Luas Line B1 alignment from the western "leg" of Glencairn Crescent adjacent to the stop in order to prevent the creation of an informal desire line route from the west of the estate across the open space to the existing vehicular entrance. No pedestrian access to the Luas Line B1 alignment will be available from the adjacent cul-de-sacs of The Gallops.

The Luas Line B1 alignment curves slightly to the south of "Glenbourne", an existing period dwelling on the northern side of Ballyogan Road. The existing vehicular entrance to this property, in immediate proximity to the Luas Line B1 alignment, will require to be closed, with a new vehicular entrance opened onto Glenbourne View Road, an internal road within the "Leopardstown Valley" (Glenbourne) residential development. However, pedestrian access to the dwelling from Ballyogan Road will be retained.

The Luas Line B1 alignment then enters a grassed reservation along the southern edge of the "Leopardstown Valley" residential scheme. A stop is proposed immediately to the south of the existing Leopardstown Valley Neighbourhood Centre, for which permission has recently

been granted for major expansion of facilities to serve the area as well as a central pedestrian route to link to the future Luas stop on the Ballyogan Road and substantial car parking facilities. This area is also planned to accommodate a public bus/Luas interchange.

The alignment continues eastwards within the existing reservation, parallel to the northern side of Ballyogan Road. The public transport facility will serve existing and planned new development in this area, including the Drinaghmore residential scheme, Ballyogan Business Park, the An Post Sorting Office and a significant extent of lands zoned for employment-related development on the southern side of the alignment. A sub-station will be located to the east of the Drinaghmore residential estate, in the southwest corner of the playing fields to the north of Ballyogan Road and adjacent to the Luas Line B1 alignment. Further east, a stop is to be located on the reservation immediately to the south of the Ballyogan Wood housing scheme.

To the east of the planned Ballyogan Wood stop, the Luas Line B1 alignment rises onto an embankment and travels north-eastwards over the reservation of the SEM via an overbridge. The length of the bridge with associated ramp structures on either is approximately 500m. On the northern

side of the Motorway reservation, the Luas Line B1 alignment crosses the eastern lands of the Leopardstown Race Course and turns to the north-east, linking to the alignment of the former Harcourt Street Railway at a point immediately to the south of the houses of "Brighton Court". A temporary stop will be provided in this vicinity, primarily intended to serve the Racecourse on event days. The Race Course stop is proposed as an occasional stop at present with the potential to become a full time stop in the future. However, this would be subject to future development in the area and the provision of more permanent access arrangements by a third party, both of which are outside the scope of this railway order application.

The Luas Line B1 alignment continues eastwards and passes immediately to the south of the lands of Carrickmines Tennis Club before passing under the Glenamuck Road Bridge. This bridge will require to be altered and upgraded to accommodate the Luas Line B1 alignment by way of an underpass and to facilitate road widening.

Immediately to the east of the Glenamuck Road Bridge, the Luas Line B1 alignment passes through the property of the former Carrickmines Station House, a Protected Structure. A modern single-storey extension has been constructed across

the alignment, and will require to be demolished. A stop and a sub-station will be located at a point to the east of the former Station House, and to the south of the existing Brennanstown Vale residential scheme. A 350 space underground park and ride facility, as well as a public bus interchange at ground level will be located immediately south of the Luas stop within the lands of the property *Priorsland*, and will link via the planned Cherrywood Spine Road to the planned SEM Carrickmines Interchange.

The Luas Line B1 alignment follows the alignment of the former Harcourt Street Railway through the Carrickmines Wood and into the townland of Laughanstown. A Luas stop will be located at a point to the north of the planned spine road and to the east of the existing Brennanstown Vale residential scheme. Extensive lands adjacent to the planned stop are zoned for residential and employment uses.

The Luas Line B1 alignment then turns to the south and crosses the alignment of the planned Cherrywood spine road by means of a grade-separated underpass. A stop will be located at the eastern side of Laughanstown Lane. The Luas Line B1 alignment will traverse Laughanstown Lane by means of an at-grade crossing. The Luas Line B1 alignment then follows the southern side of the planned Cherrywood

Spine Road across the lands of Laughanstown. A stop will be located in the planned Plaza area of the proposed District Centre at Cherrywood.

The Luas Line B1 alignment continues approx. 400m south into the Science and Technology Park at Cherrywood before terminating with a stop in the southern portion of the Science and Technology Park. This structure and the structure required to support the trackbed in the plaza area at Cherrywood will integrate with the development of Cherrywood District Centre to be provided by a third party.

4.1.2 STOP LOCATIONS

Sandyford Stop

The Luas Line B1 alignment comprises an extension of the existing Luas Line B alignment from St. Stephen's Green to Sandyford Industrial Estate. The Luas line B1 commences at the Sandyford stop on Blackthorn Avenue at the north-eastern part of the Sandyford Industrial Estate, and immediately to the south of the existing Stillorgan Reservoirs. The Sandyford Luas Depot is located immediately to the east of the Sandyford stop. This stop plays an important and



Photomontage of Luas Line B1 Glencairn Stop NOTE: Wall removed from image for clarity



Photomontage of Luas Bridge over Leopardstown Road / Brewery Road Roundabout



Photomontage of Luas Line B1 Leopardstown Valley Stop

strategic public transport interchange serving the major employment area of Sandyford Industrial Estate, with provision for cycle parking, a bus and taxi setdown/pickup, as well as a “kiss and ride” pull-in.

Central Park Stop

This stop will be located along the south-eastern boundary of the lands of the existing Central Park commercial scheme, part of which has been constructed. This stop is located at a central point of this development and adjoins the planned plaza area serving the scheme. The Environmental Impact Statement accompanying the planning application for Central Park estimates that some 12,000 persons could be employed in this scheme. Furthermore, the stop is adjacent to the existing IDA South County Business Park, as well as the lands of Leopardstown Park Hospital, on which a major extension was constructed, in recent years, on the northern portion of the hospital lands adjacent to the Luas Line B1 alignment. It is planned to provide pedestrian access to the Central Park Stop from these areas, and which also has the potential to serve the Leopardstown Race Course complex. Pedestrian access will also be available from Leopardstown Road.

Glencairn Stop

This stop is planned to be located on the eastern side of the alignment of the planned Murphystown Parallel Access oad, immediately to the south of the entrance to “*Glencairn*”. The stop is to be located on the lands of the existing “*Clonlea House*”, which is to be demolished to facilitate the Luas Line B1 alignment, and planned road improvement works. The stop will serve the considerable amount of existing and

planned new development in this area, including “*the Gallops*”, “*Mount Eagle*”, “*Leopardstown Heights*” and “*Sandyford Hall*” residential schemes, and a proposed new residential scheme to the north of Murphystown Road, which is the subject of a current planning application (by Glencairn Developments).

Gallops Stop

This stop is planned to be located on the northern side of Ballyogan Road, at the centre of the southern boundary of “*The Gallops*” residential development, to the south of Glencairn Crescent. Of more strategic importance, this stop will occupy a central position within the lands of the Stepside Action Plan 2000, which has zoned this area for significant new residential development. Currently, lands on the southern side of the western end of Ballyogan Road are being developed for new residential use. In September 2004, it was estimated that some 1,500 residential units were under construction and/or completed within the Stepside Area. It is envisaged that a further 4,000-5,000 houses and apartments will be constructed by 2012.

Leopardstown Valley Stop

This stop is planned to be located on a grassed reservation at the entrance to the Leopardstown Valley residential scheme, and immediately proximate to the existing Leopardstown Valley Neighbourhood Centre. The Stepside Action Plan 2000 and the recently adopted Dun Laoghaire Rathdown County Development Plan 2004-2010 has zoned the centre and lands adjoining to the north for development as a major Neighbourhood Centre for the area. In July 2004 planning permission was granted for a major mixed use development

comprising offices, retail, library, health centre, community centre, childcare facility, recreational facility as well as a central pedestrian route to the link to the future Luas stop on the Ballyogan Road and an additional 431 no. surface car parking spaces. A bus interchange will also be facilitated in this area.

Ballyogan Wood Stop

This stop is planned to be located at the eastern end of Ballyogan Road, immediately proximate to the existing Ballyogan Wood public housing development. Furthermore, the southern side of the eastern end of Ballyogan Road is zoned under the Stepside Action Plan 2000 for significant new commercial and employment-related development.

Racecourse Stop

This stop is planned to be located on the alignment of the former Harcourt Street Railway, to the south of the houses of Brighton Court. This stop is intended primarily to operate on event days at the Leopardstown Racecourse at present with the potential to become a full operational stop in the future. This is intended to facilitate pedestrian movement to the racecourse complex from the east.

Carrickmines Stop

This stop is also planned to be located along the alignment of the former Harcourt Street Railway, immediately to the south of the Brennanstown Vale residential scheme, and to the east of the former Carrickmines Station House off Glenamuck Road. A 350 space park and ride facility, including a public bus interchange, is planned to be located immediately to the south of the stop. In this regard, it is an objective of the Dun Laoghaire Rathdown County Development Plan 2004-2010 to provide a Luas Park and Ride facility in this vicinity. This will be served by a road linking to the SEM Carrickmines Interchange which ultimately will comprise the western end of the planned Cherrywood spine road.

Brennanstown Stop

This stop is also planned to be located along the alignment of the former Harcourt Street Railway, immediately to the north of the planned spine road and to the east of the Brennanstown Vale residential scheme, in the townland of Laughanstown. The lands adjacent to the planned stop are zoned for extensive residential and employment development uses.

Laughanstown Stop

This stop is planned to be located off Laughanstown Lane, in the vicinity of the intersection of this existing road with the planned spine road between Cherrywood and Carrickmines. Whilst currently comprising undeveloped lands, the area is planned under the Draft Carrickmines-Cherrywood Action Plan to accommodate significant new residential development, with some amount of employment-related use.

Cherrywood Stop

This stop, is to be located within the planned Cherrywood District Centre. The District Centre occupies a central position within the overall development area, and thus the stop will serve significant new residential and employment uses in this area.

Bride’s Glen

This stop, which comprises the terminus of the Luas Line B1 route alignment, is to be located to the south of the existing Cherrywood Science and Technology Park. The stop will serve the existing and planned employment population in this area.

4.1.3 INFORMATION ON THE SITE OF THE PROPOSED ROUTE ALIGNMENT

Blackthorn Avenue (Sandyford Reservoirs)

The area of Blackthorn Avenue comprises the north-eastern boundary of the Sandyford Industrial Estate. This area is characterised by a mix of industrial and new employment land uses. The existing Luas Line B alignment runs from St. Stephen’s Green in Dublin City Centre terminating at the Sandyford stop, adjacent to the Stillorgan Reservoirs. The Luas Line B1 alignment involves an extension of the existing Luas Line B alignment, linking through to the new development areas of Sandyford (Central Park), Stepside, Carrickmines-Cherrywood and Rathmichael. The existing Luas Depot will be retained at Sandyford. The Luas Line B1 alignment along Blackthorn Avenue, including a new footpath, occupies the approx. 7m wide verge on the eastern side of the carriageway, as well as the western side of the property of No. 27 Woodford. The alignment passes a residential scheme of apartments, Carmenhall Court, at the

eastern end of Blackthorn Avenue, at its junction with Burton Hall Road.

Burton Hall Road (Sandyford Industrial Estate)

The Luas Line B1 alignment traverses the southern side of Burton Hall Road. There is currently a verge area of approx. 5m, bounded by hedging, beyond which is located an industrial premises. There is considerable vehicular movement west along Burton Hall Road, which forms the eastern entrance to the Sandyford Industrial Estate. Vehicular movement in this area has been regulated by new traffic management measures undertaken on behalf of Dun Laoghaire-Rathdown County Council.

Brewery Road/Leopardstown Road Roundabout

The Luas Line B1 alignment will cross this roundabout by means of an overbridge. This is currently an extremely busy junction, with no additional road capacity available at present. Road management measures, including the provision of a left-turn slip lane from the western end of Leopardstown Road into the Sandyford Industrial Estate have been undertaken. However, overall, congestion at this roundabout, particularly during peak periods, is significant.

Central Park

These lands are still under construction to ultimately accommodate some 150,000 sq.m. of mixed-use employment and commercial floorspace. The scheme is estimated to provide some 12,000 jobs when completed. The Luas Line B1 alignment comprises a significant and strategic element of this permitted scheme, with a reservation provided along the south-eastern boundary of these lands.

The Leopardstown Park Hospital is located immediately to the south-east of this boundary. In recent years a significant extension of the Hospital facilities has been constructed on the northern portion of the hospital lands adjacent to the Luas Line B1 alignment. The IDA South County Business Park is located to the north-east of this boundary, with the Marketing Institute and Eurologic premises within this Campus being located immediately adjacent to the planned Luas Line B1 alignment.

The South-Eastern Motorway (SEM) and Leopardstown Valley

The Luas Line B1 alignment crosses a bridge over the SEM which is currently under construction and will comprise the final element of the C-Ring Motorway. This reservation, and the lands of Leopardstown Valley immediately to the south, are characterised by mature trees, and undeveloped lands. A stream, including a number of weirs, passes through the floor of the steep valley.

Murphystown Parallel Access Road

The planned Murphystown Parallel Access Road is intended to comprise a strategic link between Ballyogan Road and the Sandyford Interchange of the SEM. Its construction is a Statutory objective of the Roads Authority. The existing Murphystown Road is a narrow carriageway approx. 4m in width, and is inadequate for the carrying of the projected level of vehicular traffic along this route. The planned Parallel Access Road utilises the existing grassed area in front of “*Glencairn*”, and passes through the lands of “*Clonlea House*” to link to an existing reservation at the eastern end of “*The Gallops*” residential scheme. The construction of this route requires the demolition of “*Clonlea House*”, a Protected Structure.

Ballyogan Road

The western end of Ballyogan Road has been widened and re-aligned in the vicinity of its junction both with the planned Murphystown Parallel Access Road, and with Kilgobbin Road. However, the central and eastern portions of this road are narrower, and contained on either side by mature trees and hedgerows. The Luas Line B1 alignment will follow the northern side of the existing carriageway, before reaching a grassed reservation in the vicinity of the Leopardstown Valley Estate, and therefrom to the Ballyogan Wood residential scheme. Ballyogan Road, which comprises a central route through the area of the Stepside Action Plan 2000, is required to be re-aligned in order to accommodate the construction of the Luas Line B1 alignment. The upgrading of this road is also an objective of the Planning Authority under the provisions of the current County Development Plan.

The Alignment of the Former Harcourt Street Railway

From a point to the north of the SEM corridor the Luas Line B1 alignment follows the route of the former Harcourt Street Railway. This portion of the rail line is quite overgrown and

currently difficult to penetrate. Parts have been filled in, primarily by rubble associated with the construction of the residential development immediately to the north. The land also contains some significant amount of stagnant or slowly moving water.

The Luas Line B1 alignment passes under the Glenamuck Road Bridge, forming the boundary wall of the former Carrickmines Station House, a Protected Structure on the eastern side of the road. A single-storey extension to this dwelling has been constructed across the line. East of that property, the former rail line becomes easier to penetrate, with low-lying ivy and other vegetation, as well as immature trees which have grown since the closure of the rail line some forty years ago. A small stream flows under this part of the Luas Line B1 alignment.

In the vicinity of the Brennanstown Vale residential development, the alignment passes in immediate proximity to the southern boundaries of seven properties in this development. The reservation passes through the southern portion of Carrickmines Wood, and crosses over the Carrickmines River, a fast flowing water body at this point.

Laughanstown to Bride’s Glen

To the east of Carrickmines Wood, the Luas Line B1 alignment enters open lands at Laughanstown, which are currently mostly undeveloped, and in passive agricultural use. A number of residences and farmsteads are located on Laughanstown Lane, a narrow rural road serving the area. East of Laughanstown Lane, the area is primarily open in nature but planned for substantial new development. Early phases of residential development have been completed at Cherrywood (Tullyvale) with associated road infrastructure in place. New road infrastructure has been constructed to provide access from the South Dublin area to the SEM Cherrywood Interchange.

The entire Carrickmines-Cherrywood area is zoned for development under the Dun Laoghaire Rathdown County Development Plan 2004-2010 with a Local Area Plan proposed for this area. This includes the provision of new services and particularly, roads infrastructure in the area. This planned development will profoundly alter the existing landscape.

4.1.4 CUMULATION WITH OTHER PROPOSED DEVELOPMENT

The Luas Line B1 alignment will facilitate an extension of the existing Luas Green Line which comprises some 9 Km of light rail, running from St. Stephen’s Green to Sandyford Industrial Estate. The cumulative outcome of the development of the Luas Green Line and Line B1 alignments will be the provision of some 16.6 km of light railway, with the introduction of a state of the art public transport system linking Dublin City Centre with the developing suburban residential and employment areas of Sandyford Industrial Estate/Central Park, Stepside, Carrickmines and Cherrywood.

In particular, the Luas Line B1 alignment is planned to run through and serve lands which are designated for major new residential, commercial, employment-related and associated amenity uses in the short and medium terms. These include the lands of Central Park, Stepside, Carrickmines and Cherrywood.

The Luas Line B1 alignment runs along the side of the planned Murphystown Parallel Access Road and the Ballyogan Road. This overall route is designated as a strategic link primarily serving the Stepside area, and will provide a link between the Carrickmines and Sandyford Interchanges of the SEM. Ballyogan Road will require to be upgraded and re-aligned to facilitate the Luas Line B1 alignment in this area with significant development planned including the expenaded neighbourhood centre and residential.

4.1.5 LAND USE REQUIREMENTS - USE OF NATURAL RESOURCES

That part of the Luas Line B1 alignment between Sandyford Industrial Estate and Ballyogan (Carrickmines) is situated within an existing or planned/under construction built-up suburban area, and the land encompassed within this part of the alignment will consist primarily of existing roadway and paved surfaces. That part of the Luas Line B1 alignment between Ballyogan (Carrickmines) and Cherrywood will run for the most part along an existing rail reservation, with the

eastern extent of the alignment being incorporated into new District Centre development and Science and Technology Park.

In general, the materials needed for construction of the trackbed and for the construction of Ballyogan Road are those regularly used in civil engineering infrastructure projects such as major roads and construction projects and do not raise specific environmental issues in terms of sourcing. This would also be the case with regard to the proposed bridge structures. It is expected that construction and building materials will be sourced primarily in Ireland and elsewhere within the European Union. The likely significant direct and indirect effects on the environment which may result from the use of natural resources is addressed elsewhere in this EIS.

4.1.6 INFORMATION ON THE DESIGN OF THE LIGHT RAILWAY WORKS

4.1.6.1 DESIGN PRINCIPLES OF THE LRT SYSTEM

The Light Rail Transit (LRT) system is effectively a modern version of the old tramway. The system comprises the running on rails of 40m trams powered by electricity drawn from overhead cables. Trams are capable of running on segregated tracks like a conventional railway, as well as on-street through built-up areas alongside other traffic, with the track embedded in the carriageway. Thus LRT combines the attraction and benefits of a fast segregated rail operation with high levels of accessibility in an urban context that cannot be matched by conventional heavy rail. The modern LRT system is pollution free, and uses predominantly low floor access which provides accessibility to all sections of the population.

There are three different running formats to LRT. These are; shared running, segregated running and a protected site. The first two describe an on-street situation, while the third type describes an exclusive corridor where LRT does not

share the alignment with other vehicular traffic. The Luas Line B1 alignment will generally be a segregated system for its western and eastern portions, and a protected site for its central portion. Traffic junctions can be organised to facilitate priority movement for LRT. The commercial speed of an LRT system operating on a shared right of way corridor with low junction priority will evidently be much reduced compared to that of a system with a segregated or dedicated right of way and high junction priority. The implementation of an LRT system in an urban area provides the opportunity to re-allocate available carriageway capacity amongst public transportation vehicles, private vehicles and pedestrians.

4.1.6.2 LRT ROLLING STOCK

Trams

The trams will be 40m long, with flexibility to allow the future insertion of an additional section. Each light rail vehicle will be 2.4m wide and 3.4m high excluding the pantograph, which provides the connection to the overhead power cables. Each tram will have capacity to accommodate some 310 passengers based on a standing rate of 5 people per square metre. The number of standing passengers will depend on demand and perceptions of comfort levels. Each tram will be bi-directional with a driver's cabin at each end. It will have a low level floor for most of its length in order to allow easy access for mobility impaired persons.

4.1.6.3 TRACK DESIGN

Track & Trackbed

The track will have a gauge of 1435mm which is the standard European gauge. The system will be primarily ballasted double track throughout which gives an overall trackbed width of 6.8 metres on a straight alignment. On curves the distance between tracks is nearly a metre wider in order to accommodate the curving characteristics of the tram. The minimum horizontal radius of the track will be 50 metres, while the maximum gradient will be 8%.

Track laying methods will vary depending on the location. Close to buildings and in other sensitive locations, anti-vibratory methods will be used as required.

The type of paving/surfacing of the track will depend on the character of the surrounding area and the nature of any non-Luas traffic which may run over the trackbed. A slight incline will generally be made in the road surface, to define the edge of the Luas Line B1 alignment in order to provide for an efficient level of service, by discouraging other vehicular traffic from encroaching /remaining on the alignment. In all but a few specific instances, traffic will be allowed on the alignment only to the extent that this is absolutely necessary, for example to facilitate turning manoeuvres, or to provide access.

Luas Stops

Stops will typically consist of raised platforms approximately 280mm high and 40m long with a ramp at either end to facilitate access for mobility impaired persons. Lateral platforms, situated on either side of the tracks, will generally be approximately 3m wide, and allow for level boarding and alighting by all passengers. In all cases there will be easy access for all intending passengers and the service will be simple and straightforward. Typical stop elements include:-

- Seating
- Shelter
- Bins
- Ticket Vending Machine
- Smartcard Validating Machine
- Passenger Information System
- Advertising Column
- Incidental Electrical Equipment
- Emergency Telephone System
- CCTV
- Technical cubicles

The technical cubicles are one of the elements associated with Luas and contain the equipment relating to each individual tramstop such as electrical power supplies, telecommunications equipment, cable transmission network equipment and automatic vehicle location system. These

cubicles take their power supply from the various substations along the line and also have a battery backup supply.

Maintenance and Storage

Most maintenance and storage for Luas Line B1 will be undertaken at the existing Luas Sandyford Depot on Blackthorn Avenue, or from the existing Red Cow Depot.

Power Supply and Signalling

The trams operate on 750 volts direct current. The ESB 10 kV alternating current supply will be transformed and rectified to direct current at substations located at intervals along the line. Provision will be made for four sub-stations along the route of the Luas Line B1 alignment; one located at the Glencairn Stop, one adjacent to the playing fields to the north of Ballyogan Road, one adjacent to the Carrickmines Stop, and one located adjacent to the alignment at Cherrywood. Luas Line B1 will also be served by an existing sub-station adjacent to the Sandyford Depot. Preliminary tests have confirmed that the Luas Line B1 alignment can operate even if one of these sub-stations was required to shut down. Electricity is supplied to the trams via overhead power lines, at an average height of 5.0m above the ground, supported by poles positioned either alongside or between the tracks.

Power will be supplied to the overhead power lines via multi-tubular cable ducts which form one edge of the trackbed foundation; on the other side of the trackbed will be a parallel set of ducts carrying communications and signalling cables. The main power supply line from the substation is buried underground and is connected to the contact wire at intervals. Thus, the weight of the contact wire is minimised and there is no need for a jumble of overhead wiring. Synthetic cables which have insulating properties will be used to support overhead wiring, thus reducing the number of insulators required.

Light Rail Transit Operating System

The control system for the operation of the Luas Line B1 alignment is located in the main depot building at the Red Cow Depot. The system is designed to facilitate a safe, reliable and punctual public transport system. All the trams will be in radio contact with the main control centre and a

computerised display will be available to the controllers, showing the position of the trams on the line at any point in time.

A monitoring system will be 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 will grant isolations of the overhead power systems for maintenance and in emergencies. A video security monitoring system of stops and key junctions in the system will be displayed at the control centre. At the stops along the route the main systems will be a ticket issuing machine, a smartcard validating machine and a passenger information system.

Generally the trams will be driven on a line of sight basis in a similar fashion to road vehicles. At certain locations where trams need to change tracks, such as at the Depot area, a localised signalling system is installed to ensure that trams can operate safely over points and to ensure that no conflicting movements between trams can occur. In these locations the points are motorised. Manual points will be provided at strategic locations throughout the route to allow trams to operate over shorter sections of the route in emergencies.

An important element in the control system is its interface with any planned future traffic lights along Luas Line B1. The system will be designed in conjunction with the relevant local authorities to ensure a high level priority for the trams through the various junctions, ensuring that trams are not kept waiting at red lights. This is an important factor in determining the operating speed and the attractiveness of the overall system to passengers. The trams will be equipped with heating, ventilation and a public address system, allowing communication between central control and drivers and passengers.

Accessibility is an important operational feature of the Luas LRT system. The tram must be fully accessible for disabled people. In order to satisfy this objective the internal floor level is maintained, for at least 70% of the total length of the vehicles, at a maximum height of 350 mm from the rolling surface. The exchange rate is at least 20% (the exchange

rate is the ratio of total door width to total length of the tram). Minimum width for a double leaf door is 1,300mm.

Park and Ride Facilities

The Dublin Transportation Initiative recommended the Luas LRT system as part of an overall integrated strategy for the development of public transport. Park and Ride facilities located at strategic interchange sites are an essential element of this strategy.

Park & Ride facilities serving the Luas Line B1 alignment will be provided at Carrickmines, on the eastern side of Glenamuck Road, in the vicinity of the Carrickmines Stop. Some 350 surface car parking spaces will be provided by way of a two level underground facility at this location. In addition, a bus set down and interchange will be located at ground level in immediate proximity to the stop. The facility will be accessed by a link road to the SEM Carrickmines Interchange, which will eventually comprise the western end of the planned Cherrywood spine road, which will ultimately link the Interchange to the planned Cherrywood District Centre.

It is envisaged that this facility, which will be highly accessible for commuters, will be attractively designed and landscaped, and should provide secure and safe car parking at a reasonable economic cost. It is envisaged that further mixed use development will be carried out by a third party at this location and that this park and ride facility may ultimately be provided in the form of a two storey underground car park incorporated with mixed use development but all subject to a future planning permission by a third party. subject to planning.

4.1.6.4 BRIDGES

Four new bridges will be required along the Luas Line B1 alignment. These are described here on an area by area basis.

Area 13: Over the Leopardstown Road/Brewery Road Roundabout

From the roundabout at Burton Hall Road, heading eastwards towards the Leopardstown Road/Brewery Road Roundabout, the Luas Line B1 alignment will rise up on a new ramp to a new bridge structure crossing the larger roundabout, and linking to the northern corner of the lands of

Central Park. The bridge itself will be approximately 180m in length, with the bridge soffit approximately 5.3m above grade. Whilst this is considered to be the optimum crossing solution, in terms of impact on traffic flow, and although the structure will blend into the existing development to the south within Central Park, the bridge is perceived as being visually sensitive, particularly when viewed from the Woodford Estate. It is important that the structure be as aesthetic as possible. In this regard, the structure will include a bridge enclosure system screening the steel girders supporting the track.

Area 13: Over the SEM at Leopardstown

From the Central Park stop, heading south-westwards, the Luas Line B1 alignment will rise up on a ramp to a new bridge over the SEM, and further south, over the Leopardstown Valley. This bridge including the ramping structures on either side will be 400m approximately. The bridge soffit will be approximately 5.3m over the level of the Motorway carriageway.

Area 15: Over the SEM at Ballyogan

East of the Ballyogan Wood stop, the Luas will rise up on a new ramp to a new bridge over the SEM. This structure will be approximately 450m in length, including ramping structures. The trackbed will be approximately 5.3m over the level of the Motorway carriageway.

Area 15: Over the Wyattville Link Road

East of Laughanstown Lane the alignment will be elevated over existing ground level in the area of the planned Cherrywood District Centre to ensure a minimum clearance of 5.3m from the bridge soffit to the road carriageway. This viaduct structure will be approximately 550m in overall length.

The Luas Line B1 alignment intersects with Glenamuck Road via an underpass underneath Glenamuck Bridge. This bridge will be required to be altered and upgraded to accommodate Luas Line B1.

In addition, the Luas Line B1 alignment will intersect with the planned Cherrywood Spine Road by means of a grade-separated underpass. This structure will be approximately 350m in length.

4.1.6.5 ART ON LUAS

The RPA aim to deliver a quality enhanced transport system, which serves to add value to the communities through which it travels, and to the general Dublin area. The Luas Arts policy aims to provide quality environmental design through a collaborative effort involving local community groups, designers and artists which will contribute positively to the Dublin urban fabric.

The "*Percent for Art*" scheme will be sought for Luas Line B1. These funds will be used for the creation of employment opportunities for artists and art based community groups. The early establishment of the Arts Policy allows for a quality arts component to the project. All art procured by these funds will be provided at Luas stops and focal points as appropriate, and will be procured using the guidelines established by the Public Art Research Project Steering Group Report to Government in 1997.

4.2 CONSTRUCTION OF THE LUAS LINE B1 ALIGNMENT

4.2.1 INTRODUCTION

The Luas Line B1 alignment will be constructed in a manner which facilitates access to locations of existing and likely future commercial premises, institutions and residences in accordance with details discussed with occupiers prior to construction commencing.

To facilitate the management of the construction of the Luas Line B1 alignment, the subject area will be divided into well-defined sections so that the construction process takes place in a controlled manner. This approach will reduce or eliminate the potential for access and traffic conflicts. The works, including the required upgrading and realignment of Ballyogan Road, will be carefully co-ordinated to ensure compatibility with the objectives of the Stepside and Draft Carrickmines-Cherrywood Action Plans, prepared by Dun Laoghaire-Rathdown County Council.



Luas Traversing William Dargan Bridge, Dundrum.



Luas at Sean Heuston Bridge.



Luas Tram

A detail of Construction Scenarios is set out on an Area by Area basis in Chapter 7 of this EIS.

4.2.2 CONSTRUCTORS COMPOUND AND ASSEMBLY AREAS

Contractors compounds and assembly areas are proposed at a number of locations along the Luas Line B1 alignment as follows:-

- The Sandyford Depot on the northern side of Blackthorn Avenue (approx. 5,500m²).
- To the north of the alignment on the southern side of Burton Hall Road, within the existing property of FAAC Electronics Ltd. (approx. 2,000m²)
- Immediately south of the SEM in the vicinity of Central Park
- Immediately north of the SEM in the vicinity of the planned Leopardstown Luas Bridge (approx. 2,000m²)
- On lands north of Murphystown Road, immediately west of the Luas alignment, in the vicinity of the property Glencairn (approx. 3,000m²)
- To the east of Murphystown Road, south of the property Glencairn (approx. 1,000m²)
- Immediately east of the public playing pitches on the northern side of Ballyogan Road, and extending to the western boundary of the Ballyogan Wood residential development (approx. 10,000m²)
- At Carrickmines, on the eastern side of the alignment, immediately north of the SEM alignment (approx. 18,500m²)
- In the vicinity of the intersection of the Luas alignment with the planned Cherrywood Spine Road, to the west of Laughanstown Lane (approx. 28,500m²).

4.2.3 CONSTRUCTION WORKS

The works in the subject area include preliminary and accommodation works; utility diversions; trackbed construction; the construction, installation and provision of power supply and communications systems; the development of Luas stops and associated equipment; the development of electricity sub-stations; the construction of a number of structures, including four bridges, an underpass and the upgrading of the existing Glenamuck Road Bridge; surface finishes and soft landscaping. In addition, the proposed development provides for the upgrading and re-alignment of Ballyogan Road. The estimated timescale for the construction of the overall Luas Line B1 is approximately 38 months.

The widths and depths of works will vary depending primarily upon the geometry of the track alignment and structures. Typical double line corridor width values, referred to as swept path, will be 6.8 metres on a straight alignment. On curves the distance between tracks is wider in order to accommodate the curving characteristics of the tram. Typical track work depths range from 800 to 1200 millimetres. However, it is intended to take some 10m width of land to facilitate the construction of the planned trackbeds, including temporary land take during construction. Some 15m width of land will be required in areas planned to accommodate proposed structures, such as ramps. Some significant amount of additional lands will also be required to accommodate the planned re-alignment and improvement works on Ballyogan Road, and the associated provision of footpaths, verges and cycleways.

There are four sub-stations in addition to that existing at the Luas Sandyford Depot; in the vicinity of the Glencairn Stop on Murphystown Road, adjacent to the playing fields on the north side of Ballyogan Road, in the vicinity of the Carrickmines Stop, and adjacent to the alignment at Cherrywood. The provision of these facilities will require additional land take.

The planning of construction works will be co-ordinated with Dun Laoghaire-Rathdown County Council such that their requirements, and those of the local businesses, institutions,

private residents and developers, in terms of access and timeframe of works, are met. This co-ordination process will ensure that the Luas works will be compatible with other important local development initiatives.

4.2.4 SPECIAL MATTERS

The following will require particular attention during construction of Line B1:

- No. 27 Woodford: where the western portion of the property is required to facilitate the alignment. In addition, a part of the boundary wall of the Woodford Estate fronting onto Blackthorn Avenue will require to be demolished and rebuilt a short distance back, to permit the insertion of the alignment along the public road.
- Crossing of Burton Hall Road will be by signalised junction, which has been undertaken as part of the traffic management measures planned for the Sandyford Industrial Estate.
- The creation of a ramp on the southern side of Burton Hall Road, within the existing property of FAAC Electronics Ltd.
- Construction of Bridges, over the Leopardstown Road/Brewery Road Roundabout, at two locations over the SEM and the Wyattville Link Road. In addition, the existing road bridge deck at Glenamuck Road is to be altered to accommodate the Luas underpass. Issues of visibility and, in the case of the Leopardstown Road/Brewery Road roundabout, retention of proper sightlines will be crucial in the design of the new bridge structures
- Through Central Park. The Luas Line B1 alignment is intended to be an integral link element of this major mixed-use development. However, its insertion also requires the removal of existing trees and the existing boundary wall with Leopardstown Park Hospital. A wall and new tree planting will be required following the insertion of the alignment.

- In the vicinity of Murphystown Castle. The Luas Line B1 alignment runs through the edge of the zone of archaeological interest.
- An existing Protected Structure *Clonlea House* will require to be demolished to facilitate the construction of the Luas Line B1 alignment.
- Construction of a grade-separated underpass serving the Luas Line B1 alignment, under the planned alignment of the Cherrywood Spine Road.
- The vicinity of the Cherrywood District Centre. The Luas Line B1 alignment will comprise a major facility within the central Plaza element of this centre.

4.2.5 THE SEQUENCE OF CONSTRUCTION ACTIVITIES

The construction of any linear project has different characteristics to that of a contained site development. In order to complete the overall Luas Line B1 construction works within a reasonable time period, it is proposed to consider starting construction simultaneously at a number of locations along the alignment. In this way, as construction work progresses along the alignment, different activities will occur in different places at different times. This is especially so of the Luas where a clear sequence of activities, described below, has to be followed.

Construction works will incorporate:-

- site clearance and preparation,
- utilities diversion and excavation for the foundation,
- upgrade and re-alignment works to Ballyogan Road,
- structures construction,
- installation of the trackbed and rails,
- finishing to surfaces and installation of electrical and operating equipment,
- Landscaping.

The activities described here should be regarded as typical of the construction work to be undertaken along the route. 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, which is ongoing, and finalisation of work methodology with the relevant contractor.

4.2.5.1 SITE PREPARATION

The initial phase of work will be the mobilisation of the appointed contractor(s), establishment of site offices and initial site preparation. The site has to be prepared by the removal to store of any street furniture that might be affected including bollards, guard rails, directional signs, letter boxes, etc. Property boundary walls that have to be set back will be moved at this stage and the new boundaries rebuilt in accordance with the agreements reached with the property owners. In the very limited number of cases where demolition is essential, this will also be undertaken as part of the site preparation so that the full site area will be available to the main contractor to assist him in carrying out his work.

4.2.5.2 UTILITIES DIVERSION

This activity involves the removal and replacement or decommissioning of any public utilities which cannot remain directly below the trackbed. They will generally be relocated away from the trackbed area but provision for suitably protected crossings will be made where existing or future development requires it. Principally these works will involve the diversion of water, storm water drains and sewers, electricity, gas, telecommunications and TV cables. Where sewers are of large diameter and are buried at substantial depths they will not be relocated but, where practicable, any access manholes will be relocated a clear distance from the swept path. The utilities diversion process may give rise to levels of local disruption to traffic. Chief amongst the factors which could potentially give rise to this would be:-

- Utilities located adjacent to, or crossing, entrances to properties

- Construction traffic
- Co-ordination between various utilities owners
- Co-ordination between contractors
- Tight schedules
- Frequent movement of construction sites as the contract progresses

Various mitigation methods will be employed including:-

- Frequent liaison and information exchange with interested parties
- Partial possession of roads (i.e. working in two halves)
- Temporary ramps across trenches for diverted traffic
- Temporary footpaths and footbridges
- Temporary access to properties
- Nightly reinstatement of trenches (where practical and appropriate)
- Safety fencing around trenches
- Clear sign-posting for road traffic and pedestrians
- Strict control of construction vehicles
- Co-ordination of construction works associated with the Luas Line B1 alignment with any works by the utility companies and their contractors

These works will constitute a sensitive stage of the project. It should be emphasised nonetheless that this will be a short and well defined stage of the works and will be carried out under tight management control. In addition, these works will enable the utility operators to renovate and upgrade their existing installations taking account of their future requirements. This should result in a substantial reduction in the need for further utility related works for a number of years.

4.2.5.3 UPGRADE AND REALIGNMENT OF BALLYOGAN ROAD

In addition to the actual construction of the Luas Line B1 alignment, the insertion of Luas along the northern side of Ballyogan Road requires an associated southern re-alignment of this public carriageway. It is a Roads Objective of the current Dun Laoghaire Rathdown County Development Plan 2004-2010 to ensure the upgrading of the Ballyogan Road. Following discussions with the Statutory Roads Authority, it has been resolved that the construction of the road will also include the associated provision of footpaths, verges and cycleways on either side. The upgrading and re-alignment works along this road will be required to occur prior to the insertion of the Luas Line B1 alignment in this area, in order to ensure a proper and adequate route for passage of vehicles.

4.2.5.4 STRUCTURES CONSTRUCTION

This will involve construction of the two SEM overbridges, the overbridge to the Leopardstown/Brewery Road Roundabout and the overbridge to the Wyattville Link Road. It will also involve the construction of the two underpasses; of the Glenamuck Road and of the planned Cherrywood Spine Road.

4.2.5.5 TRACKBED AND TRACK CONSTRUCTION

Trackbed construction will generally entail the excavation of a 6.6 to 7.3 m wide trench varying in depth between 800mm and 1200mm. The excavated material will be recycled where appropriate. Where this is not possible, waste material will be removed by lorry to an approved and licensed disposal facility.

On approval of the track bed formation, the formation is firstly laid, compacted and levelled. Sleepers are then positioned. The rails are fixed to the sleepers and are secured in place, before being welded together to form a continuous length. During this phase of the works, the multi-tubular ducts which

carry the tramway power supply cables and the communications links required for the tramway are installed. The foundations for the poles which support the OverHead Line Equipment (OHLE) are also built. Finally, the particular alignment surface finish is put in place.

The construction site for this phase of the works will be more readily and tightly defined than that occupied for utility diversions, extending to some 10m in width. Thus it can be properly fenced off and temporary works crossings for pedestrians can be installed as required. Similarly temporary ramps across the works can be installed for vehicles at major junctions. Construction works at main road junctions will be carefully phased in accordance with an overall traffic management plan. The circulation and parking of concrete delivery trucks will need to be accommodated adjacent to the site.

Track laying is an operation which can be carried out with relatively little disturbance. Nevertheless, it should be noted that the delivery of rails, supplied in lengths of up to 18 metres, may cause disruption to traffic flow for short periods during unloading and placing of the rails.

4.2.5.6 SURFACING & EQUIPMENT

After laying of the tracks, the final stage of surface works comprises the surfacing of the trackbed, where required, the reinstatement of all disturbed surfaces on pedestrian footpaths and carriageways, and the completion of civil works at the stop platforms. This will entail works that cause little disturbance with the exception of the affect on pedestrian and vehicular circulation over limited areas and possible short term interruptions of traffic flow.

4.2.5.7 OVERHEAD LINES, POWER SUPPLY, CABLE INSTALLATION

The installation of the overhead lines and the power supply facilities will occur once the trackbed has been completed, and will not normally create disturbances. The support pole foundations will generally have been constructed at the same

time as the trackbed and the erection of the support masts will require no more than rapid operation using mechanical equipment.

Installation of the power supply requires the building of small structures that may cause limited disruption during construction. The pulling of cables through the underground multi-tubular ducts will generally be performed using two vehicles which will have to be parked for a few hours in the highway. A similar method will also be used for the threading of other signalling and communication cables required for the tramway.

4.2.5.8 LANDSCAPING

Landscaping can be divided into two categories, soft and hard. Soft landscaping includes planting of trees, shrubs, or other plants. Hard landscaping will include the surfacing of the trackbed and the completion of civil works at the stop platforms.

4.2.6 LIKELY CONSTRUCTION PROGRAMME

Until a contractor has been formally appointed to undertake the construction of the Luas Line B1 alignment, no precise programme can be established. For the purposes of this EIS the following assumptions can reasonably be made based on the experience gained on similar projects elsewhere, and in particular, the construction of the Luas Green and Red Lines.

- Work will start simultaneously at a number of locations
- Duration - overall about 38 months
- A period for testing and commissioning the system is included
- Trams will be supplied during the construction period

4.2.7 TRAFFIC CIRCULATION DURING THE WORKS

There are significant traffic volumes accessing the Sandyford Industrial Estate, particularly at the Leopardstown Road/Brewery Road roundabout. This demands rigorous control of the temporary traffic management arrangements. It should be noted that a major traffic management programme for the Sandyford Industrial Estate has been implemented on behalf of Dun Laoghaire-Rathdown County Council. The management of the Luas Line B1 alignment construction programme will also require to be sensitive to the needs of businesses, in terms of access requirements, environmental pollution and hours of work. The on-street services of Dublin Bus through the Industrial Estate and along Ballyogan Road will require diversion for the duration of construction activity. Overall, however, due to the fact that a considerable extent of the Luas Line B1 alignment is off-street or on a designated/reserved route, traffic circulation during construction works should not be impacted upon to any significant adverse extent.

Of greater significance, the provision of the Luas Line B1 alignment involves the upgrading and realignment of Ballyogan Road. This is a major element of the project, which is intended to link the existing realigned portion at its western end junction with Kilgobbin Road to a slip road off the planned SEM Carrickmines Interchange at its eastern end. The upgrading of this route which will involve normal road construction procedures, will require appropriate traffic circulation measures including, but not limited to, the use of temporary traffic signals permitting access along one side of the road at a time, or road closures to through traffic.

All construction activities will be carefully planned and organised in advance of the permanent works. Detailed proposals for traffic diversion and traffic management during construction, taking due cognisance of the movement of construction vehicles, will be developed in conjunction with Dun Laoghaire-Rathdown County Council. Where permanent changes are required, these will be introduced as early as possible in the construction works. Similar attention will be given to advance warning signage as well as local signing of diversions.

4.2.8 CONSULTATION DURING CONSTRUCTION

Arrangements for consultation with the public will be made during the detailed design stage and the construction phase of the development. During construction these arrangements will mostly be intended:-

- To enable communities and neighbourhoods to function satisfactorily, during any temporary disturbances caused to traffic and public transport
- To keep local communities and residents fully informed at all times and to provide a ready point of contact with which to raise local issues as these may arise
- To minimise any nuisance caused by the works to neighbouring residents, traders, businesses and other land users.

Public Information

Public Information will be disseminated through the media, or directly as appropriate, and will explain the nature and scheduling of the works to be undertaken and related impacts including traffic diversions.

Commercial Activities

It is acknowledged that the Luas Line B1 alignment construction works may create difficulties concerning access and parking. Detailed works schedules will take due cognisance of such potential problems.

4.2.9 WASTE MANAGEMENT

A Waste Management Plan will be prepared by the appointed contractor prior to the commencement of development. This approved plan will be implemented by the appointed contractor on site. This will involve identification of all likely waste materials prior to construction work commencing and a review and selection of the most appropriate means of waste disposal in accordance with best practice and the provisions of the Waste Management Acts.

Excavated materials from the trackbed will vary in their composition depending on their source. All excavated inert

material will be reused, where possible, to create embankments and bunding elsewhere along the alignment.

All unwanted materials will require disposal to a licensed landfill site. Inert materials with some engineering strength (e.g. brick and stone rubble, ballast etc.) would be suitable for disposal in a land reclamation project if one were proceeding contemporaneously with the Luas Line B1 alignment contract. Clay materials, depending on their permeability may be used for lining or capping new or existing landfills.

4.2.10 ARCHAEOLOGY

There is a possibility that construction works associated with the proposed track laying and the relocation of services, especially in areas of archaeological potential (described in Chapter 7), will reveal archaeological soils, features or stray artefacts. In order to ensure the recognition and appropriate recording of such features, a monitoring archaeologist will be appointed to the project team. The monitoring will be carried out under licence from the Heritage Services of the Department of Arts, Heritage, Gaeltacht and The Islands (formerly OPW) and the National Museum of Ireland, the Statutory bodies charged with responsibility for the built and material archaeological heritage. The archaeologist will be responsible for liaison with these authorities and with the Local Authority, and will keep them apprised of the development as it progresses. Any archaeological finds or features revealed will be reported to the Heritage Services and to the National Museum, as required under the National Monuments Acts (1937 - 1995).

4.2.11 POTENTIAL ROUTE DEVIATION

The following are the proposed limits of deviation that will be included as part of the Railway Order application.

"General powers of the Agency

In constructing or maintaining any of the light railway works the Agency may:-

(1)(a) where such works are situated in a public road

(i) deviate laterally by an amount not exceeding 2.5 metres from the lines or situations shown on the deposited plan

(ii) deviate vertically by an amount not exceeding 1 metre upwards or downwards from the levels shown on the deposited plan

(iii) deviate longitudinally by an amount not exceeding 20 metres in respect of any light rail work.

(b) where such works are situated otherwise than in a public road

(i) deviate laterally by an amount not exceeding 5 metres from the lines or situations shown on the deposited plan

(ii) deviate vertically by an amount not exceeding 2 metres upwards or downwards from the levels shown on the deposited plan

(iii) deviate longitudinally by an amount not exceeding 20 metres in respect of any light rail work.

(2) The Agency may, in constructing or maintaining light railway works,

lay down either single or interlacing tracks of parallel rails in places where double tracks are shown on the deposited plan."

The purpose of these powers of deviation are to facilitate on-site construction and allow a limited degree of flexibility to react to on-site circumstances which may be unforeseen at this stage. It is envisaged that such powers of deviation, if and where employed, will be used to further mitigate the potential impact on any given aspect of the environment considered rather than contribute to an increased impact.

4.3 LUAS LINE B1 SAFETY MANAGEMENT

4.3.1 INTRODUCTION

A risk based approach has been adopted for the management of safety through the design, construction and operation of the Luas network. This is an iterative process involving each stage of the works, from outline design through to eventual commissioning into use and future operations. This risk management process was established during the development of the Luas Red and Green Line and is in line with best national and international practice. A systematic review of the effectiveness of safety management as applied to the Red and Green lines has been undertaken and lessons learnt have been adopted. A rigorous safety evaluation process involving internal and external specialists ensures that works, plant and equipment associated with the system are not introduced unless they are fit for purpose and compliant with legislation.

4.3.2 SAFETY LEGISLATION

Construction and operation of Luas Line B1 will be carried out in accordance with the relevant Health and Safety legislation, having particular regard to:-

- Framework European Council Directive 12th June 1989 (89/391/EEC) on the introduction of measures to encourage improvements in the safety and health of workers at work and the several daughter directives made under this Framework.
- Safety Health and Welfare at Work Act 1989 and the several regulations made under this Act including, in particular, the Safety Health and Welfare at Work (Construction) Regulations 2001 and 2003.
- Transport (Railway Infrastructure) Act, 2001
- Railway Safety Bill, 2001,
- Applicable Standards, Codes of Practice and Guidelines.

4.3.2.1 RISK ASSOCIATED WITH LUAS

The risks associated with Luas Line B1 are considered at the design stage, construction stage and the operational stage. The principal components during the design stage will be:-

Project design incorporating:

- Track design;
- Rolling stock design;
- Stop design;
- Structures design;
- Control Centre and Depot design;
- Electric Traction System;
- Traffic Management and Junction Design.

During the construction stage the following areas of risk will be addressed in order to minimise risks:-

- Procurement of competent contractors,
- Procurement of materials, plant and equipment fit for purpose and compliant with Standards,
- Segregation of the works from the public,
- Safe place and systems of work for contractors,
- Traffic management
- Control of contractors;
- Safety of the public who may otherwise be affected by our works.

During the operational stage the following areas of risk will be under the care and control of the operator in order to minimise risk:-

- Interface with road traffic, especially at road junctions;
- Interface with pedestrians and cyclists;
- Risks associated with street (non-protected) running of Luas;
- Presence of overhead line electrified equipment;
- Employment of competent work-force;
- Security of track and electrical equipment;
- Passenger safety;
- Management of trams;
- Management of stops;
- Security of property;
- Protection /security of staff against personal attack;

- Security of cash (collection and handling procedures);
- Vandalism, impacting on passenger safety and trams;
- Interfacing with emergency services including isolation of electrical equipment as required;
- Security and fire protection of Control Centre and Depot;
- Disaster and contingency plans for loss of computer facilities and power source.

These lists are not exhaustive and will be further developed s appropriate as the project advances.

4.3.2.2 LUAS DESIGN AND CONSTRUCTION

Safety management measures are in place for the design, construction and operation of Luas. This embraces all aspects of the organisation and implementation of the project. The aim of the safety management system is ensure that all potential hazards associated with the design, construction and operational stages are examined, and that the risks identified are eliminated or controlled (to an acceptable degree/as far as is practicable and in accordance with national and international best practice).

Designs are informed by and validated against a wide variety of technical engineering Standards. The overall system is designed to meet the requirements of HSG153/8 (part 2, Section G) entitled "Railway Safety Principles and Guidance". This document, although produced for and applied to UK Light Rail systems, is accepted as being best current practice in Europe. It has been the standard reference document for all recent UK systems and was followed in the development of Luas Red and Green lines.

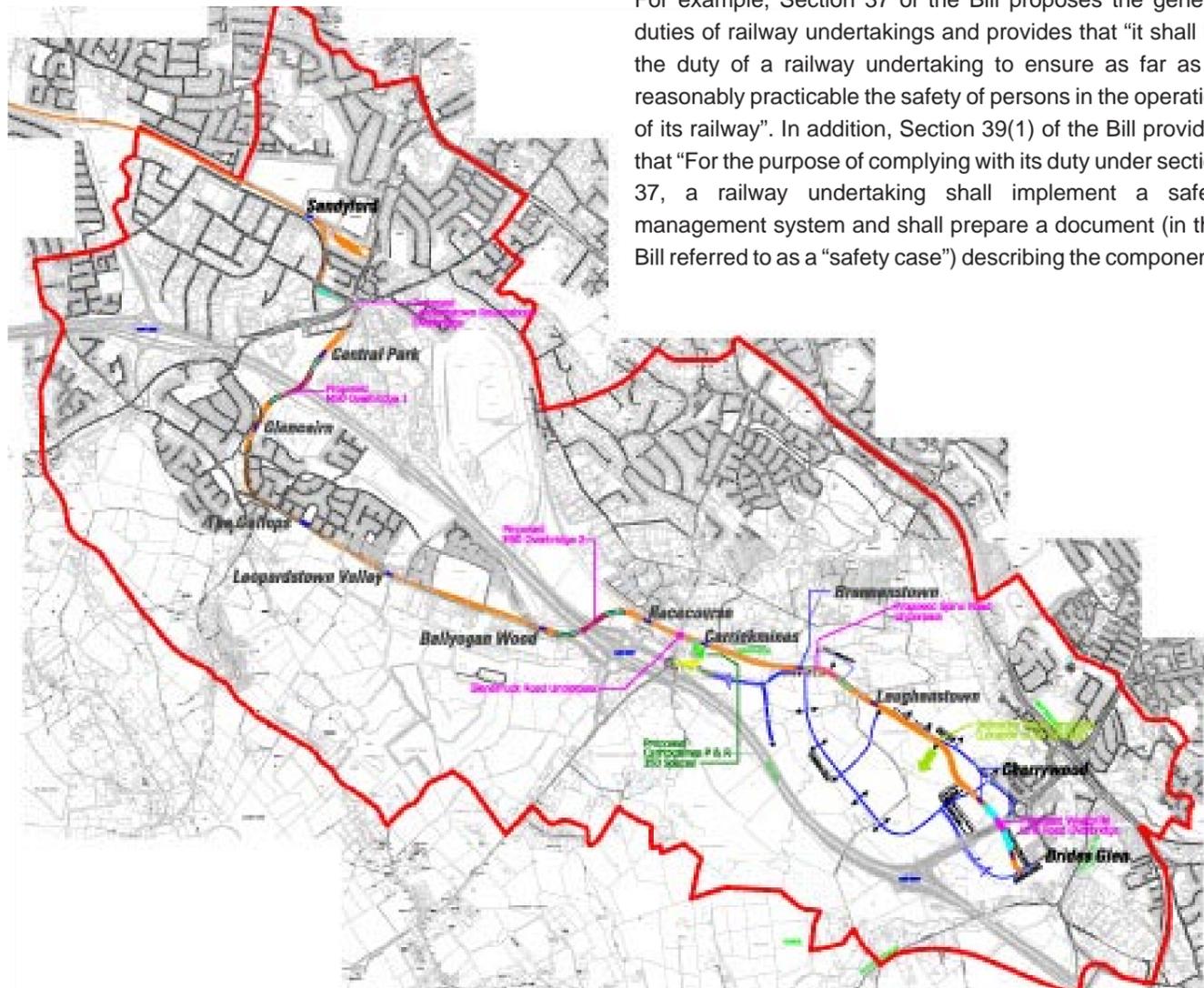
Management of safety risks for Luas design and construction stages are governed by the Safety Health and Welfare at work (Construction) Regulations 2001 and 003. Experience has shown that the most serious potential risk during the construction stage arise from conflict with buried services and working in close proximity to the public. Open excavations, the handling of material in confined spaces and the use of construction plant in confined areas and general housekeeping issues were also areas requiring firm management attention.

To offset these risks all construction contracts will require at a minimum, conformity with all applicable regulations currently in force – principally The Safety, Health and Welfare at Work (Construction) Regulations, 2001. The system will only be brought into use when the requirements of the Transport (Railway Infrastructure) Act 2001 (in particular, Section 51) have been met. Under Section 51, the safety and suitability of the railway, and of the vehicles to be used on such railway, and the appropriateness of the systems and procedures that will be used to ensure the safe operation of the railway must be demonstrated before the railway is opened (whether for testing or to the public).

4.3.2.3 LUAS OPERATIONS

The management of risks associated with the commencement and ongoing operation of Luas Red and Green Line are in accordance with the requirements set out in the Railway Safety Bill, 2001 which have been adopted as if they were enacted. The provisions of this Bill would apply to all railway undertakings, including the operation of light railways, metros and trams. Operation of Luas Line B1 will therefore be operated in accordance with these requirements.

For example, Section 37 of the Bill proposes the general duties of railway undertakings and provides that “it shall be the duty of a railway undertaking to ensure as far as is reasonably practicable the safety of persons in the operation of its railway”. In addition, Section 39(1) of the Bill provides that “For the purpose of complying with its duty under section 37, a railway undertaking shall implement a safety management system and shall prepare a document (in this Bill referred to as a “safety case”) describing the components



of such safety management system”. Section 39(2) details the objectives of a safety case as follows:-

- “A. it shall demonstrate that the railway undertaking has the ability to properly assess and effectively control risks to the safety of persons, in compliance with its general duty under section 37; and*
- B. it shall provide a working document by which railway management and the Authority can ensure that the accepted standards and safety systems are being properly implemented and continue to be maintained”.*

Sections 41 and 42 propose that a railway undertaking shall also not bring into operation new works or new rolling stock unless it has submitted safety assessments to the Authority which can demonstrate the safety of the new works or rolling stock. Under the Bill, such assessments must be submitted for the approval of a Railway Safety Commission to be established under the Bill.

During implementation of the Luas Red and Green Line processes and procedures were established in line with best practice to comply with the above requirements. These will be utilised, revised and extended as appropriate to incorporate Luas Line B1. For example an emergency preparedness plan was prepared in conjunction with the emergency services for Luas Red and Green Line. This will be revised to reflect changes to the Luas system when Luas Line B1 is complete. Continuous training is an integral element of such procedures.

All operational staff are trained to the highest standards. Tram drivers and control staff require special training, control and certification. Tram design arrangements ensure that drivers are able to exit or enter the driving cab quickly in an emergency situation.

For implementation of the Red and Green Line, particular consideration was given to minimising the risk of accidental collisions at road junctions, by putting in place procedures covering maximum tram speeds, junction layout, road markings, education and enforcement. RPA and the

Operator continue to monitor the effectiveness of these procedures so that cognisance can be taken of preventative measures adopted and recommendations made following accidents. These measures ensure proactive measures are implemented to minimise the risk of accidents during the operational stage of Luas. This process will continue to inform the design, implementation and subsequent operation of Luas Line B1.

Road junctions and areas of shared running are the subject of special risk assessment to ensure that the agreed maximum speed, frequency of service, the tram/road/path/rail inter visibility and the safety equipment provided are to acceptable standards. An independent safety audit of the Luas Line B1 design will be undertaken to identify potential safety hazards and to identify measures to eliminate or mitigate possible problems.

A Code of Practice has been prepared covering standards to be adopted to ensure that maintenance of building and property frontages and of utility providers adjoining Luas can be carried out in a safe and effective manner. For instance, the erection of scaffolding, ladders and crane equipment and minimum distances from buildings to facilitate window and building cleaning, as well as routine property and utility maintenance and repairs are stipulated in the code of practice. The Luas operator implements a permit to work for such activities. This will apply to Luas Line B1 also.

The principal risks to passengers travelling on Luas are injuries arising from:

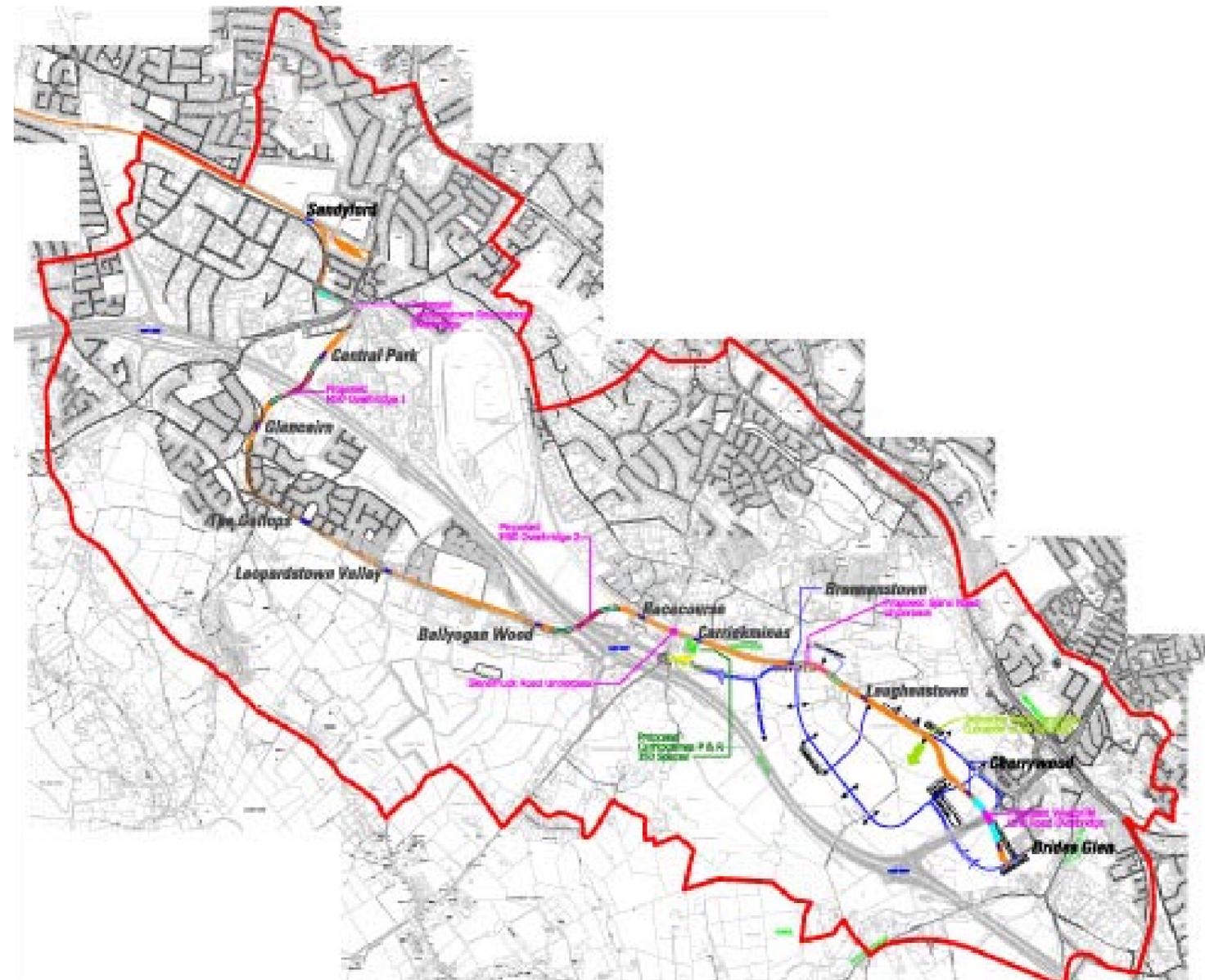
- Collision
- Derailment
- Electrical and or mechanical malfunction
- Fire
- Emergency braking
- Malicious action or vandalism which could give rise to any of the above.

The trams in use on the Red and Green Line were subject to safety approval before the commencement of operations. This included an analysis of safety aspects associated with the trams including:-

- Electrical Safety
- Fire Safety
- Crash-worthiness
- Passenger Safety
- Door Circuit Safety
- Traction System Safety
- Braking System Safety
- Safety against Derailment
- Safety against Overturning

This list is indicative rather than exhaustive. Any new trams and or modifications to existing trams will be subject to similar safety approval to ensure compliance with current Standards and Guidance.

Where the tram crosses a public road on a bridge structure, provision is made for suitable standards of derailment containment to ensure the safety of road users. Where a public road crosses above the tramway, bridge parapets of sufficient height will be provided to ensure that access to the overhead live wires is prevented and to restrict so far as is practicable, acts of vandalism against trams. Warning signs will be displayed prominently in appropriate locations and reasonable precautions will be taken to deter any wilful or malicious acts that would endanger public safety or present a hazard.



5.1 Human Beings



5.1.1 INTRODUCTION

Human beings clearly comprise one of the most important elements of the “environment” and any potential impact on the status of human beings by the Luas Line B1 alignment proposal must therefore be comprehensively assessed. The principal concern is that human beings experience no significant unacceptable diminution in aspects of “quality of life” as a consequence of the construction and operation of the proposed development. Relevant components of “Human Beings” in this section of the EIS, include; demography and employment, land use planning and development; vehicular and pedestrian traffic (and safety); community severance.

This section comprises a socio-economic study of a defined catchment area through which the proposed Luas Line B1 runs. The purpose of the assessment is to establish the location, size and profile of the population to be served by the Luas Line B1.

5.1.2 DEMOGRAPHY AND EMPLOYMENT

The purpose of this assessment is to establish the location, size and profile of the population to be served by the Luas Line B1 alignment.

5.1.2.1 METHODOLOGY

An examination is made of the key demographic and employment characteristics of the resident population within the catchment area. These include; population structure, age profile, household size, number of persons at work, employment profile, and social class data. Travel mode and car ownership rates are also detailed. This information is primarily sourced from Census of Population data. The majority of this assessment is based on the 2002 Census of Population data, which is the most recent source of official data available on an Electoral Division (ED) basis. The Electoral Division is the smallest administrative area for which population statistics are published by the Central

Statistics Office. The current structures of EDs are based on the 1986 Government of Ireland Electoral Division Map. This remains the relevant ED map to this day even though much development change and growth has taken place.

Area catchments are defined by selecting and aggregating EDs as follows:

- EDs which are intersected by the route alignment
- EDs within which a Luas stop is proposed to be located
- EDs of which 50% or more falls within a zone 1 km distant from the nearest tram stop

Based on this, seven EDs are identified along the Luas Line B1 alignment:-

- Stillorgan-Leopardstown
- Stillorgan-Merville
- Dundrum-Balally
- Glencullen
- Foxrock-Carrickmines
- Cabinteely-Loughlinstown
- Shankill-Rathmichael

This figure of 1km represents the threshold of reasonable walking distance for the average pedestrian to a Luas stop. There is an allowance for flexibility in this process. On the ground survey, local knowledge and professional judgement has been used so that, EDs where 50% or more falls within the 1km zone but where little or no resident population resides are excluded. Likewise, EDs where 50% or more lie beyond 1 km but whose population is predominantly within this distance, are included in the analysis. It should be noted in particular that the Glencullen ED, within which parts of Area 14 and Area 15 are located, covers an extensive area of land, equivalent in area to some 18 times that of Stillorgan-Merville ED.

The route of the Luas Line B1 alignment has been divided into three Areas for assessment. It should be noted that there is some overlap between adjoining Areas where an ED falls into more than one catchment. Thus, in addition to the population

catchments of individual Areas, an overall population for the entire Luas Line B1 alignment has been calculated. This overall figure thus differs somewhat from a simple addition of data for all of the three Areas. The purpose of the three Area calculations is to establish a socio-economic profile of these locations.

Tables 5.1.2.1 to 5.1.2.3 provide information on the overall Luas Line B1 alignment Catchment Area and the DTO Study Area (this is equivalent to the GDA area as set out in the Regional Planning Guidelines and includes Dublin, Kildare, Meath and Wickow) with regard to population, unemployment rates and car ownership rates. Further details relating to the specific areas of Line B1 are set out in Chapter 7 of this EIS.

Table 5.1.2.1: Total Population Luas Line B1 and DTO Area, 1991-02

	TOTAL LINE B1	DTO AREA
1991	24,557	1,350,595
1996	28,981	1,405,671
2002	32,367	1,535,446

Table 5.1.2.2: Population Change Luas Line B1 and DTO Area, 1991-02 (%)

	TOTAL LINE B1	DTO AREA
1991-96	18.0	4.1
1996-02	11.7	9.2
1991-02	31.8	13.7

Table 5.1.2.3: Car Ownership, 1991-2002 (per 100 households)

	1991	2002
Line B1 Catchment	132	159

5.1.2.3 CRITERIA FOR RATING OF IMPACTS

It is difficult to establish a precise scale of impact rating. In reality the Luas Line B1 alignment is not expected to significantly alter the demographic profile of an Area's population. On the other hand, the introduction of the Luas Line B1 alignment may act as a catalyst along with several other factors beyond the remit of this project, such as planning policy objectives for new development, or existing population trends such as smaller household size. In other areas the Luas Line B1 alignment will provide a new permanent transport link thus increasing accessibility and mobility of both residents and workforce.

It is appropriate to consider the impact of the Luas Line B1 alignment on Demography and Employment at a strategic level, using various socio-economic indicators. A broad range of rating criteria is set out below: -

Significant

Where the demographic structure of a population would be fundamentally altered as a result of one or more categories of population living or working in an area (e.g. young persons seeking first homes, middle sized family units, office workers) moving into the area to live/work, or departing from there as a direct result of the Luas Line B1 alignment.

Moderate

Where the demographic structure of an area would be noticeably altered as a result of the Luas Line B1 alignment such that for example, the workforce, households (such as apartment dwellers) are predicted to be added to/taken from the current populations but without fundamental changes in demographic profile.

Slight

Where any alteration to the demographic breakdown is incidental and no meaningful alteration to population and employment profiles is readily identifiable.



5.1.2.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

The construction works will generate employment opportunities for both the local and regional labour forces. There will be no direct impact on household size and composition during the construction of the Luas Line B1 alignment. Because the alignment is off-street for most of the route, disturbance will be localised and limited to bridgeworks and areas where the alignment crosses, or runs alongside the existing road network.

Operational Phase

No likely significant impact on overall size, age profile or average household size is predicted. However, an increase in the residential and working population is planned to occur over time as extensive lands in this area are developed. It is also likely that the Luas Line B1 alignment will result in some shift away from the use of private to public transport. Car ownership rates amongst the resident population however, are not expected to change significantly.

5.1.3 LAND USE PLANNING AND DEVELOPMENT

5.1.3.1 INTRODUCTION

The Dublin Transportation Office has confirmed the positive connection between transportation and land use planning. In this regard it is important to assess the Luas Line B1 alignment project in the context of:-

- current land use along the Luas corridor
- the Statutory Development Plan context which incorporates policies and objectives for the areas which the Luas Line B1 alignment will serve
- prospective trends in development

5.1.3.2 METHODOLOGY

The methodology adopted assesses land use planning and development under three sub-categories. These are:-

5.1.3.2.1 Land Use Structure

Sandyford Industrial Estate continues to evolve as the primary employment centre of South County Dublin. Other employment centres in immediate proximity include the Stillorgan Business Park, Central Park and the IDA South County Business Park. It is estimated that some 20,000 persons are currently employed in this area. There is still existing capacity in Sandyford Industrial Estate to facilitate significant further development, in line with sustainable transport provision. In addition there are undeveloped industrially zoned sites, some of which are unserved, located at Sandyford, Carrickmines, Cherrywood and Bray Little. The redevelopment of the existing industrial areas and the serviced undeveloped zoned lands, are capable of providing major new sources of employment.

To be responsive to future economic growth additional employment zoned lands have been provided in Cherrywood. The Dun Laoghaire Rathdown County Development Plan 2004-2010 estimates that the future employment population at Cherrywood will amount to some 10,000 persons. The provision of Luas Line B1 alignment between Sandyford Industrial Estate and Cherrywood thus has the potential to create a strategic public transport link between these existing and planned employment areas.

Ballyogan Road comprises a central transport spine within the wider area of the Stepside Action Plan 2000. The Dun Laoghaire Rathdown County Development Plan 2004-2010 estimates that over the next 8-10 years, some 4,000-5,000 new housing units will be constructed within the Action Plan area. In addition, the Dun Laoghaire Rathdown County Development Plan 2004-2010 estimates that some 20,000 new residents will be facilitated within the Cherrywood/Rathmichael Area.

There is a significant extent of undeveloped lands in proximity to the proposed Luas Line B1 alignment, at Brennanstown

Laughanstown, and eastwards towards Cherrywood. These lands have generally been rezoned under the Dun Laoghaire Rathdown County Development Plan 2004-2010 to provide for new residential communities, economic development and employment, open space and recreational amenities, new or improved neighbourhood centre facilities and district centre facilities).

The Luas Line B1 alignment passes in the immediate vicinity of a number of buildings of note, including the Leopardstown Park Hospital, Glencairn and Clonlea House, two Protected Structures on Murphystown Road, Murphystown Castle, the former Carrickmines Railway Station - a Protected Structure on the eastern side of Glenamuck Road, and an identified heritage area centred around Tully Church, including an ecclesiastical enclosure and remains.

5.1.3.2.2 Strategic and Statutory Planning Context

This category addresses the Statutory and Strategic land use planning and development policies and objectives primarily contained in the following:-

Ireland National Development Plan 2000 – 2016

The main objectives of The National Development Plan are to:

- Continue sustainable national economic and employment growth
- Consolidate and improve Ireland's international competitiveness
- Foster balanced regional development
- Promote social inclusion

It is a National Priority of the Plan to concentrate investment in economic infrastructure primarily roads, public transport and the environment. The Plan outlines a transport strategy for the Dublin Area. This strategy will direct investment to various modes of transport including the following:-

- developing, extending and increasing the capacity of the bus network

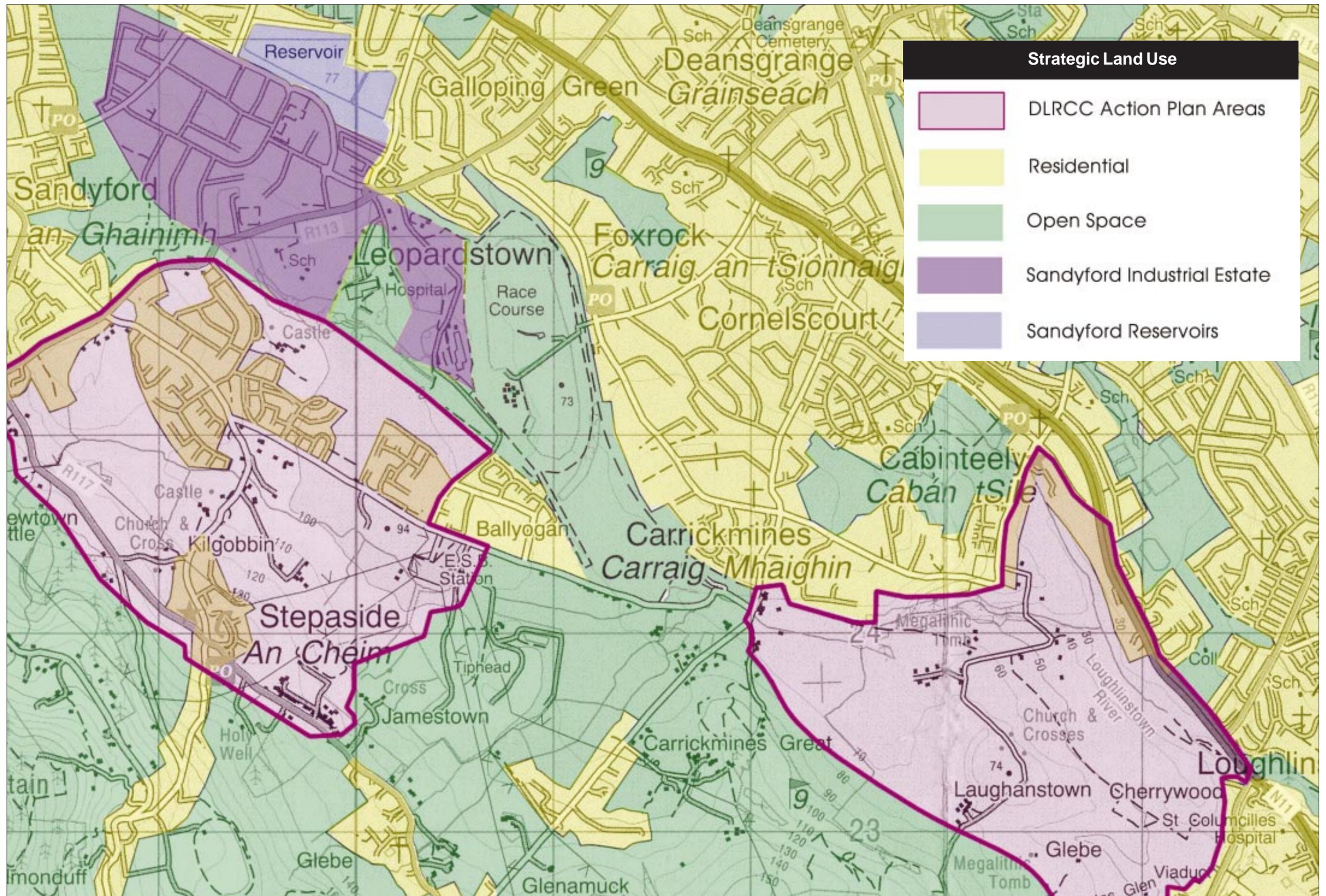
- implementing the light rail network approved by Government in 1998
- completion of the M50, Dublin Port Access Tunnel and national road projects

The National Spatial Strategy

The National Spatial Strategy is a twenty-year framework designed to deliver a more balanced social, economic and physical development between the regions. The Strategy stresses that it is essential for balanced regional development that the performance of the Greater Dublin Area (GDA as set out in the Regional Planning Guidelines includes Dublin, Kildare, Meath and Wickow) be built upon and physically consolidated. This will create a more efficient GDA, securing its vital national role in terms of improved mobility, urban design quality, social mix and regional connections.

The strategy identifies the need for decisions on land use and development to consider the existing public transport networks or more importantly to support the emergence of new or improved networks. The NSS recognises that to support balanced regional development, Ireland's transport networks must:

- *build on Ireland's radial transport system of main roads and rail lines connecting Dublin to other regions, by developing an improved mesh or network of roads and public transport services,*
- *ensure, through building up the capacity and effectiveness of Ireland's public transport networks, that increases in energy demand and emissions of Co2 arising from the demand for movement are minimised,*
- *allow internal transport networks to enhance international access to all parts of the country, by facilitating effective possibilities between the national transport network and international airports and sea ports,*
- *address congestion in major urban areas by increasing the use of public transport.*





In terms of the location of housing, the Strategy specifically seeks to ensure that the provision of housing in urban areas is sustainable and involves:

- *concentration of development in locations where it is possible to integrate employment, community services, retailing and public transport;*
- *mixed use and well-designed higher density development, particularly near town centre and public transport nodes like railway stations;*
- *the efficient use of land by consolidating existing settlements, focusing in particular on development capacity within central urban areas through reuse of under utilised land and buildings as a priority, rather than extending greenfield development.*

Regional Planning Guidelines for the Greater Dublin Area 2004 – 2016

The Regional Planning Guidelines for the Greater Dublin Area 2004 – 2016 (RPGs) is a long-term strategic planning framework for the development of the Greater Dublin Area (GDA) for a period of 12 years which build on the Strategic Planning Guidelines for the Greater Dublin Area.

The Guidelines envisage that the GDA will accommodate approximately 1.831 million people by 2020. This large population will help ensure a dynamic, robust and diverse regional area, while underpinning and sustaining a strong and well performing economy. The Guidelines recommend a number of measures to accommodate these high levels of growth.

The Luas Line B1 is located in the Metropolitan Area within the GDA. The key objectives for the future development of the Metropolitan Area are to ensure:

- *Consolidation of the urban centres located within the Metropolitan Area.*
- *Development of brownfield sites, in urban centres throughout the Metropolitan Area, especially those along public transport corridors.*

- *Delivery of well designed urban environments enhancing the quality of life for residents and workers alike.*
- *Provision and facilitation of an integrated transport system and the achievement of a greater use of sustainable transport modes through the integration of land use and transport planning.*
- *Clear definition of the boundaries of urban centres to ensure a clear division between rural and urban areas.*

The Guidelines recognise the importance of consolidating development within the Metropolitan Area. This will require a further increase in overall residential development densities, the delivery of well-designed urban environments, as well as measures to ensure priority for public transport.

Sustainable Development – A Strategy for Ireland

This 1997 Department of the Environment document recognises that land use planning can support sustainable development in a number of ways. These include:

- efficiency in the use of energy, transport and natural resources,
- the planning process can promote the most effective use of already developed areas,
- the protection and enhancement of the natural environment,
- new development needs can be accommodated in an environmentally sustainable and sensitive manner.

The Strategy advocates the clustering of business and residential communities around transport nodes, thus facilitating higher density uses. With regard to sustainable transport the objectives of the document include:-

- minimisation of potential growth in transport demand,
- increased efforts to manage the existing road network more efficiently,
- to support and improve public transport systems and infrastructure.

Dublin Transportation Office Strategy 2000-2016: “A Platform for Change”

This report by the Dublin Transportation Office (DTO) has been prepared to support the strategic land use planning framework described in the *Strategic Planning Guidelines for the Greater Dublin Area*. The overall strategy has two inter-dependant elements:-

Demand Management:- which seeks to reduce the growth in travel while maintaining economic progress, and which is designed to encourage a transfer of trips, especially at peak periods, from the private car to sustainable modes of transport (public transport, cycling and walking).

Infrastructure and Service Improvements:- including a substantial expansion of the public transport network, strategic road construction, and traffic management.

A major public transport element of the proposed strategy is the proposal to extend the Luas Line B1 alignment from Sandyford Industrial Estate to Cherrywood. The implementation programme contained in the DTO strategy envisages that this will be implemented between 2003 and 2006. The Strategy envisages that between 2006 and 2010, the alignment between Cherrywood and the City Centre will be served by a metro line.

Central to the effectiveness of the DTO Strategy is that all land use development must be consistent with the Strategic Planning Guidelines. The DTO state therefore that:-

“it follows that the public transport infrastructure proposed in the DTO Strategy should be a prime consideration in the location, land use type and density of new development. A corollary of this is that developments that generate a high volume of trips should be located in public transport corridors and not in strategic road corridors.”

Dun Laoghaire-Rathdown Development Plan 2004-2010

The overall strategy for the planning and sustainable development of the County is to create a polycentric settlement pattern – by developing and expanding the existing towns, district centres and villages in the urban area. Policy RES1 of the Plan states, *“It is the policy of the council to*

follow a settlement strategy based on the simple concept of ‘nodes and corridors’ – towns, villages and centres connected by transport corridors”.

The nodes or centres with good interchange facilities will be developed for residential, commercial and employment opportunities. New nodes will be required where there is a gap in the urban structure. The Plan indicates four primary nodes for significant urban development:-

- 1) Dun Laoghaire
- 2) Dundrum
- 3) Bray Environs
- 4) Cherrywood-Rathmichael

Cherrywood-Rathmichael

The Plan identifies Cherrywood-Rathmichael, approx. 307 ha, as the area with the greatest potential as a Special Development Area, due to its location within the defined Metropolitan Area, on the motorway, on the proposed Luas B1 route, adjoining the N11 and the South Eastern Motorway, with links to Dun Laoghaire. The Plan proposes that a new Local Area Plan be prepared for the Cherrywood-Rathmichael Areas which will supercede the former Draft Carrickmines-Cherrywood Action Area Plan.

The Plan notes that Development at Cherrywood will require the provision of the following key infrastructural works-

- *Luas Line B1 from Sandyford*
- *The Laughanstown (aka Lehaunstown) Interchange Upgrade*
- *New water supply scheme to serve Cherrywood and environs*
- *Surface water supply scheme to serve Cherrywood and Environs*
- *Surface water and foul drainage schemes*

The core of the Cherrywood-Rathmichael Area will contain



extensive mixed use development. It is estimated that the potential number of residential units will provide for a population of c. 20,000 persons. The retail function of the area will expand with the Plan siting a floor area target of 35,000sq.m for Cherrywood. It is envisaged that the number of employees would in the long term be c.10,000 workers.

The Plan emphasises that the envisaged and target figures outlined are predicated on the provision of the Cherrywood Luas terminus. In this regard Policy REG3 of the Plan states *"It is the policy of the Council that only limited development shall take place in the Cherrywood/Rathmichael Area until the light rail/public transport facilities which will facilitate the development of the area in a sustainable manner are advanced."* The Council recognises the special environment of the Rathmichael area which needs to be protected until adequate infrastructure is in place to accommodate any future development.

There is a specific objective in the Plan in relation to Cherrywood Town Centre which states *"It is the aim of Dun Laoghaire Rathdown County Council to facilitate the development of Cherrywood on a phased basis subject to the provision of rail links, a sufficient resident population and the preparation of an approved urban design Master Plan."* In this regard Policy REG4 of the Plan states *"It is the policy of the Council that the district Centre zoning remain on the Cherrywood site until such time as it is confirmed that the area will be serviced by the Luas line. The town centre shall not commence until such time as the Luas contract is signed."*

Employment and Transportation Policy Objectives

In terms of employment it is an objective of the Council *"to support the ongoing development of the Sandyford Business Estate, Central Park and the South County Business Park area as a major employment centre with supporting facilities such as crèches, public restaurants/cafes and amenity areas for employers and visitors."* This objective is an important consideration in the land use planning analysis of the Luas Line B1 alignment, as the effect of it is to facilitate ongoing development of higher intensity employment activity in areas such as Sandyford Industrial Estate and Central Park. In regard to the employment lands at Carrickmines and Cherrywood there are remaining deficiencies in terms of

water supply. However, the Council will encourage the provision of public transportation infrastructure as an element of servicing lands for employment.

It is a policy of the 2004-2010 Plan to *promote, facilitate and co-operate with other agencies in securing the implementation of the transportation strategy for the Dublin Region as set out in the Dublin Transportation Office Strategy 'Platform for Change 2000-2016'*. It is a specific objective of the Plan to provide a Luas station at Leopardstown Valley, Cherrywood and to extend the Luas network in the future to St. Colmcille's (Loughlinstown), Shankill and Shanganagh/Woodbrook.

Section 49 - Development Contribution Scheme

The capital cost of the Luas Line B1 extension has been [partly] covered by the Section 49 – Supplementary Development Contribution Scheme (SDCS), as provided for under the Planning and Development Act 2000, for the Extension of the Luas Line B1 – Sandyford to Cherrywood. This was adopted by Dun Laoghaire Rathdown County Council on 13th January 2003. Section 49 of the Planning and Development Act 2000 enables a Planning Authority when granting a permission pursuant to Section 34 of the Act to attach a condition to a planning permission requiring payment of a financial contribution in respect of any public infrastructure service or project. In this instance the project involved the extension of the Luas Line B1 from Sandyford to Cherrywood. The scheme applies to an area of 1,992 ha, which is a catchment area of approximately one kilometer on either side of the proposed Luas Line B1. The extent of the area was considered to represent a reasonable walking distance to stops along the proposed line. The actual levels of contributions adopted are as follows:

Residential: A contribution rate of 250,000 per gross site hectare.

Commercial: A contribution rate of 570,000 per gross site hectare.

Rathmichael Local Area Plan 2003

The Rathmichael Local Area Plan covers an area of approximately 9.3hectares, which is located approximately 0.5km due south of the expanding Cherrywood Science and Technology Park and 1.5km northwest of Shankill Village.

The lands are zoned 'A1' which is *"To provide for new residential communities in accordance with approved action area plans"*. In addition the lands have a specific objective which states *"that the Action Plan shall include provision for the Bride's Glen as a public amenity space."*

Within this development area c.7 hectares is zoned residential, c.0.5 hectares is zoned Neighbourhood Centre and the remaining 1.7 hectares is zoned public open space. The Plan provides for a mixed-use scheme incorporating medium-high density residential development *"dependent on the improved access to the quality Bus corridor on the N11 and the future reservation of a pedestrian access to the proposed Luas at Cherrywood."* At present the site is outside the recommended distance (ten-minute walk time) for higher density development.

Stepaside Action Plan 2000

The Stepside Action Plan, 2000 anticipates that the area will be developed primarily for higher density residential development over a ten year period. According to the Action Plan some 20,000 persons could ultimately reside within the Action Plan area in a mix of house types and layouts. It is estimated that in September 2004 c. 900 residential units were under construction and/or completed and an additional 510 units were occupied. It is envisaged that a further 4,000-5,000 houses and apartments will be completed by 2012. However, the Action Plan, *"in seeking to encourage the ethos of sustainability in relation to the Stepside project, is anxious to encourage a modest element of mixed use activity into the underlying structure of the Plan - particularly in relation to issues of employment, business and work-space."*

The Action Plan confirms that *"...the provision of an improved public transport infrastructure is fundamental if the sustainability objectives of the Plan are to be met."* In this regard, it recognises the logic of routing a Luas extension from Sandyford Industrial Estate through the Action Plan area. This would link to the existing and planned employment uses at Leopardstown, as well as to the new residential community at Stepside. The route shown in the Action Plan, primarily running along the alignment of the Ballyogan Road would bring all parts of the Stepside Plan Area within 1 kilometre of a fixed-line public transport

corridor. This provision of the Luas Line B1 alignment will facilitate a greater density of residential development within its catchment area.

Draft Carrickmines-Cherrywood Action Plan 2000

A Draft Action Plan for the Carrickmines-Cherrywood area, including Laughanstown, was prepared by Dun Laoghaire Rathdown County Council in May 2000 but never formally adopted. Under the current Statutory Development Plan it is an objective of the Council to prepare a new Local Area Plan for the Cherrywood-Rathmichael Areas which will supercede the former Draft Plan.

The Draft Carrickmines-Cherrywood Action Plan envisages a future population mix in the area of 8,000 residents and 11,500 workers. These will be facilitated by the provision of lands zoned for residential, open space and industrial use, including a designated science and technology park. A major district centre is also proposed to serve the scheme.

Section 17.4 of the Draft Action Plan refers to the provision of Luas to the area, and details the planned route alignment, including the general location of stops along this route. It also refers to the provision of two Luas park and ride facilities serving the route, one at Carrickmines, and the other at the Cherrywood District Centre which are also included in the Dun Laoghaire Rathdown County Development Plan 2004-2010. The Plan also includes provision for a longer term extension of the line south of the Wyattville Link Road towards Shankill. Overall, it is an objective of the Action Plan to encourage joint venture schemes for the construction of Luas in association with the development of the area.

5.1.3.2.3 Development Trends and Potential

This category documents recent land use developments and considers prospective development trends in the area of the Luas Line B1 alignment corridor. Information for this section was obtained from a detailed perusal of the Planning Files at the Planning Department of Dun Laoghaire-Rathdown County Council.

When combined, these elements provide a representative portrait of existing and likely future land use and development



in the area of the Luas alignment. The impact of the insertion of the Luas Line B1 on these areas therefore can be assessed as regards its compatibility or otherwise, with existing land uses and the implications for further development are also considered.

A detailed analysis of recent applications for permission and newly constructed developments in the immediate vicinity of the Luas Line B1 alignment are outlined, on an area by area basis, in the subsequent volumes of this EIS.

5.1.3.3 CRITERIA FOR RATING OF IMPACTS

The significance of land use planning and development impacts due to the construction and operation of Luas Line B1 are dependent on the following:-

5.1.3.3.1 Land Use Structure

Existing land use may be the subject of physical impact during construction. As a temporary impact, significance relates to the ability of existing land uses to remain functional, having regard to the fact that some disturbance and inconvenience is often unavoidable. During operation of Luas Line B1 alignment, effects on the functioning of land uses (including improved functionality) influences the scale of an impact.

Significant

Where the project would reduce/augment the viability of land uses such that consideration of relocation away from the area/to the area would occur.

Moderate

Where the project would inhibit/enhance current land uses.

Slight

Where the project would cause minor inconvenience/benefit to land uses.

5.1.3.3.2 Strategic and Statutory Planning Context

It is relatively straightforward to assess whether a statutory development policy or strategic policy objective is impacted upon by the proposed Luas Line B1 alignment. The rating of

the significance of this impact relates to the importance of that policy or objective in the development plan (or associated Action Plan), or in a strategic planning document.

Significant

Where the project would have a major role in enabling/prohibiting the achievement of an important policy or objective of the Statutory Development Plan (or associated Action Plan), or a strategic planning document.

Moderate

Where the project would contribute to/militate against the achievement of an important Development Plan/Action Plan/Strategic Plan objective.

Slight

Where the project would have a token impact on important plan objectives, or which would enable/prohibit the achievement of minor objectives.

5.1.3.3.3. Development Trends and Potential

The rating of impacts relates to the assessment of the contribution of the Luas Line B1 to the achievement of development potential. In this regard, the Luas Line B1 may serve to act as a catalyst for development trends in the area. This may be, for example, the achievement of further residential or employment use development in certain areas along the alignment.

Significant

Where the Luas Line B1 would have a major role in reducing/augmenting the viability of development such that relocation of development proposals away from this area/into this area would occur.

Moderate

Where the Luas Line B1 would frustrate/enhance development in an area to a limited degree.

Slight

Where the Luas Line B1 would cause minor inconvenience/benefit to proposals for development in an area.

5.1.3.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

There will be some localised short term and temporary significant impacts on land uses adjoining the alignment during the construction process, both due to the construction of the Luas Line B1 alignment itself, and due to the associated upgrading and re-alignment of Ballyogan Road. However, no significant long term impact on land use planning and development is predicted to occur.

Operational Phase

The proposed Luas Line B1 alignment will comply with the policies and objectives of the Dun Laoghaire-Rathdown County Development Plan 2004-2010, the Stepside Action Plan 2000, and the DTO Strategy 2000-2016 to provide a light rail link between Sandyford and Cherrywood. It will provide a significant benefit for existing and planned residential and employment land uses adjoining the site.

5.1.4 VEHICULAR AND PEDESTRIAN TRAFFIC AND SAFETY

5.1.4.1 INTRODUCTION

This section considers the impacts on vehicular and pedestrian traffic and safety arising out of the construction and operation of the Luas Line B1 alignment. A methodology for consideration of the potential impacts is set out in addition to criteria for rating of the impacts. Detailed assessment on an area by area basis is set out in Chapter 7 of this EIS.

5.1.4.2 METHODOLOGY

The approach to the assessment has been based on previous experience by the EIS Consultants' work for linear developments including light rail rapid transit (existing Luas Red and Green Lines), conventional rail and highway projects. Detailed information on the developing engineering design has been used to 'scope' the potential key issues

relating to vehicular and pedestrian traffic and thus more economically to define the extent of data collection and evaluation required. Informal discussions have been held with transportation planners in other cities that have either existing LRT systems or where systems are proposed.

The advice contained in EIS guideline sources has been examined carefully. Among the most important references have been the Environmental Protection Agency's *EIA Guidelines and Good Practice Guide*, the UK Department of Transport's Environmental assessment volume which offers comprehensive advice for the staged assessment of major road schemes (DMRB Volume 11).

The sequence of assessment has followed the established pattern of data collection, prediction of impacts, development of mitigation measures and identification of residual or predicted impacts for the construction and operational stages. This has been followed by an assessment of any requirements to monitor for environmental effects in a similar fashion. Reinstatement has been addressed, although the Luas is seen as an investment with an indefinite life compared to an industrial process that may require decommissioning at the end of its design life. Specific problems encountered during the assessment, including limitations in data quality or availability are referred to. These are also addressed in Chapter 8, "*Difficulties Encountered in Compiling this EIS*".

Data Sources

The principal sources of data for pedestrian and vehicular traffic, for accidents, and for transportation modelling are as follows:-

Traffic Data (Vehicle Flows)

The principal source of traffic data for the 2016 forecast year has been the Dublin Transportation Office (DTO) Traffic Model, which is discussed below. This has been supplemented by individual traffic link and junction counts undertaken by the Railway Procurement Agency (RPA), which incorporate pedestrian and cycle counts.

Accident data

The DTO has provided the RPA with the traffic accident data



which itself derives from the National Roads Authority Accident database, for the period 1998-2002. This information, which relates to personal injury accidents, is condensed from the national Garda reporting system which categorises accidents as fatal/serious/minor.

The Dublin Transportation Initiative (DTI) and DTO Traffic Model

As part of the DTI studies, a traffic model was developed for the Dublin area and this has been the basis of predicting changes arising out of the introduction of the Luas Line B1 alignment. In common with other traffic models the zones used to define change are smaller in the city area and larger in the suburbs. As part of the Luas Line B1 alignment studies, some zones within the study area have been disaggregated to provide a greater level of detail.

The original DTI traffic model has been enhanced and upgraded as part of the ongoing transportation planning process of the DTO. The resulting DTO model has been used in this study for the purposes of comparison of the situation that is likely to pertain in the year 2016 with elements of the DTO Strategy but without the Luas Line B1 alignment and an analogous situation which includes the Luas Line B1 alignment and also a higher density of development commensurate with the provision of a high quality public transportation system as represented by the Luas LRT system. Comparison with the existing situation is not relevant as the strategy is an ongoing process. As such it would be impossible to single out the effects of the Luas LRT system in particular as opposed to the effects of the DTO strategy in general on the basis of such a comparison.

The DTO strategy includes the completion of the C Ring, widening and junction upgrades along the M50, the Port Tunnel, DART/Suburban Rail initiatives, QBCs, cycle networks and other associated measures such as traffic management, Park and Ride and integrated fares and ticketing. The implementation of any one of these measures may have a more radical effect on traffic than the Luas LRT system may have. It must be stressed that the Luas LRT system is one integral element of an overall recommended transportation strategy for the metropolitan region. Thus impacts on traffic will occur from the implementation of other

elements of the DTO strategy, which are being progressed independently of the Luas LRT system by the appropriate implementing agencies and the DTO.

5.1.4.3 CRITERIA FOR RATING OF IMPACTS

As is recorded in the DTI Final Report, it is important to note that the overall transportation strategy for Dublin comprising Luas, traffic restraint within the C-Ring, and better use of existing assets, including the balance of use of parts of the road network adjusted in favour of public transport, are all key elements of the Dublin Transportation Initiative Recommended Strategy. The ongoing transportation planning process carried out by the Dublin Transportation Office (DTO) yielded '*A Platform For Change*' (September 2000) which provides a summary of the first updating by the DTO of the original DTI Strategy and outlines the resulting DTO Strategy. The public transport provision of the original DTI Strategy has been greatly enhanced and expanded into the wider metropolitan area in the DTO Strategy and includes both the extension of the light rail network and development of a higher capacity segregated light rail network (Metro). Traffic management objectives include the development of effective networks for pedestrians, cyclists and public transport users. Thus traffic management measures including the continued development of traffic cells in the city centre and traffic calming generally are a fundamental component of DTO Strategy and are justifiable in the interests of the common good and the proper planning and development of transportation and land use elements within the metropolitan area.

With the above in mind, evaluative criteria for potential significant effects arising from the insertion and operation of the Luas Line B1 alignment, have been developed for vehicular and pedestrian traffic and changes in traffic flows reflecting potential for pedestrian loss of amenity. 5 year data for personal injury accidents has been obtained from the DTO and this is reported in Chapter 7 of this EIS.

In addition to the Guidelines published in 1995 by the Environmental Protection Agency, three UK sources were

used to provide guidance and advice. Where guidance was not available, professional judgement was used. In general, criteria have been set at a conservative level in order to ensure that any potential effects were captured and assessed.

Vehicular and Pedestrian Traffic

The Institute of Environmental Assessment Guidelines suggest two broad rules-of-thumb to be used as a screening process to delimit the scale and extent of an environmental assessment in terms of significant impact. It should be stressed that these criteria are framed for site specific planning proposals rather than linear public transport projects. Nevertheless as an indication of how changes to traffic flow are assessed these broad rules-of-thumb are stated below:-

- Highway links where traffic flows will increase by more than 30% (or the number of heavy goods vehicles will increase by more than 30%)
- Any other specifically sensitive areas where traffic flows have increased by 10% or more. (Specifically sensitive areas would include accident blackspots, conservation areas, hospitals, links with high pedestrian flows, etc.).

For the purposes of this EIS, traffic flow increases directly attributable to Luas of less than 10% were not considered likely to give rise to any potential significant effects. Increases of 10-30% were only considered to give rise to significant effects in specifically sensitive areas. For accidents, this was defined as any road link with more than 15 accidents in the last five year period for which data was available. For pedestrian and cyclist amenity, account was taken of available data for pedestrians and cyclist information on a qualitative basis.

Criteria thresholds were set higher for temporary effects than permanent effects, reflecting the shorter periods for which the adverse effect will persist.

In deciding on evaluative criteria for car drivers, pedestrians and cyclists delay effects, a starting point was the *Design Manual for Roads and Bridges (DMRB Vol. 11 Environmental Assessment)*. This defines slight severance as involving

increases in pedestrian journeys of at least 250m. Longer distances were also used for driver delay criteria (taking into account higher travel speeds), again incorporating consideration of usage and whether the increases are permanent or temporary. Safety could be affected not only by traffic increases, but also by proposed changes to the road network to incorporate the Luas LRT system. Permanent traffic calming and speed reductions could improve safety.

Criteria for Driver Delay

Driver delay: for the purpose of the EIS potential significant effects were deemed to exist where any of the situations described below were identified at a specific location:

- Where there is predicted to be a permanent decrease in link speeds of more than 5km/h.
- Where there is predicted to be a permanent increase in journey length of 500m.

Cyclists

The principal potential effect (benefit) for cyclists from implementation of the Luas Line B1 will come through the opportunity for provision of additional cycleways along the corridor. The realigned Ballyogan Road for example will include the provision of a cycle track on both sides and cycle parking facilities will be established at all stops where practicable. The use of the Luas Line B1 alignment will be prohibited to cyclists, other than where the line must be crossed, since it would otherwise infringe upon the fundamental principle of priority for the trams and also cyclist safety. Other than at road crossings the Luas alignment is separated from the adjacent carriageway.

Pedestrian Amenity

Potential significant effects were deemed to exist if, at a specified location, there is predicted to be a permanent increase in total traffic flow of more than 10% and the increase is more than 40 movements per day; and there are "material" levels of pedestrians; and the sensitivity of the area is "high" (e.g. conservation area, major community facility). It should be noted that the significance relates to the cumulative impact of the above factors.



Data on pedestrian flows are based on junction counts undertaken by the Railway Procurement Agency and is reported on in Chapter 7.

Rating of Impacts

The criteria set out in the preceding section have been used to rank effects in terms of their magnitude based on the identification of significant effects. The application of this ranking will vary from aspect to aspect of the vehicular and pedestrian traffic topic. The rankings have, accordingly, been prepared with current “best practice” in mind. Effects have been categorised broadly into three levels of ‘significant’, ‘moderate’ or ‘slight’. The ‘significant’ level equates with the term ‘severe’ and is regarded as a significant effect as envisaged in the Directive on Environmental Assessment (85/337/EEC).

Moderate’ and ‘slight’ impacts are, respectively, those which, depending on their intensity or the sensitivity of location to vehicular or pedestrian activity or the duration of the effect, should be recorded in an assessment, but which do not rank as significant themselves. ‘Slight’ impacts are those which, by and large, should be capable of being ‘designed out’ in the detailed design and construction planning of the Luas Line B1 alignment. In particular, construction activity will generate many ‘slight’ effects that are typically of short duration and can be remedied with suitable traffic management measures and the provision of temporary bridges and footways.

5.1.4.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

With the provision of remedial measures, and in cognisance of the temporary nature of such works, overall predicted impacts on both vehicular and pedestrian traffic flows and safety will be slight, principally arising out of the road crossings and bridge works.

Operational Phase

The Luas Line B1 alignment is predominantly off-street, and in conjunction with the above remedial measures, the impact is considered to be neutral. Some slight effects in the form of increases in road traffic flows along parts of the highway

network such as at Ballyogan Road or Brewery Road are predicted for the future year 2016. These increases arise however principally from the transfer on to Luas of more strategic or longer distance trips which in turn means that localised demand is now able to access these routes.

Facilities for pedestrians will be enhanced through the provision of controlled crossings at all at-grade junction crossings of the Luas Line B1 alignment. The cycling environment will benefit as a result of the implementation of the alignment, through the provision of parking facilities at stop locations and the realisation of cycle tracks on the realigned Ballyogan Road. The provision of planned bus set-down facilities at Sandyford and Leopardstown Valley stops, and at Carrickmines, and the strategic location of bus stops along Ballyogan Road will provide interchange between Luas and public bus services within the wider catchment area.

The proposed 350 space Park and Ride facility at Carrickmines will have some negative effects on the local road network, which impacts are considered to be moderate. The provision of bus interchange at this location will assist in the provision of a comprehensive public transport network in the area and reduce dependency on the private car as a mode of transport.

5.1.5 COMMUNITY SEVERANCE

5.1.5.1 INTRODUCTION

This section deals with community severance. This is best articulated in terms of pedestrian and vehicle movements within an area and between nodes, and the implications for these of the insertion of the Luas Line B1 alignment.

Severance can be defined as the sum of the divisive effects that a project may impose on a community in terms of access to and movement between locations such as residences, workplaces, commercial/retail areas, schools, community facilities etc. Thus, using its widest definition, it is the impact that a development can have on the accessibility and mobility

of the resident, working and visiting communities. This includes the possible obstruction of access to and from places of residence, workplaces, shops and schools.

Severance may be experienced by pedestrians and by those travelling in vehicles (particularly domestic, access and delivery traffic) and relates principally to the impact on the ability to move at and around the area where the insertion of the Luas Line B1 alignment is proposed.

Certain persons are more prone to the impact of severance than others. Mobility impaired persons, the elderly, children, adults with small children, and persons without access to private transport, are typically more vulnerable to potential severance impacts. An assessment of severance combines the structural and routing implications of the Luas Line B1 with consideration of the demographic profile of the population likely to be impacted.

5.1.5.2 METHODOLOGY

In deciding on a framework within which broad measurement of community severance can be undertaken, the most relevant way of looking at interrelationships that produce community movement was to categorise severance impacts to this movement by the type of users affected. A detailed assessment has been carried out to identify severance impacts of the Luas Line B1 alignment on the resident and business populations. This includes consideration of the route alignment, adjoining land uses, pedestrian and access nodes and general movements. The methodology incorporated a visual survey of the route alignments on an Area by Area basis. This included an assessment of traffic, public transport as well as development and community activities data. For example, catchment areas for community and religious facilities by reference to parish boundaries. Major health facilities were also identified. Other community facilities such as local shops and services were identified en bloc, while important community services such as schools, post offices, public houses etc. were identified separately. An assessment of the primary location of business activities was undertaken.

With regard to the above, it was possible to establish typical patterns of movement in the various Areas. In conjunction with this information, professional judgements were made in establishing if severance in a particular area would be likely and significant.

To enable observation of potential severance implications in actual circumstance, the specialist consultants responsible for this section of the EIS, have experience of the existing Green and Red Line Luas system in Dublin and experience of systems elsewhere in Europe. Overall, the Luas Line B1 alignment can be considered very much as having the potential for improved accessibility and mobility in areas which might otherwise be subject to heavy road traffic flows. An assessment of severance therefore differs substantially from, for example, a road reservation proposal where community movements are often disrupted or need to be channelled at certain locations.

5.1.5.3 CRITERIA FOR RATING OF IMPACTS

The rating of community severance impacts due to the construction and operation of the Luas Line B1 alignment comprise as follows:-

Significant

People are likely to be deterred from making trips to an extent sufficient to induce a re-organisation of their habits. This would lead to a change in the location of centres of activity or in some cases to a permanent loss to a particular community. Alternatively, considerable hindrance will be caused to people trying to make their existing journeys.

Moderate

Where pedestrians or drivers are likely to be dissuaded from making some trips by reason of the fact that trips are made longer or less attractive.

Slight

The current journey pattern is likely to be maintained, but there will probably be some hindrance to movement.

Whilst these criteria may be applied to the assessment of both



pedestrian and vehicular severance, it should be noted that a particular element of the project will affect pedestrian and vehicular flow in different ways. In operation, on-street sections of a Luas LRT corridor can be expected to reduce pedestrian severance over existing conventional road based movements, whilst requiring a more managed vehicle environment. Whilst assessing and rating severance, regard must be had to the following:-

- The number of people who would be impacted
- The presence of particularly vulnerable groups such as children, the aged or the disabled amongst those likely to be impacted

be provided in an area currently experiencing a serious deficiency in such service, as well as due to the planned upgrading of Ballyogan Road. The planned provision of a park and ride facility at Priorsland Carrickmines will serve to minimise any unregulated parking in the Carrickmines area.

5.1.5.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

Pedestrian Flow

Remedial measures will ensure that any potential short term inconvenience will not become a significant impact which would result in an increase in community severance.

Traffic Flow

The introduction of appropriate management measures and the retention of access, though with certain restrictions, and in view of the temporary nature of the construction works, will mean that there will be a slight predicted impact in terms of community severance with respect to traffic flow.

Operational Phase

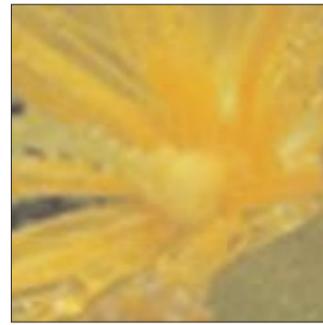
Pedestrian

A reduction in severance of pedestrian flow along the Luas Line B1 will occur with the associated improved pedestrian environment, including the provision of new footpaths in the area.

Traffic Flow

Given the remedial and reductive measures proposed, a beneficial impact is predicted in parts of this section in terms of traffic flow, as a significant public transport alternative is to

Flora and Fauna



5.2.1 INTRODUCTION

This section of the EIS deals with Flora and Fauna. It is important to assess how the LUAS Line B1 alignment will directly impact upon each of these, as well as how changes in flora due to the alignment may affect fauna.

5.2.2 METHODOLOGY

Plant communities and habitats were assessed using Phase 1 habitat survey methodology, using Fossitt (2000) to classify the habitats present. Field work was initially carried out in May 2001, using aerial photography as an aid to habitat mapping along and in the immediate vicinity of the route alignment. The route was re-visited between late January and early April 2005, to update the 2001 survey and take account of recent development in the vicinity of the alignment. Plant identification follows Webb et al (1996), and nomenclature follows Scannell and Synnott (1987). Reference was made to Doogue et al (1999) with regard to the distribution of plant species in Co. Dublin, and to the Flora Protection Order (S.I. No. 94 of 1999) and Curtis and McGough (1988). Plant species lists for each of the areas 13, 14 and 15 are given in the Appendices of Volume 2.

Bird fauna were recorded during early morning visits in May 2001. Additional records from surveys in 2005 are included in the description of the receiving environment. Bird species were assessed as breeding if the following were recorded:

- Territorial song
- Adults carrying nesting materials or food
- Occupied nests or fledglings.

The presence of mammals was assessed with regard to direct observation, and the presence of field signs such as tracks, droppings, feeding signs, and burrows. A bat survey was carried out in habitats directly impacted by the proposed development in area 13 in 2001, because of seasonal factors this survey was not repeated in 2005.

The alignment crosses three watercourses: Carrickmines River, a small stream near Ballyogan Road, and the ornamental ponds at Glencairn. Aquatic fauna was not surveyed, however reference is made to existing information on the aquatic fauna of these watercourses.

5.2.3 CRITERIA FOR RATING OF IMPACTS

Impacts are assessed in accordance with the guidelines on information to be contained in Environmental Impact Statements (EPA, 2002). The significance of ecological impacts depends on both the rarity of habitats, flora and fauna potentially impacted by the proposed development, and on the type and duration of those impacts which could arise from the proposed development. The degree of rarity of an ecological feature gives a rating of international, national, regional or local importance.

A global context of the ecology of the proposed Luas Line B1 route is given below. A more detailed description of flora and fauna in each of the areas comprising the route is given in Volume 2 of this EIS. No rare (Curtis and McGough, 1987) or protected species of flora were recorded on the Luas Line B1 alignment.

5.2.3.1 CONSERVATION DESIGNATIONS

There are no conservation designations on, or immediately adjoining the proposed route. Areas subject to proposed Natural Heritage Area designations within a 5km radius of the proposed development are as follows:

Loughlinstown Wood (Site Code 1211)

This is the woodland area along the Loughlinstown River which lies on the eastern side of the N11. It is a good example of a demesne woodland, which comprises beech, sycamore and ash on dry ground, and area of ash, hazel, blackthorn and bramble, and wet willow and alder woodland on the valley floor.

Dingle Glen (Site Code 1207)

Dingle Glen is a glacial spillway channel, now dry. It has a regenerating woodland cover, with holly, willow, blackthorn, ash, hazel, oak and spindle in the valley, and gorse and bracken on the higher slopes.

5.2.3.2 AREA 13: SANDYFORD TO MURPHYSTOWN ROAD

This section of the alignment passes mainly through developed lands, and lands currently being developed. The main section of interest for flora and fauna are the neutral grassland, woodland and pond habitats present in the Glencairn area, on either side of the Racecourse stream valley. Badgers and several bat species occur here, and a pair of kestrels was recorded nesting in mature trees on the alignment.

The main mitigation measure is the minimisation of tree felling, and replacement planting where space permits. Mature trees scheduled for removal will be examined by a licensed bat expert prior to felling, so that appropriate mitigation measures can be taken. Flora and fauna in this area will be impacted by other approved developments, and cumulative impacts are expected to be significant in the medium term as all developments proceed.

5.2.3.3 AREA 14: MURPHYSTOWN ROAD TO BALLYOGAN WOOD, BALLYOGAN ROAD

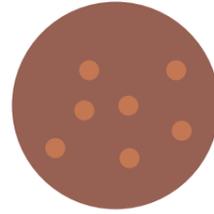
The alignment in area 14 lies largely on existing roads, paved areas, and amenity grassland, adjoining existing residential developments, but also impacts on mature hedgerow. The widening of Ballyogan Road under a related proposal will impact on a mature treeline. The main impacts on flora and fauna relate to the loss of mature hedgerow and treeline habitats, with locally significant impacts. Mitigation measures aim to replace this habitat where possible.

5.2.3.4 AREA 15: BALLYOGAN WOOD, BALLYOGAN ROAD TO CHERRYWOOD

The alignment and adjoining lands along area 15 have a greater diversity of flora and fauna than areas 13 and 14, arising from the development of immature woodland on sections of the alignment, and the proximity of broad-leaved woodland and scrub habitats as well as undeveloped grassland and fallow arable land. The main impacts arise from the loss of immature woodland on the alignment, and from disturbance impacts during the operational phase reducing the value of sections of the route as a wildlife corridor. Cumulative impacts arise in relation to approved and planned developments on adjoining lands.

Mitigation measures include the retention of existing treelines along the alignment boundaries, and new planting of treelines and hedgerows along sections which do not have this habitat currently.

5.3 Soil



5.3.1 INTRODUCTION

This section considers the impacts on the soil environment arising from the construction and operation of Luas Line B1 alignment. Detailed analyses are provided in Chapter 7 of this EIS on an Area by Area basis.

5.3.2 METHODOLOGY

The assessment of the Luas Line B1 alignment project by reference to soil includes the identification of potential effects on soil disturbed during the construction process (principally for the trackbed), the identification of areas of potential contamination where the removal of material might give rise to hazards during the construction and any potential issues arising from the disposal off-site of material excavated from the trackbed.

A qualitative ground quality assessment has been carried out using a source-pathway-receptor methodology. The starting point was to obtain and review existing information and to carry out a walkover of the route. Possible disturbance of contaminated land was regarded as the main impact that needed assessment; therefore, part of the review included the identification of potential contaminant sources in the vicinity of the route. These were then assessed to determine whether the construction of the route would disturb these areas, and whether such land would have an impact on the construction of the route.

Data Sources

The following sources of information were consulted during this assessment:

- Current and historic topographic mapping
- Geological and hydro-geological mapping
- Borehole records for the route or other previous construction activities in the vicinity
- Previous contamination surveys

- Environmental Protection Agency data:
 - landfill sites or other waste activities
 - pollution or contamination records
 - nearby IPC installations
 - environmental quality of nearby watercourses
- Local authority data:
 - recorded environmental health complaints
 - environmental quality of nearby watercourses
 - water abstractions within the vicinity of the alignment
- Interviews with local people in the area.

The geology of the area through which the Luas Line B1 alignment passes has been determined from the Irish Geological Survey Sheet 16 (Geology of Kildare-Wicklow). The geology comprises granites of the Northern pluton. They are overlain by glacial deposits, with alluvial deposits being present in streams. Made ground and reworked natural soils and fill are also likely to be present in specific areas along the alignment.

5.3.3 CRITERIA FOR RATING OF IMPACTS

The following criteria have been defined to rate the scale of an impact on the soil environment, arising from the construction and operation of the Luas B1 alignment.

Significant:

An impact that would result in a permanent unacceptable effect on human health, building materials or the environment. A significant impact is deemed to carry the same weight as a significant effect as referred to in the EU Directive on Environmental Assessment.

Moderate:

An affect that would result in a temporary unacceptable impact on human health, building materials or the environment.

Slight:

Localised effects which can readily be investigated and/or

designed out in the construction process, or by the disposal of contaminated but non-hazardous spoil in accordance with statutory provisions.

5.3.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

Following remedial and reductive measures, no likely and significant impacts are predicted with regard to soil during the construction phase.

Operational Phase

No likely and significant impacts are predicted with regard to soil during the operational phase.

5.4
Water



5.4.1 INTRODUCTION

This section considers the impacts on the Water environment arising from the construction and operation of the Luas Line B1 alignment. Detailed analyses are provided in Chapter 7 on an Area by Area basis. This section describes and assesses the extent of potential impact of Luas Line B1 on surface waters and hydrogeology during the construction and operational phases.

5.4.2 METHODOLOGY

Existing information was obtained and reviewed relating to the use, quality and sensitivity of streams and rivers along the route, and the hydrogeology in the area. A walkover of the route and visual inspection of the water courses was also carried out. The potential impacts from construction and operation of the Luas Line B1 alignment were then assessed in relation to the potential for flooding, spillage to watercourses, increase in sediment load to water courses, local derogation of surface waters and aquifers due to contaminant migration, and alteration of groundwater flows.

5.4.2.1 DATA SOURCES

Data that was collected for the assessment included information on the surface water hydrology, land drainage, flooding, surface water quality, aquatic fauna and flora, hydrogeology and groundwater quality and water abstraction licenses. This information was obtained from the EPA, Dun Laoghaire Rathdown County Council, and the Geological Survey of Ireland.

Surface Water

The Luas Line B1 alignment crosses the Racecourse Stream twice, the Carrickmines River once and also runs alongside a minor tributary of the Carrickmines River, flowing within the cutting of the Former Harcourt Street Railway (FHSR) These watercourses are detailed below:

The Racecourse Stream rises at Murphystown Road and

drains ornamental ponds at *Glencairn* and Leopardstown Park Hospital. It is culverted for a significant length under Leopardstown Racecourse before draining as an open stream to join the Glenamuck Stream near the Glenamuck Road.

The tributary of the Carrickmines River flowing within the cutting of the FHSR rises around 20m west of the Glenamuck Bridge and flows beneath the Glenamuck Bridge to join the Carrickmines River just prior to the Brennanstown Stop. This stream is culverted just south of Brennanstown Vale.

The Carrickmines River is fed by a number of tributaries including amongst others, the Racecourse Stream, Ballyogan Stream and Glenamuck Stream, which converge just west of Carrickmines. The Carrickmines River drains the Carrickmines valley from Carrickmines to a point north of Cherrywood where it joins the Shanganagh River at Loughlinstown.

A number of specific studies have been carried out on the watercourses in the area, including river catchment study work carried out in 1996/97 for DLRCC in connection with the

Guide to Q ratings

Q1 and Q2 *seriously polluted*

Q3-4 *slight pollution*

Q2-3, Q3 *moderately polluted*

Q4 and Q5 *unpolluted*

Note

The River Catchment Study (1997) has recommended that water quality objectives of Q3-4 be adopted for potential salmonid rivers. Therefore, in the future, the Statutory local authorities may adopt a water quality objective for the Carrickmines River of Q3-4. Planned developments may have to take this into account.

SEM, and studies specifically for the SEM EIS. A summary of relevant information on the Carrickmines River and the Racecourse Stream is given in Table 5.4.1.1.

Water resources in the route corridor

The Luas Line B1 alignment crosses deposits generally considered as non-aquifers. Dublin's potable water supply is obtained from upland gathering grounds and not from underground supplies.

Groundwater storage can occur in the weathered horizons of the granite and well yields of up to 100 to 200m³/day can be obtained. It is understood that although a number of properties in Laughanstown (between Cherrywood and Carrickmines) previously obtained potable water supplies from private licensed abstractions, all such properties are now in the process of being connected to the mains water supply. All remaining properties along the Luas Line B1 alignment are already connected to the mains water supply. A trial well in this area (1994) found 40m of black stony clay over 15m of mixed sands and gravels, over fractured granite, which indicated potential sustainable potable yields of

220m³/day. Should, in future, this water resource be used, it is separated from the Luas Line B1 alignment formation level by over 40m of impermeable clays.

Flooding Information

Flooding has not been reported as a concern on the route of Luas Line B1. It is an issue on one part of the Ballyogan River and downstream of the Carrickmines River. The Local Authority's study into the catchment was aimed partly at understanding the cumulative impacts that development of the region would have on the drainage capacity. The Local Authority have plans for changing the drainage characteristics of the Ballyogan Stream – providing more storage capacity. The Luas Line B1 impact is a very small part of the cumulative impact.

General characteristics of the Luas trackbed

The Luas Line B1 alignment generally runs along surface level requiring a normal maximum construction trench of some 800-1200mm in depth. Deeper excavations may be required to enable public utilities service diversions, and the

Table 5.4.1.1 Water quality and habitat of streams and rivers

Watercourse	Water Quality by Q values.			Habitat	
	EPA Q Ratings (2003)	EPA Q Ratings (2000)	DLRCC Ratings (1997)	SEM EIS (Surveys 1996/97)	SEM EIS (surveys 1996/97)
Racecourse Stream	No data	No data	2, 2-3, 3 Moderate pollution with local serious pollution indicated at Glencairn, just downstream of new bridge crossing.	3	No trout recorded. Does not comprise a useful trout habitat.
Carrickmines River	3	3	3, 3-4	3, 3-4. Slight to moderate pollution	No trout recorded but section has very high quality river habitat with spawning, nursery and adult potential.



insertion of certain Luas ancillary structures such as substations.

There are three watercourse crossings. The two Racecourse Stream crossings will be on new bridge constructions. The crossing of the Carrickmines River will be on the existing bridge structure. The Luas Line B1 alignment shall also be constructed along the former Harcourt Street Railway (FHSR), which shall run directly adjacent to a tributary of the Carrickmines River flowing from near to Glenamuck Bridge to within the vicinity south of Brennanstown Vale where it then flows within a culvert.

Where the track runs on or adjacent to existing roads, discharges of surface water from the Luas trackbed will be to the existing or upgraded highway drainage system. Where the alignment runs across open land a new drainage system will be built; in cuttings this will involve the use of filter drains. In this way all rainfall will be collected and discharged to the streams in the vicinity of the route. At the planned park and ride facility at Carrickmines, provision will be made for positive drainage for storm water from hard surfaced areas via Class 1 interceptor traps. Drainage plans will be to the requirements of the Dun Laoghaire-Rathdown County Council. A regular maintenance programme for the traps will ensure that releases of hydrocarbons to surface waters do not occur. It may be necessary to pump surface water and groundwater inflows from the lowest basement level (60.00mOD) of the 350 space two level Park and Ride facility at Carrickmines. These flows will be minor as the surface runoff will be drained by gravity at the underside of the upper level slab.

Sustainable Urban Drainage Systems (SUDS)

Sustainable urban drainage is a concept that includes environmental and social factors in decisions about drainage. It takes account of the quantity and quality of runoff, and the amenity value of surface water in the urban environment. Many existing urban drainage systems can cause problems of flooding, pollution or damage to the environment and are not proving to be sustainable. Sustainable Urban Drainage Systems (SUDS) are designed to manage surface water runoff in a more sustainable way than traditional drainage

systems. They provide more natural approaches to runoff management and, when incorporated into developments, help to prevent increases in flood or water pollution risk downstream of the development. They can also provide direct improvements to amenity and biodiversity. They may also allow new development in areas where existing sewerage systems are close to full capacity, thereby enabling development within existing urban areas.

SUDS are made up of one or more structures built to manage surface water runoff. They are used in conjunction with good management of the site, to prevent flooding and pollution.

There are five general methods of control:

Prevention: Site management, including minimising paved or directly connected areas, can significantly reduce quality and quantity problems, and can provide improved amenity.

Filter strips and swales: Filter strips and swales are vegetated surface features that drain water evenly off impermeable areas. They mimic natural drainage patterns by allowing rainwater to run in sheets through vegetation, slowing and filtering the flow.

Permeable surfaces and filter drains: These devices have a volume of permeable material below ground to store surface water. The water passes through the surface to the permeable fill. This allows the storage, treatment, transport and infiltration of water.

Infiltration devices: These devices, including soakaways, infiltration trenches and infiltration basins as well as swales, filter drains and ponds, drain water directly into the ground. Infiltration devices work by enhancing the natural capacity of the ground to store and drain water.

Basins and ponds: Basins are areas for storage to surface runoff that are free from water under dry weather flow conditions, and include Flood plains, Detention basins and Extended detention basins. Ponds contain water in dry weather, and are designed to hold more water when it rains. They include Balancing and attenuation ponds, Flood storage reservoirs, Lagoons, and Wetlands.

Table 5.4.1.2 Severity of Impact of Development on Water

Type of Impact	Scale of Impact	Site specific threshold of impact	Level of severity	Severity threshold
Pollution to Watercourses	Applies to all scales: significant, moderate and slight	No minimum threshold; derogation of water quality in any water course is considered to be an impact	Low	Any Class C,D* or unclassified watercourse
			Medium	Any Class B* watercourse
			High	Any Class A *watercourse
Derogation to either a major or minor aquifer	Applies to all scales	Causing disturbance in ground within <6m thickness of strata overlying an aquifer	Low	Within <6m thickness of strata overlying aquifer
			Medium	Within unsaturated zone of aquifer
			High	Within saturated zone of aquifer
Causing or exacerbating flooding	Applies to all scales	No minimum threshold; flooding of any land is considered to be an impact	Low	Flooding affecting agricultural land
			Medium	Flooding affecting roads and infrastructure
			High	Flooding affecting buildings
Derogation to any natural discharge or abstraction for water supply	Applies to all scales	No minimum threshold	Low	Reduction of any natural discharge (stream baseflows or spring/seepage zones)
			Medium	Any public or private source abstracting <1Ml/day
			High	Any public or private source abstracting >1Ml/day

Class A – unpolluted;
 Class B – slightly polluted;
 Class C – moderately polluted;
 Class D – seriously polluted



SUDS can be designed to function in most urban settings. The variety of design options available allows designers and planners to consider local land use, landtake, future management and the needs of local people when undertaking the drainage design, going beyond simple drainage and flood control. The range of options means that active decisions have to be made that balance the wishes of different stakeholders and the risks associated with each option. Where appropriate the construction and operation of the Luas Line B1 alignment will have reference to the principles of SUDS.

5.4.3 CRITERIA FOR RATING OF IMPACTS

The following criteria have been defined to rate the scale and severity of an impact on the Water environment, arising from the construction and operation of the Luas Line B1 alignment. The scale of the impact is defined as follows:

Significant

Changes which would result in a permanent alteration to the quality or status of the water, major culverting and works affecting licensed abstraction points. A Significant impact is deemed to carry the same weight as a significant effect as referred to in the EU Directive on Environmental Assessment.

Moderate

Temporary changes which affect the aquatic environment, e.g. construction works, piling or dredging.

Slight

Localised effects which can readily be investigated and/or designed out in the construction process.

The level of severity is defined for different types of Water impacts in the Table 5.4.1.2:

5.4.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

With the implementation of remedial measures, no likely and significant impacts are predicted during the construction stage.

Operational Phase

No likely and significant impacts are predicted during the operation of the Luas B1.



5.5.1 NOISE

5.5.1.1 INTRODUCTION

This section of the EIS considers the impacts on the environment of noise arising from the construction and operation of Luas Line B1. Detailed analyses are provided in Chapter 7 on an Area by Area basis. An account of the methodology adopted in considering the potential impact on the Noise environment and the criteria for rating of impacts is set out below.

5.5.1.2 METHODOLOGY

The Luas system comprises an electrically powered surface based public transport service. Noise generation will occur both during construction and during operation of the service. Noise may potentially cause disturbance at sensitive receptors, such as residences, schools and hospitals. Uses which are of moderate sensitivity include offices and retail areas and low sensitivity uses include industrial areas and open amenity spaces. These activities are less likely to experience impact in terms of noise.

The noise levels likely to be generated at particular locations are predicted by calculation. Measured noise levels refer to a receptor point 1 metre outside the facades of buildings. Ambient noise levels and noise during construction are rarely steady and typically these vary from moment to moment.

The parameter used to describe the noise is L_{Aeq} , which is the equivalent continuous noise level measured in dBA. The L_{Aeq} is a notional noise level which contains the same amount of noise energy over an interval of time as the fluctuating noise level. The dBA level gives an indication of the loudness response of the human ear.

Typical L_{Aeq} levels for a sample of noise environments are set out below:

L_{Aeq} Level	Noise	Environment
Less than 30	dBA	Very quiet rural area at night.
30 - 40	dBA	Quiet suburban area, (away from major roads) at night.
40 - 50	dBA	Quiet suburban area during daytime.
50 - 60	dBA	Suburban area (proximate to major roads) during daytime.
60 – 70	dBA	Urban area/city centre with heavy traffic during daytime.

Along the Luas Line B1 alignment, the receiving noise environment was measured at a number of representative locations. These locations allow for a sample indication of the receiving environment in each Area.

Four samples of fifteen minutes duration were taken at each chosen location. Where practical, the microphone was placed one metre from building facades. The samples were analysed to yield the equivalent continuous noise level (L_{Aeq}) and the percentile levels LA10 and LA90, which are the noise levels in dBA equalled or exceeded for 10% and 90% of the sample time. The maximum noise level at L_{Amax} was also measured for each sample. The instrumentation used was a Bruel and Kjaer Precision Integrating Sound Level Meter: type 4136. This was calibrated using a Bruel and Kjaer Calibrator: type 4230.

The predicted construction phase noise levels recorded in this EIS, are based on published and measured data.

The predicted noise levels during the operation of the Luas Line B1 alignment are based on measurements of the Luas Green and Red Line in operation and international experience of the consultant and also by reference to the HMSO publication, "Calculation of Railway Noise 1995"

5.5.1.3 CRITERIA FOR RATING IMPACTS

Noise generated by the construction process will be of a temporary nature and is expected to be intermittent in form. Because of this, higher levels of noise during construction can be tolerated by the population. The scale of impact is generally more greatly influenced by acceptance of the new absolute noise level rather than by a change in noise level.

Construction Noise Levels - Impacts of L_{Aeq} , 12 hour

Noise level	Rating
Less than 55 dBA	Negligible
55 to 65 dB	Slight
65 to 75 dBA	Moderate
greater than 75 dBA	Significant

Operational Noise Levels - Impact is related to the extent to which L_{Aeq} , 18 hours is exceeded due to operation over pre-existing ambient L_{Aeq} level

Noise level	Rating
0 to +5 dBA	Slight
+5dBA to +10 dBA	Moderate
greater than +10 dBA	Significant

There is some overlap in these ranges as the smallest change in noise levels that people can detect is 2 to 3dBA. In addition, cognisance has to be taken of the absolute noise level since human tolerance to a change in noise levels is greater from a lower base.

5.5.1.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

The predicted impact in general along the alignment varies from slight to significant. Leopardstown Park Hospital would be a sensitive location for noise impact, although this would be short-term and intermittent and would be similar to that which occurs during laying and general maintenance works associated with public utilities. Full details of specific impacts is set out in Chapter 7 of this EIS.

Operational Phase

The predicted operational impact overall varies from none to slight and moderate. Full details of specific impacts is set out in Chapter7 of this EIS.

5.5.2 VIBRATION

5.5.2.1 INTRODUCTION

This section discusses the impacts on the environment due to Vibration arising from the construction and operation of the Luas Line B1 alignment. Detailed analyses are provided in Chapter 7 on an Area by Area basis. It describes and assesses the extent of potential impact of the Luas Line B1 alignment both during the construction and operational phases. An account of the methodology adopted in considering the potential impact on the Vibration environment and the criteria for rating of impacts is set out below.

5.5.2.2 METHODOLOGY

The Luas Line B1 alignment may give rise to vibration during the construction and operational phases which could be transmitted via ground to adjoining land uses. In the case of any sensitive receptors such as residences, schools and hospitals in the vicinity of the route alignment, this could potentially lead to an impact on persons and to building structures.

Vibration is described in terms of:

- acceleration in units of metres per second squared. (m/sec²); or,
- particle velocity in units of metres or millimetres per second. (m/sec or mm/sec).

The root mean square (rms) or the peak values of these parameters are used as appropriate.

Vibrational impacts are assessed by reference to the absolute level of vibration generated in relation to established criteria. In general, the level of acceptability of vibration to persons is just above the level of perceptibility. The criteria adopted for possible disturbance to people in their homes is that set out in Annex A, Table 2 of International Standard 2631-2 "Evaluation of Human Exposure to Whole-Body Vibration Part 2: continuous and shock induced vibration in buildings" (1 to 80Hz). The criteria for the possible onset of cosmetic damage to buildings (i.e. slight cracking of plasterwork) is the German Standard DIN 4150.

The perception threshold of vibration by persons is a peak particle velocity level of about 0.28 mm/sec. The possible onset of cosmetic damage to flats and houses is a peak particle velocity of 5mm/sec. A lower threshold of 3mm/sec can apply to sensitive buildings. During construction, vibration impacts are temporary and intermittent. Human tolerance increases to this type of activity where it is known that the works are intermittent, short term and will be completed to a reasonable timeframe. For example, normal road works including surface breaking activities may create vibration levels of 1mm/sec to 2mm/sec. However, due to the typical short term nature of these works, the general understanding of requirement for such activity, the population can tolerate these vibration levels within reason.

The propagation of vibration through the ground is extremely complex. There are no national or international standards dealing with this aspect. Vibration data gathered from existing LRT systems are used in the design of vibration isolation of the rail and trackbed to achieve the required criteria. The consultant has acquired extensive data on

vibration relating to comparable LRT systems, over the last 10 years.

Existing vibration levels were measured at 24 locations along the entire Luas Line B1 alignment. A comparatively low level of vibration is created by the passage of road vehicles along existing roadways, as these vehicles have pneumatic tyres. This level of vibration is generally imperceptible.

5.5.2.3 CRITERIA FOR RATING OF IMPACTS

Criteria for the rating of impacts are set out below. These are broad ranging and relate to two separate elements; impact to persons; impact to buildings. Any structural impact to a building would evidently be a significant impact. It should be noted that existing vibration levels transmitted to adjoining properties due to road traffic in the area of the Luas Line B1 alignment, are extremely low and are significantly below the level of perceptibility.

Rating	Description
Slight	Persons
	Compliance with criterion for human perceptibility with none or barely perceptible levels of vibration.
	Buildings
	No potential damage to buildings.
Moderate	Persons
	Double exceedance of criterion for humans with vibration levels perceptible
	Buildings
	No potential damage to buildings.
Significant	Persons
	Quadruple exceedance of criterion for residences with very clearly perceptible levels of vibration and lengthy duration of vibration activity.
	Buildings
	Exceedance of criterion levels for protection of buildings

5.5.2.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

During the construction phase, vibration will arise. The scale of impact varies throughout the Luas Line B1 alignment from negligible to slight to moderate. Full detail is set out on an Area by Area basis in Chapter 7 of this Environmental Impact Statement.

Operational Phase

The level of vibration arising from the operation of the Luas Line B1 alignment will meet the criterion for residential properties both day and night set out in Annex A, Table 2 of the International Standard 2631-2 "Evaluation of human exposure to whole body vibration, Part 2: continuous and shock induced vibration in buildings (1 - 80 Hz)". This will result in a neutral impact. The vibration criterion set out above will be designed into the track and track-bed system as well as in the trams themselves so as to ensure that the criterion set down are met. A negligible impact overall is predicted.

5.5.3 LIGHTING

5.5.3.1 INTRODUCTION

This section describes the methodology used for an assessment of the Luas Line B1 alignment with regard to Lighting. The criteria adopted for the rating of impacts is also set out. Full detail on an Area by Area basis is set out at Chapter 7 of this EIS.

5.5.3.2 METHODOLOGY

The methodology used by the specialist consultant responsible for lighting, in the study was as follows:

- Assessment of the Luas Line B1 alignment plans.
- Assessment of the receiving environment. This comprised



walking the proposed Luas Line B1 alignment where possible during daylight hours, and also by night to observe the existing public lighting system in operation.

- Appraisal of the proposed system in accordance with BS 5489, Part 1, 1987 and the current recommendations of the Chartered Institute of Building Services.

5.5.3.3 CRITERIA FOR RATING OF IMPACTS

Impacts on the Lighting environments during the construction and operational phases of the LUAS Line B1 alignment have been rated on the following basis:-

Significant

Where the proposed level of public lighting would be less than the present level, or if the new lighting installation would result in permanent inconvenience, such as causing glare, or where a new lighting regime improves the lighting environment.

Moderate

Where an occurrence of the above phenomena takes place on a temporary basis during the Construction Phase.

Neutral/Slight

Where no perceptible/just perceptible alteration to the present level of public lighting occurs.

5.5.3.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

The night-time lighting of construction sites will be facilitated through the use of low angle lighting with an average of approximately 25 lux, which concentrates the light beams downwards, thereby minimising the impact of night-time light disturbance to local properties. This will have a temporary impact, though this is not predicted to be significant.

The proposal will not have any significant adverse impact on the natural lighting along this route section. It is anticipated that, as in other similar systems, persons will quickly become accustomed to infrequent flashing and sparking from the



Luas overhead lines, such that its intrusion will not be a significant adverse impact. The provision of any public lighting associated with the planned upgrading of the local road network in the vicinity of Ballyogan will be to the requirements of the Local Authority.

5.5.4 ELECTROMAGNETIC ASPECTS

5.5.4.1 INTRODUCTION

This section considers the potential for electromagnetic interference (EMI) on existing receptors and potential impacts from stray currents arising from the construction and operation of Luas Line B1. A methodology for considering this environmental aspect is set out, along with an assessment of impacts. Full detail on an Area by Area basis is set out in Chapter 7 of this EIS.

The main known effect of electromagnetic interference is on telecommunications equipment. Effects are also possible on sensitive receptors, listed in the European Directive on Electromagnetic Compatibility, Annex III, such as scientific equipment, pacemakers, recording studios and trading floors etc.

Another aspect of the EMC is that leakage of return current can cause stray currents in the ground which can lead to corrosion of metal pipes and other ground embedded metal structure and metal sheathed cables (see below).

Electromagnetic Currents

Electromagnetic currents (EMC) emissions have generally not been a problem with railway and tramway operation. EMC emissions may be generated by either the DC traction power supply system (i.e. fixed infrastructure - such as electrical sub stations and the overhead current collection system along the route) which creates a static magnetic field, or by AC emissions generated by the switching of DC current at high frequencies within the propulsion system onboard the trams.

Where emission problems have been experienced on other light rail systems, these were principally related to the switching of the DC supply onboard the propulsion units. Identified emission problems of this type have been resolved by careful design and specification.

Tram-bourne equipment and infrastructure power supply systems will be designed to conform to European Union (EU) Directive 89/336/EEC. Technical requirements will conform to European Standard EN 50121.

Whilst it is not possible to design against all potential levels of interference in every case, where the magnitude and frequencies of the adjacent electrical appliances are known, good engineering practice and appropriate specification of the propulsion equipment will ensure that the potential for interference is overcome by specifying limits on the EMC emissions produced. This applies to both modern and older types of electrical appliance and most of the standards and directives currently in force should cover the majority of eventualities.

The influence of EMC interference dissipates quickly at a ratio based on the square of the distance from the line. The precise distance at which the dissipation is complete will depend on the sensitivity of individual receptors and therefore is difficult to define precisely. However, as a general guide, receptors further than 10 metres from the centre line of the nearest tramway should not be affected by EMC interference.

With modern traction equipment, such as that in use on the Luas system, which is in compliance with current EMC standards, adjacent household equipment should generally be immune from interference.

Stray Currents

Stray Currents may be generated from a number of sources, including industrial premises and any un-insulated or poorly designed and/or poorly maintained tramway track-bed. Corrosion of the ground embedded metal may take place at the point of metal discontinuity dependent on earthing arrangement.

5.5.4.2 METHODOLOGY

Electromagnetic Currents

The approach to the assessment of Luas with regard to electromagnetic aspects, involves the consideration of previous experience in relation to other LRT systems and a full review of the route in terms of potentially sensitive receptors identified in Annex III to the European Directive on Electromagnetic Compatibility (89/336/EEC). These are:

- domestic radio and television receivers industrial manufacturing equipment
- mobile radio equipment
- mobile radio and commercial radio telephone equipment medical and scientific apparatus
- information technology equipment
- domestic appliance and household electronic equipment aeronautical and marine radio apparatus
- educational electronic apparatus
- telecommunication networks and apparatus
- radio and television broadcast transmitters
- lights and fluorescent lamps

The Luas Line B1 alignment has been appraised for potentially sensitive receptors and land users, and discussions will need to be held with interested parties. These parties include the Utility Operators such as Gas, Water Supply, etc. including hospitals, telecommunications providers, as well as with any relevant private companies in the vicinity of the alignment.

On the Luas Line B1 alignment, the route runs along ESB High Voltage ground embedded cables and crosses the ESB High Voltage pylons.

The route also runs with in close vicinity of the FAAC

Electronics Ltd and Leopardstown Park Hospital. Where interface issues are of concern discussions will be held with other parties with the aim of special design provisions to be included, where necessary, to mitigate stray current or EMC issues.

Stray Currents

Sensitivity to stray currents will be discussed with the ESB and other utility companies.

5.5.4.3 CRITERIA FOR RATING OF IMPACTS

The rapid rate of decay of electromagnetic fields with the square of the distance from source to receptor, together with the likelihood of interference effects ceasing at 10 metres, are key determinants in an assessment of potential electromagnetic effects. However, the absence of specific electromagnetic detail of the rolling stock for the Luas Line B1 alignment, makes it difficult for a more detailed appraisal at this stage. Similarly the differing effects on sensitive receivers according to the nature of the apparatus, and the frequency of operation make the identification of definitive assessment criteria inappropriate at this time. Rather it is to be noted that there are very specific remedial and reductive measures in compliance with European and other international standards to ensure the electromagnetic compatibility of light railway installation. Thus potential adverse impacts can be resolved by mitigation.

Stray Currents

An appraisal of the sensitivity of utilities to stray currents will be undertaken by the Utilities Technical Group, which includes the responsible authorities for various service pipes and cables. This Group will be undertaking a comprehensive survey including ground investigation, to locate the position of all utilities in relation to the future Luas Line B1 alignment. When complete, this data will be made available to relevant Consultants responsible for assessment of Electromagnetic Aspects. The identification of the sensitive runs of utilities in relation to the trackbed, and preliminary site investigations to confirm the location of utilities will allow a clear identification of proximity distances. These distances will dictate whether it is necessary to protect particular pipes. The individual utility

authorities will specify the criteria for the protection measures necessary for their installations.

Data Sources

Data on the location of the most likely sensitive receptors have been obtained by means of a general survey and inspection of the Luas Line B1 alignment, though this has not incorporated a property by property assessment, and also from individual sources and through the Luas Utilities Technical Group. Professional advice has also been provided by Semaly in Lyon, France and Mott MacDonald in Croydon, U.K. from their LRT experience.

Mitigation Measures in Design

Electromagnetic currents can be mitigated through the technical design of the Luas Line B1 rolling stock. The selected manufacturer will follow standards such as European Norm. EN 50121 (1 to 5) to ensure electromagnetic compatibility. EN 50121 when fully implemented will require compliance to defined standards for electromagnetic compatibility for all apparatus involved in the operation of Luas Line B1. The B1 alignment will be constructed to meet the requirements of the EU Directive on Electromagnetic Compatibility (89/336/EEC). The circuit made up by the rectifier station, the overhead line, the rolling stock, and the track generates an electromagnetic field. During the initial tests of the rolling stock, the harmonic currents in the installations will be measured to check that the filters are performing correctly.

In respect of stray currents, any potential risk where identified, can be mitigated by various measures including increasing the insulation between the rails and the ground, moving pipes to a safe distance from the rails; use of non-metallic materials wherever possible, insulating pipes if needed, and by installing measuring equipment at sensitive points.

Bridges and other major structures along the route will be protected by special design features to be incorporated in the infrastructure design.

5.5.4.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

No likely and significant impacts are predicted during the construction phase. Overall the impact is predicted to be neutral.

Operational Phase

No likely and significant impacts are predicted during the operation of the Luas Line B1 alignment.





5.6.1 INTRODUCTION

This section of the EIS examines the issue of Air Quality arising from the construction and operation of Luas Line B1. Detailed assessments are provided in Chapter 7 on an area by area basis. A description of the existing air quality in the South Dublin suburbs, followed by a methodology for the assessment procedure and rating of air quality impacts is set out below.

5.6.2 EXISTING AIR QUALITY

The route of Luas Line B1 may be divided into three sections for the purpose of describing the existing ambient air quality. The first section is the industrial and commercial estates at Sandyford and along Leopardstown Road, the second is the section through Murphystown and Ballyogan Road and the third is the remainder of the line between Carrickmines to Cherrywood. This third section mainly runs along the disused former Harcourt Street Railway line or agricultural land. The air quality in the first section largely reflects the combined impact of atmospheric emissions from traffic and industrial/business park developments. For the second section, the existing air quality is primarily determined by emissions from local road traffic and domestic heating requirements.

The air quality in the Sandyford/Leopardstown area is rated as satisfactory with concentrations of sulphur dioxide, nitrogen dioxide, benzene, carbon monoxide and particulates (PM₁₀) below the current and future National Air Quality Standards (NAQS) contained in the Air Quality Standards Regulations 2002 (SI No 271 of 2002). Levels of air pollutants in the area have declined dramatically since the end of the 1980's. This is due to the major change in fuel usage patterns within the domestic sector following the ban on the sale of bituminous coal throughout Dublin since 1990, (Marketing, Sale and Distribution Regulations 1990-1993). Solid fuel has been largely replaced by natural gas throughout extensive parts of these suburbs. New housing developments in the area use natural gas as the primary fuel for heating.

The principal source of atmospheric emissions is from traffic, with a background contribution due to emissions from housing and miscellaneous sources. Immediately adjacent to the main roads in the area, such as Leopardstown Road and through Sandyford Industrial estate, elevated levels of nitrogen oxides, hydrocarbons, carbon monoxide and particulates may be measured. These are a major component of motor vehicle exhausts. Sandyford Industrial estate is mainly occupied by warehousing, service distribution centres and software technology companies, which are primarily heated with natural gas and so atmospheric emissions from these premises will be low.

Ambient levels of air pollutants would be substantially below the NAQS within the other two sections of the Luas Line B1 alignment. In the residential areas near Ballyogan Road there are no major sources of air pollutants with the main contribution from vehicles travelling along the local road network. In the outer suburbs from Carrickmines to Cherrywood, ambient concentrations of air pollutants would be close to background levels beyond the roadside.

Motor vehicles are a major source of atmospheric emissions thought to contribute to Climate Change. In 1997 the Kyoto Protocol set targets for developed countries to achieve a reduction in emissions of the main greenhouse gases by 2008-2012. In the case of the EU member States as a whole, an 8% overall reduction in emissions from 1990 levels was agreed. Under this arrangement, Ireland agreed to limit an increase in its greenhouse gas emissions to 13% above the 1990 levels in the period 2008-2012. Ireland has already reached the 2010 growth limitation target of 13% for a combination of greenhouse gases. As a consequence, an ambitious target to reduce National greenhouse gas emissions by over 20% within the next decade has been set under the National Climate Change Strategy. A report on the Limitation and Reduction of CO₂ and other Greenhouse Gas Emissions in Ireland, published by the Department of the Environment and Local Government, noted that the continuing National economic growth has also lead to increasing levels of ownership and usage of private vehicles.

A number of policies are proposed to reduce vehicle

emissions including a modal shift from private cars to public transport. The Luas Line B1 alignment will provide an alternative mode of public transport for commuters from this part of the Dublin conurbation into the city. Lower car usage will reduce exhaust-pipe emissions, including carbon dioxide, and so the operation of Luas will contribute to meeting the National Objectives on Climate Change.

5.6.3 METHODOLOGY

The methodology used to assess the likely impact of Luas Line B1 on the air quality of the area has been based on examining the route details in relation to proximity of track-bed to housing and other private properties that may be affected during the construction phase, land-use type through which the route passes and projected traffic flows on adjacent roads. These projections were obtained from the traffic impact study undertaken for this EIS in relation to the 2016 'With Luas' and 'No Luas' operating scenarios.

5.6.4 CRITERIA FOR RATING OF IMPACTS

5.6.4.1 CATEGORIES OF IMPACT ON AIR QUALITY

Positive Impacts

Luas B1 is effectively pollution-free and will provide an alternative mode of transport for traveling into Dublin to private car use. Its operation will result in a reduction in cars and lower vehicle emissions, in particular during peak commuter periods. This will contribute to an improvement in overall air quality for the area.

Negative Impacts

During the construction of the track-bed, Luas stops and ancillary activities major works are required which will generate emissions of dust, PM₁₀ and gaseous air pollutants. Where significant excavation and removal of

material is necessary or where importation of material to construct ramps for overbridges is required then this can result in a local short-term increase in dust and PM₁₀ levels. This potential for emissions of dust and PM₁₀ can lead to material being deposited on adjacent roadways or create a local nuisance at nearby houses or other properties unless adequately controlled. The magnitude of negative impacts during the construction phase can be controlled and reduced by effective site management.

Neutral Impacts

The provision of Luas Line B1, both in terms of construction and operation may not significantly alter the air quality along certain parts of the route. This is particularly the case where the Luas B1 alignment follows the former Harcourt Street Railway or runs along undeveloped ground. For these sections of the route the impact may be defined as neutral.

Significant Impacts

A significant impact during the construction phase is where dust and PM₁₀ emissions are affecting local properties at such magnitude that it will result in regular complaints. An increase in air pollutant concentrations is observed that results in ambient levels near or exceeding National Air Quality Standards. Dust deposition rates at nearest houses or other sensitive receptors would be over 150 mg/m² per day, expressed as a monthly average.

Moderate Impacts

A moderate impact is a noticeable increase in dust and PM₁₀ emissions during the construction phase. An increase in air pollutant concentrations is observed that results in ambient levels of air pollutants within 25% of the National Air Quality Standards. Dust deposition rates at nearest houses or other sensitive receptors would be over 100 mg/m².per day, expressed as a monthly average.

Slight Impact

Slight impacts during the construction phase occur where control measures are implemented that are effective in ensuring that air emissions do not result in any observed change likely to affect the sensitivity of the local ambient air quality. This may be where the surface of adjacent roadways



are kept clear of silt and mud or where the impact at the nearest properties do not result in changes in the amenity value of open spaces or significant deposition of dust on surfaces. Observed rates of dust deposition at sensitive receptors would be within 25% of background levels for the area.

5.6.5 SUMMARY OF PREDICTED IMPACTS

5.6.5.1 CONSTRUCTION PHASE

With the planned remedial measures, any impact on air quality in terms of dust deposition rates and airborne particulates (PM₁₀) will be slight. No significant impacts are predicted at existing housing and other properties adjacent to the Luas B1 alignment.

5.6.5.2 OPERATIONAL PHASE

The alignment runs along undeveloped ground along most of its length and so the impact on air quality from the operation of Luas Line B1 is predicted to be neutral at properties adjacent to the route.

The provision of Luas Line B1 will provide an alternative transport mode option for commuters into Dublin and so help to reduce the number of car-trips within the southeastern suburbs of the conurbation. Lower car usage in the area due to improved public transport will have a positive impact in helping to reduce road vehicle emissions. This will contribute to an improvement in local air quality within the area.

5.7 Landscape & Visual Impact



5.7.1 INTRODUCTION

The purpose of this section is to detail the impacts on the urban townscape and landscape, and the nature and extent of measures to alleviate these. It also details the methodology used to determine the qualities of the landscape and townscape of the route corridor. A similar exercise is undertaken to assess the visual impact of the proposed development, and the impact on trees along the alignment corridor. Full detail of these elements is set out in Chapter 7 of this EIS.

5.7.2 LANDSCAPE

5.7.2.1 METHODOLOGY

The methodology is based on an analysis of the relevant factors which give the physical environment its visual character. Sieve mapping has been used to illustrate patterns and configurations of the landscape and townscape.

Remedial action has been recommended in two forms. Primary mitigation includes those measures which fall within the remit of the project and will be carried out by appointed contractor. Secondary mitigation covers the treatment of certain areas, contiguous to the line insertion, where recommended mitigation is outside the specific remit of the Luas Line B1 alignment and which would be executed by other parties.

Analysis of the Luas Line B1 alignment landscape/townscape has been carried out at a detailed level as the morphology of the urban fabric can change quite dramatically over short distances. The analysis headings considered to be most relevant are:-

- contiguous land uses,
- pedestrian and vehicular circulation patterns,
- built form characteristics,
- enclosure.

The land uses provide an indication of the scale and grain of the townscape through which the route passes and they are mapped as:

- institutional,
- commercial,
- industrial,
- residential,
- public open space,
- formal open space,
- significant private open space,
- derelict landscape,
- urban dereliction,
- natural features e.g. water.

In addition to the sieve mapping outlined above, a synthesis of all the factors analysed is provided to illustrate the coincidence of relationships between the various urban patterns, areas of overlap and areas of potential conflict.

5.7.2.2 CRITERIA FOR RATING IMPACTS

A listing of broad criteria for the rating of impacts on landscape and townscape of the Luas Line B1 alignment is set out below:-

Profound

A profound impact is where an area of townscape, including open space, is obliterated, such as the destruction of a public garden or forecourt. It also applies to the complete townscape transformation of a location such as landscaping of an existing derelict area as a public open space.

Significant

A significant impact is where the character of the Luas Line B1 alignment dominates the character of the route corridor through which it passes; where an element or elements of Luas Line B1 physically affect on a contiguous townscape; or where the insertion of Luas Line B1 will alter a piece of high amenity landscape or townscape.

Moderate

A moderate impact is where the scale of the route corridor can comfortably accommodate the scale of the line insertion; where the quality of the contiguous landscape/ townscape is not high; and where existing elements are partially changed by Luas Line B1.

Slight

A slight impact is where the scale of the route corridor dominates Luas Line B1 elements when inserted; where the quality of the contiguous landscape/townscape is poor or derelict; or where the impact of an element of the Luas system is very localised.

5.7.2.3 SUMMARY OF PREDICTED IMPACTS

Construction Phase

Construction impacts which, by their nature are temporary and intermittent, will be strongly controlled. They are all impacts that are normal in the urban/suburban scene, though irregular in the rural environment. These are not regarded as being significant in landscape terms.

Following amelioration and mitigation, the trackbed will have a moderate, positive impact on the corridor in general, as the consistent treatment of the area of the alignment with paving and planting will comprise an environmental improvement to the roadway. This impact will be strengthened by the consistent design and treatment of the grass verges with new planting.

Operational Phase

The increase in the use of the Luas Line B1 alignment as a safe and environmentally attractive movement corridor will have a positive impact on the area. Overall and with the provision of remedial measures, the Luas Line B1 alignment will have a widespread, significant and positive impact on the landscape and townscape of the areas. Any residual negative impact of the OHLE and its supports will be greatly outweighed by the positive impacts of the other parts of the system and by the anticipated long term benefits that will

accrue to the landscape environment. An overall moderate positive impact will result from the operation of the Luas Line B1 alignment.

5.7.3 THE BUILT ENVIRONMENT AND VISUAL IMPACT

5.7.3.1 INTRODUCTION

The Built Environment and Visual Impact sections of this EIS assess impacts on the character of the built environment. There are three general headings under which impacts on the character of the built environment usually arise:

- Impacts arising from changes in character brought about by construction activity, including temporary structures.
- Impacts arising from changes in character brought about by the existence of new buildings, structures or activity.
- Impacts arising directly from the design and resultant character of any new building or structure.

A hoarding around a construction site changes the character of the surrounding built environment while that hoarding is in place. The changing character of a new building or structure, while under construction, brings about continuous changes in the character of the surrounding built environment. When complete, the existence of the new building or structure brings about a permanent change in the character of the surrounding built environment. The users of any new building or structure will experience the character of that building or structure of itself, in addition to any impact it may have on its surroundings.

The area through which the Luas Line B1 alignment runs varies from open lands on the borders of the Sandyford Industrial Estate, through new and established housing areas, large development sites, open parkland, a new motorway, farmland, and suburban development land. The area may be characterised as being the periphery of the city between established residential, commercial and institutional lands, and open suburban farmland running into the foothills

of the Dublin Mountains. The existing built character of this area varies greatly.

5.7.3.2 METHODOLOGY

The methodology used in preparing an assessment, for the purposes of this EIS, of the impacts of the development on the character of the built environment included:

- An assessment of the character of the existing built environment
- Analysis seeking to establish the likely visibility and/or visual impact of the development
- An assessment of the character of Luas Light Rail
- An assessment of the potential impacts of the development on the built environment, of the benefit of any mitigation measures, and of the predicted mitigated impacts of the development on built environment.

Assessment of the character of the built environment

An assessment was carried out to identify the character of the receiving environment surrounding the development. This assessment sought to describe:

- The predominant character of the receiving environment in each area
- The character of the buildings in each area
- The extent of sensitivity of the built environment in each area to change
- Any identifiable sensitivity of the inhabitants of the built environment in each area to change
- The capacity, arising out of the above, of the built environment in each area to absorb development.

This assessment is presented in this EIS and is supported generally by photographs.

Analysis of the likely visibility of the development

Assessment of the likely visibility and/or visual impact of the development took into account the characteristics of the development, and the physical characteristics of the existing built environment. The development does not include any structures of significant height. This will generally tend to limit its visibility to its immediate surroundings.

The Character of Luas Light Rail

The Luas trams themselves are visually attractive, and the standard of detail design of Luas Stops is regarded as high, including elements such as shelters, signs, etc. The impacts on the built environment of the existing Luas lines is considered to be significant, but is generally positive, because of the quality of the design, and also because of the overall very positive public response to the existing Luas Red and Green Line. It is likely that the public response to Luas Line B1 will be equally positive, and this is likely to mean that impacts on the built environment are likely to be received as positive, by the general public, even where these impacts are very significant or pronounced in nature.

Assessment of the impacts of the development on the character of the built environment

This assessment has taken into account the characteristics of the development in each location, and any mitigation measures, setting these against the capacity of the receiving

environment to absorb change. In making an assessment of potential or predicted impacts the principal elements that are likely to be associated with the development were considered, including:

- The trams.
- The wirescape of the overhead electrified lines, including the cables carrying them, their fixings and the supporting poles.
- Luas stops including shelters, lighting and signage.
- Bridges, bridge abutments and ramps leading to bridges.
- The trackbed, new landscaping and any boundary treatment.

There will be impacts associated with all of these elements individually and in combination. There will also be impacts where the Luas Line B1 alignment causes the removal of or change to existing built features or existing landscapes.

The assessment of impacts on the character of the built environment was carried out in accordance with Section 37 of the Transport (Railway Infrastructure) Act, 2001 and also had regard to the Guidelines on the Information to be Contained in



Environmental Impact Statements prepared by the Environmental Protection Agency (2002), and to the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999.

5.7.3.3 CRITERIA FOR THE RATING OF IMPACTS

5.7.3.3.1 Definition of Impacts used in this Section

The list of definitions given below is taken from Section 5: Glossary of Impacts contained in the Guidelines on the Information to be Contained in Environmental Impact Statements prepared by the Environmental Protection Agency. Some comment is also given below on what these definitions might imply in the case of visual impact or landscape and visual impact. The definitions from the EPA document are in italics.

Imperceptible Impact:

An impact capable of measurement but without noticeable consequences. The definition implies that the development would be visible, capable of detection by the eye, but not noticeable. If the development were not visible, there could be no impact.



No.27 Woodford



The 'Atrium' as seen from the Woodford Estate



Central Park as seen from the Woodford Estate

**Slight Impact:**

An impact which causes noticeable changes in the character of the environment without affecting its sensitivities. For this definition to apply, a development would be both visible and noticeable, and would also bring about a change in the visual character of the environment. However, apart from the development itself, the visual sensitivity of the surrounding environment should remain unchanged.

Moderate Impact:

An impact that alters the character of the environment in a manner that is consistent with emerging trends. In this case, a development must bring about a change in the visual character of the environment; and this change must be consistent with a pattern of change that is already taking place.

Significant Impact:

An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. The wording of the definition is clear. Difficulty in assessing whether an impact might or might not be significant lies in the word 'sensitive'. In visual terms, particularly when related to the appearance of landscape or the built environment, what one person might be sensitive to another might not. A conservative approach, classifying impacts as significant even though many observers might not regard them as significant, is taken here.



Central Park as seen from the Chase

Profound Impact:

An impact which obliterates sensitive characteristics. In visual terms, profound impacts are only likely to occur on a development site, in that it is only on the site that all previous visually sensitive characteristics could be obliterated. Outside the site, some visual characteristic of the original environment is likely to remain.

Consideration must also be given to whether an impact is permanent, temporary or occasional in nature.

The range of possible impacts listed above deal largely with the extent of impact; and the extent of the impact of a development is usually proportional to the extent to which that development is visible. This proportionality may be modified by the extent to which the development is seen as culturally or socially acceptable. Whether a visual impact is positive, negative or neutral depends on the interaction between the visual character of the proposed development, and the visual character of the receiving environment.

5.7.3.3.2 Cultural or social factors influencing the positive or negative nature of impacts

Development which is intrusive may, by some, be regarded as making a positive contribution if they are seen as being socially or culturally desirable. Conversely, developments which are almost unnoticeable may be thought of as intrusive, if for some cultural or social reason they are regarded as unacceptable.

For the reasons set out earlier, development associated with extensions of the Luas are likely to be thought of as positive, and, though sometimes intrusive in any objective sense, may not be thought of as visually negative by the general public. In the case of the Luas Line B1, the extent of the works, and the extent to which these works might impact on local roads, dwellings and businesses, is likely to result in significant impacts on the character of the built environment near the line. Whether these impacts are regarded as positive or negative may largely depend on whether or not the viewer sees the alignment as a whole, and not just its immediate local effect, in a positive light. This fact is noted in the EPA guidelines where it refers not just to sensitivity to change of the receiving environment itself, but of those who inhabit it.

5.7.3.4 SUMMARY OF IMPACTS ON THE CHARACTER OF THE BUILT ENVIRONMENT

Along the Luas Line B1 alignment, institutions and institutional lands as well as new and established housing areas are potentially sensitive to change and to new development. However, given the very extensive new development planned, approved or under construction in the vicinity of the alignment, sensitivity to the development of Luas itself would be secondary to sensitivity to these larger developments. Residents at Woodford, The Chase and Carmanhall Court are likely to be sensitive to the Luas Line B1 alignment because of intrusion at Woodford, and perceived overlooking from the Luas. Residents along Murphystown and Ballyogan Roads are also likely to be sensitive for similar reasons, but less so. There is likely to be little sensitivity at Carrickmines except at the former station house, which is directly affected by the works.

The proposal by Dun Laoghaire Rathdown County Council to construct a new Murphystown Road, and to upgrade Ballyogan Road is contained in the 2004 Development Plan and in the Stepside Action Plan 2000. These proposals and their resultant impacts are independent of any Luas proposals. The impacts arising out of the realignment of Ballyogan Road and the demolition of Clonlea House to specifically facilitate the Luas Line B1 to proceed are acknowledged and directly addressed in this EIS.



The alignment of the planned Murphystown Parallel Access Road (Luas on East side)

At the Sandyford Stop the construction of the Luas Line B1 alignment is likely to result in slight to significant impacts, neutral in character. At Woodford the construction of the Luas Line B1 alignment will result in a significant negative impact at No 27 Woodford. The impacts on Blackthorn Avenue are likely to be slight to significant, but regarded as generally neutral in character, negative at Carmanhall Court. At Burton Hall Road, the Leopardstown Road/Brewery Road roundabout and at Central Park, the rising ramp carrying the alignment and the bridge over the roundabout are likely to bring about a significant change in the character of the built environment of the area, resulting in significant impacts, which have the potential to be regarded as negative. Along the boundary between Central Park and Leopardstown Park Hospital the impact of Luas Line B1 will be slight when compared with that of Central Park and the South Eastern Motorway, as well as the ongoing construction works to the front (north) of the Hospital, but is likely to be perceived as negative in character until new planting matures. The impact, on the motorway itself, of the bridge carrying Luas Line B1 will be significant but is likely to be regarded as positive in character. At Glencairn the loss of Clonlea House is likely to result in a significant negative impact on the character of the local area. The subsequent construction of the Glencairn Stop is likely to mitigate that effect and bring about a positive impact on the character of the area.

The construction and subsequent existence of the Luas Line B1 alignment along the planned Murphystown Parallel Access Road and along the new and widened Ballyogan Road is likely to result in significant impacts on the character of the area. The impacts of the new roads will be greater than that of the Luas Line B1 alignment. The loss of mature trees on the south side of Ballyogan Road will result in significant negative impacts on the character of the area. The impacts of the construction and existence of the Luas Line B1 alignment is likely to be regarded as negative by the residents of houses facing or immediately adjoining the line. Other residents or users of the area are likely to regard the presence of the Luas Line B1 alignment as neutral or positive in character. The alignment is likely to have a positive impact on the character of the centre at Leopardstown Valley.

The impact, on the South Eastern Motorway, of the bridge carrying Luas Line B1 from Ballyogan Road back to the

alignment of the former Harcourt Street Railway will be significant and is likely to be regarded as positive in character. Once back on the old alignment the impact of the construction and existence of the Luas Line B1 alignment will be generally imperceptible to slight. At Carrickmines, however, the impact of the reconstruction of the bridge will be temporarily significant and negative during the construction phase, imperceptible to slight once complete. The impact of the removal of the extension to the former Station House will be significant and positive. The impact of the provision of new pedestrian access points at the north side of Carrickmines Stop is likely to be perceived as slight. The impacts of the construction of road access for buses and the park and ride at the south side of the stop is likely to be significant and negative during the construction phase. Landscaping has the potential to reduce these impacts during the operational phase.

Impacts between Carrickmines and Cherrywood are generally not impacts on the character of the built environment, and are more appropriately classified as landscape impacts, or, at Tully Church, impacts on archaeological heritage. These impacts are addressed under Section 7.13.7 of Volume 2 of this EIS. In the Cherrywood area, there is much new development, some completed, some under construction and yet more being planned. Where, at Cherrywood, development is complete or nearing completion, the Luas will bring about visual impacts on the built environment. On the other hand, where Luas works



Ballyogan Road looking east along the Luas alignment

coincide with the construction of other infrastructure or development, it is not practicable or appropriate to assess the development of the Luas as having an impact on other simultaneous development.

In general, the impacts of Luas Line B1 are likely to be significant from Sandyford Stop to Cherrywood. These impacts are likely to be regarded as significant and negative during the construction phase. During the operational phase, the impact of the Luas Line B1 alignment is likely to be regarded as significant and negative at Leopardstown, slight to significant and generally positive elsewhere. The impact of the Luas Line B1 alignment on passengers using it is likely to be positive overall in character.

5.7.4 TREES

5.7.4.1 INTRODUCTION

This section outlines the methodology used in considering the potential impact of Luas Line B1 and the criteria used in rating the impact of the alignment on trees.

5.7.4.2 METHODOLOGY

A tree survey was carried out from ground level, noting the condition of the trees at the time of inspection. In general, all trees surveyed should be subject to reassessment every two years to assess physiological and environmental changes.

Each tree within the area surveyed was recorded and numbered. Corresponding numbered metal tags were attached to each tree.

Reference to Age is as Follows:

Young : Trees up 1/3 of their expected ultimate height (Y)

Early Mature : Trees between 1/3 and 2/3 expected height (EM)

Mature : Trees more or less full height but still increasing in size (M)

Over Mature : Crown starting to break up and decrease in size (OM)

Reference to Condition:

Good : Full healthy canopy, but possibly including some suppressed or physically damaged branches.

Fair : Slightly reduced leaf cover, minor deadwood or isolated major deadwood

Poor : Overall sparse leafing or extensive deadwood.

Reference to Codes:

A Trees whose retention is most desirable, vigorous, healthy trees, of good form or trees of particular historical, commemorative value or specimens of rare or unusual species.

B Trees whose retention is desirable, not included in category A above, due to their impaired condition and early mature trees with potential to develop.

C Trees which could be retained, those in adequate condition or which could be retained with minimal tree surgery.

D Trees for removal: dead or structurally dangerous trees, or insecure root hold or with significant fungal decay at the base or in the main bole, or with cavities, or that may become dangerous after the removal of other trees, or that are inappropriate due to their location.

“Overhaul” refers to cleaning out dead, dying, or diseased wood, removal of unwanted epicormic shoots and growth, along with climbing plants and other objects such as wires, clamps and boards. This tree survey was carried out from the



ground, with no destructive or invasive evaluation techniques used.

5.7.4.3 CRITERIA FOR RATING OF IMPACTS

5.7.4.3.1 Negative Impacts

Significant

The removal of trees whose retention is most desirable, i.e. vigorous, healthy trees of good form or trees of particular historical, commemorative value or specimens or rare or unusual species.

Moderate

The removal of trees whose retention is desirable. Their removal is not considered significant however, due to their impaired condition and early mature trees with potential to develop.

Slight

The removal of trees which are of adequate condition only, but which could be retained with minimal tree surgery.

5.7.4.3.2 Positive Impacts

The removal of trees for the following reasons:

- dead or structurally dangerous.
- insecure root hold.
- significant fungal decay at the base or in the main bole with cavities.
- those which may become dangerous after the removal of other trees.
- those that are inappropriate due to their location.

5.7.4.4 SUMMARY OF PREDICTED IMPACTS

The planned alignment will have a significant impact of the receiving environment, due to the required removal of a large number of mature trees, recently planted areas, and unmanaged agricultural hedgerows. This represents a slight to significant negative impact. It will also require some



amount of trees and vegetation to have their growth controlled. This represents a moderate negative local impact. Replanting, and the re-location of existing young trees would reduce the intensity of such impact.



5.8.1 INTRODUCTION

This Section assesses the impact of the Luas Line B1 alignment on Material Assets, defined as Public Utilities and Property. It sets out the Methodology of assessment, and the criteria for the Rating of Impacts. It also provides a Summary of the Predicted Impacts of the proposed development. These are addressed on an Area by Area basis at Chapter 7 of this EIS.

5.8.2 PUBLIC UTILITIES

5.8.2.1 INTRODUCTION

This section considers the impacts on the Public Utilities environment arising from the construction and operation of Luas Line B1. An Area by Area assessment of Public Utilities is set out in Chapter 7 of this Environmental Impact Statement.

In order to construct and operate Luas in South County Dublin, a basic conflict must be resolved; that is between the need to provide a continuity of service of public utilities, gas, water, telecommunications, electricity, etc. to the community while at the same time providing a guarantee of no subsequent disturbance to the Luas trackbed during operation. Resolution of this problem involves diverting all existing services outside or below the Luas trackbed. The complexity and diversity of underground services in urban areas is well documented. The roads of South County Dublin contain a wide range of pipes, ducts and cables of all ages. Most are in use but there are a number of abandoned service installations. The Luas Line B1 alignment therefore necessitates a major programme of public utilities services diversions.

To provide a full and permanent level of Luas service, it is imperative that once in place, the Luas trackbed should not be disturbed. Even though there are crossovers provided at intervals between the twin tracks, these are at considerable distances and the digging up of one pair of tracks, even in a

limited area for normal public utility repairs would totally disrupt the operation of the Luas service as a whole. For this reason, diversion of public utilities is normally required. Deep sewers may be retained under the trackbed if there is enough structural cover with new manholes for side access constructed outside the trackbed. Where track crossings of public utilities cannot be avoided, duplicate spare ducts positioned beside existing services crossing the trackbed can be adopted in order to replace damaged apparatus.

5.8.2.2 METHODOLOGY

General

It is a fundamental principle that the B1 alignment once constructed, should not be disturbed for typically minor public utility repairs. In addition issues such as stray currents, which can potentially corrode metallic services or cause interference to electrical and telecommunications networks, will be addressed during the design process with specialist advice on suitable protection measures being incorporated into the proposed designs.

Definition of Thresholds

All utility companies operate under specific statutory powers and responsibility for defining technical standards lies with the Utility Companies/Authorities themselves. Through a review process with the utilities companies regarding Luas Red and Green Lines, a set of threshold levels for each public utility in terms of size or capacity of installation was set. These values could then be used as a cut-off level for evaluating the rating of impact and the sensitivity of utility relocations during the construction of Luas Line B1. They are set out in Table 5.8.2.1 with comments on the nature of the specific factors applicable to each utility. It was therefore assumed that although the Luas Line B1 alignment was able to take a view on the significance of particular utility runs, it is a matter for each utility to define its own requirements and satisfy itself that these can be met. Factors considered in arriving at the thresholds shown include:

- Continuity: the importance of the continuity of service to receptors (i.e. the consumers)

Table 5.8.2.1 Public Utilities – Significance Thresholds

Potential Factors (Relevant Authority)	Proposed Significance Threshold
<p><i>Water (Dun Laoghaire-Rathdown County Council)</i> Existing installations range from 4" (100mm) to 30" (762mm) and greater in diameter. Dun Laoghaire Rathdown County Council map all mains greater than 300mm diameter as major supplies</p>	<p><i>Diameters</i> 8" (200mm) diameter mains or greater</p>
<p><i>Electricity (Electricity Supply Board)</i> Domestic Services are supplied at 220V and small industrial premises at 415V (three phase). ESB, however, in network terms consider major supplies at 10kV or over. Existing services include 10kV, 38kV, 110kV and 220kV supplies</p>	<p><i>Voltage</i> Cable routes of 10kV and over to be assessed for significance</p>
<p><i>Gas (Bord Gais)</i> Gas is distributed at high, medium and low pressure. High and medium lines are part of the strategic network. Low pressure lines provide supplies to consumers of all types domestic, industrial and commercial. Any alteration to the network must be considered as significant, and low pressure lines greater than 150mm diameter may be significant</p>	<p><i>Diameter/Pressure</i> All high and medium pressure lines; and all low pressure lines greater than 150mm diameter to be noted</p>
<p><i>Waste Water (Dun Laoghaire-Rathdown County Council)</i> Subject to inspection trunk sewers will be relined with a plastic liner with new side access manholes being constructed outside the swept path if required. Sewer relining may be used on large sewers where applicable. Effects of sewer relocations are more likely to relate to possible long duration of works, deep trenching and consequent traffic diversions rather than effects on the quality of service</p>	<p>There is no clear threshold for sewers since the age and construction materials will be important factors. Diameters of 450mm are unlikely to be considered important</p>
<p><i>Telecom (Eircom)</i> Of all utilities, telecommunications are experiencing the biggest technological changes. Eircom ducts are considered as having the potential to carry all types of communication cables. All 4 way or greater (4 x 100mm dia.) are regarded by Eircom as major. Substantial ducting is known to exist in the highway which is now hardly used. Carriageway ducts are generally of a higher specification than footway ducts. Existing installations include 4- and 6-way ducting systems</p>	<p>4-way ducts or greater</p>
<p><i>Cable Television (incl. NTL, ESAT, Worldcom etc.)</i> Cable TV/Commercial requirements are not normally significant in terms of dimensions. Possible location of key distribution network is potentially more significant</p>	<p>Criteria context dependent</p>



- Capacity: the larger the capacity of the link in question or the risk involved, then the higher the potential impact rating
- Highway disturbance: factors included potential duration of works and the need for deep trenching
- Off-line diversion: requirements for possible off-line diversionary routes and any requirements for exceptional equipment were also considered
- Cumulative and knock-on effects: particularly in areas of old services
- Fragility of existing services: in the area proposed to accept the new service runs

Construction impacts were further considered by reference to type of utility:

- Sewers – these can involve large scale works including sheet piling and shaft excavation. They tend to be deeper than most other excavations since the vertical alignment is determined by gravity and the depth of invert levels
- Gas/Water Mains – mains can be large in diameter and deeper, in which case the trenches may need protection with sheet piles or propping. The Luas route crosses or runs along many strategic gas, water and electricity services
- Smaller gas, water, electricity and telecommunications services - can normally be diverted using open trenches
- Low voltage electricity and telecommunications installations - are usually smaller in diameter but very high voltage cables (greater than 100 kV) can need long excavations for jointing and long lead-in times for procurement of cables
- Cable TV – generally the ducting required for cable operations is small and in shallow excavation (300mm).

Provided utilities will be moved out or lowered in relation to

Luas Line B1 to the satisfaction of the individual utility operators in full compliance with their requirements/codes of practice, it is assumed that there will be no subsequent operational impacts attributable to the B1 alignment..

5.8.2.3 CRITERIA FOR RATING OF IMPACTS

Application of the Thresholds:

The effect of constructing the Luas Line B1 alignment on those utilities which are over the threshold has therefore been reviewed on the basis of professional judgement against the following factors:-

- Duration of the works in relation to surrounding land use and occupiers,
- Scope of the civil engineering works, e.g. sheet piled trenching
- Extent of obstruction to the movement of pedestrians and vehicles during the service diversion

It has been assumed that while the utility diversions may give rise to logistical difficulties, they will not pose exceptional technological problems, and that the works required are within the scope of major renewals or diversions which the utility organisations may expect to undertake from time to time.

5.8.2. SUMMARY OF PREDICTED IMPACTS

Construction Phase

There is likely to be minimal impact on utilities during the construction phase with proper sequencing of works and good traffic management.

Operational Phase

No likely and significant impacts are predicted on public utilities during the operational phase of the Luas Line B1 alignment.

5.8.3 PROPERTY

5.8.3.1 INTRODUCTION

The impact of the Luas Line B1 alignment on property is assessed in terms of its direct impacts on existing property, and its broad effect on the future property market. Details of property impacts on an Area by Area basis for the entire Luas Line B1 alignment are set out at Chapter 7 of this Environmental Impact Statement. Full details of all proposed property acquisition are given in the maps and schedules which form part of the Railway Order Application to the Minister for Transport.

5.8.3.2 METHODOLOGY

Properties along the proposed Luas Line B1 alignment, where acquisition and/or demolition is required, have been identified. An assessment of the likely direct effect of Luas Line B1 construction and operation on the future viability of established premises has been made. This includes the effects of land-take from private properties such as the loss of gardens and other undeveloped lands, garages/extensions or parking spaces in whole or in part. With regard to public land required for Luas Line B1, an estimation can be made of its importance in terms of its usage, i.e. land use and, where relevant, numbers of people using the land.

The broad effects of the operation of Luas Line B1 on development land and redundant or disused property were also assessed including the impact on development potential. In this way, a general examination was carried out of the effects of the Luas Line B1 alignment on potential future property viability and development. This overlaps with consideration of Land Use Planning and Development, under the heading of Human Beings.

5.8.3.3 CRITERIA FOR RATING OF IMPACTS

The criteria for rating of property impacts due to the construction and operation of Luas are dependent on the following:-

Profound

Total acquisition and/or demolition required, current use no longer possible.

Significant

Acquisition and/or demolition of part of property such that current use, although still possible, no longer enjoys current amenity.

Moderate

The acquisition and/or demolition such that property remains in current use though with noticeable reduction in amenity.

Slight

The acquisition is incidental with no meaningful reduction in amenity/viability.

5.8.3.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

Acquisition of land will be required in places to accommodate Luas Line B1, the associated stops and sub-stations, and the necessary re-alignment of the Ballyogan Road.

Where partial demolition of a property occurs, such as at No. 27 Woodford and the rear extension of the Carrickmines Station House, this will result in a significant local adverse impact. Where total demolition occurs, such as at Clonlea House, this will result in a profound local adverse impact. Where strips of lands are required, this will result in a slight to moderate local impact. Otherwise with the implementation of remedial measures, there will be a slight impact in terms of property.

Where property is acquired, compensation will be payable to the property owners in accordance with the general Compulsory Purchase Code.

Operational Phase

In general, existing properties will benefit from their location along the alignment of a new permanent, fast and efficient public transport system. The operation of Luas Line B1 will consolidate the attractiveness of property in the area and will serve to strengthen the overall property market in the vicinity. This will effect an overall significant positive impact on property in the area.



Luas at Heuston Station

5.9 Cultural Heritage



5.9.1 INTRODUCTION

The Cultural Heritage for the purposes of this EIS comprises Local History, Architectural Heritage and Archaeological Heritage. Each sub-section includes a methodology, Criteria for Rating of Impacts and a Summary of Predicted Impacts.

5.9.2 LOCAL HISTORY

5.9.2.1 INTRODUCTION

The Luas Line B1 alignment passes through the Murphystown, Stepside, Carrickmines, Laughanstown and Cherrywood areas, parts of which are of significant historical interest. In this regard it is important to assess Luas Line B1 in terms of its effects on historical areas, and historical sites/buildings/monuments. An assessment of Local History on an Area by Area basis is set out in Chapter 7 of this Environmental Impact Statement.

5.9.2.2 METHODOLOGY

To assess the impact of the Luas Line B1 alignment on Local History, points of historical interest relating to the catchment of the alignment have been identified and described. This was done mainly by means of desk-based literature searches. Any potential for impacts were then assessed having regard to the insertion and operation of the alignment.

5.9.2.3 CRITERIA FOR RATING OF IMPACTS

The sociological and emotive context of history means that in many instances a simple rating of impacts is not possible nor indeed appropriate. However, there are also elements of Local History that are firmly linked with built form or the form of locations. A criteria for rating of impacts on Local History due to the construction and operation of Luas is interlinked with other elements of Cultural Heritage such as buildings of merit and archaeology.

Significant

Where works involve disturbance, or otherwise prohibit the continuing appreciation of a site of local historical importance.

Moderate

Where the works directly effect a reduction in the ability for continuing appreciation of a site of local historical importance.

Slight

Where works result in no measurable reduction in the ability for continuing appreciation of a site of local historical importance occurs.

5.9.2.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

No likely and significant impacts on local history during the construction phase are predicted.

Operational Phase

No likely and significant impacts on local history during the operational phase of the Luas Line B1 alignment t are predicted.

5.9.3 ARCHITECTURAL HERITAGE

5.9.3.1 INTRODUCTION

The Statutory Planning Context for the Luas Line B1 alignment is outlined in Section 5.1.3 of this EIS. Some reference to the detail of the acts is given below to explain how the contents of the Acts bear on the methodology used in preparing an assessment of architectural heritage and impacts upon it.

The Heritage Act, 1995

Architectural heritage is defined in the Heritage Act, 1995 as follows:

Protected Structures in the Vicinity of the Luas Line B1

Location	Name	Description
Brewery Road	Waterworks Complex	House, Granite Walls, Gateway and Bridge
	Railway Station (former Stillorgan Station)	Railway Station (former) / House
	Nos. 1-29 Arkle Square,	Houses
	St Joseph's House (for Adult Deaf and Deaf Blind)	House
Leopardstown Road	Burton Hall (St. John of God Brothers)	House
	Leopardstown Park Hospital	Stables (former) House
Murphystown Road	Clonlea House and Lisieux Hall (Park Cottage)	Houses
	Glencairn House	Entrance Railings, Piers, Archway & Gates, Gate Lodge, Main House, Outbuildings & Conservatory
Carrickmines	Former Carrickmines Railway Station	Railway Station / House
	Priorsland	House, Out Offices & Gates
Brennanstown Road	Barrington's Tower	House
	Glendruid	House & Gates

“architectural heritage” includes all structures, buildings, traditional and designed, and groups of buildings including street-scapes and urban vistas, which are of historical, archaeological, artistic, engineering, scientific, social or technical interest, together with their setting, attendant grounds, fixtures, fittings and contents, and, without prejudice to the generality of the foregoing, includes railways and related buildings and structures and any place comprising the remains or traces of any such railway, building or structure”

This definition is helpful. It makes specific reference to the importance of railway, and related, buildings and structures. The grammatical structure of the definition appears to indicate that all railway, and related, buildings and structures fall within the definition of architectural heritage.

Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999

Architectural heritage is defined in the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 as follows:

- structures and buildings together with their settings and attendant grounds, fixtures and fittings,
- groups of such structures and buildings, and
- sites, which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

This definition is consistent with that given in the Heritage Act, 1995, although it makes no specific reference to railway, or related, buildings or structures. Listing under the National Inventory of Architectural Heritage has not yet been published for the County of Dun Laoghaire-Rathdown.

Protected Structures

The Luas line B1 alignment runs through the administrative area of Dun Laoghaire-Rathdown County Council, specifically those areas illustrated on Maps 6, 7 and 9 of the Dun Laoghaire-Rathdown County Development Plan, 2004-2010. The buildings and structures protected by Dun Laoghaire-Rathdown County Council in Schedule 2: Record of Protected Structures of the 2004-2010 Development Plan are tabled below, in the order they occur moving from Sandymount to Cherrywood.

The Luas Line B1 alignment will not be visible from all of the buildings and structures tabled above.

The Planning and Development Act, 2000

Part IV of the Planning and Development Act, 2000, affords protection to items of architectural heritage. Section 57(10)(a) requires planning authorities and an Bord Pleanála to have regard to the protected status of such structures; and Section 57(10)(b) states that:

“A planning authority, or the Board on appeal, shall not grant permission for the demolition of a protected structure save in exceptional circumstances”.

The Act defines a ‘structure’ as: ‘having the same meaning as in the Principal Act but includes:

- the interior of the structure,
- the land lying within the curtilage of the structure,
- any other structures lying within that curtilage and their interiors, and
- all fixtures and features which form part of the the interior or exterior of any structure or structures referred to in paragraph (a) or (c)

What is significant about this definition is that it broadens the definition of what constitutes a structure, and therefore what must be included within the definition of architectural heritage when assessing impacts on it.

Conservation principles and practice

Principles guiding conservation practice are set down in the Venice Charter, May 1964. Several of the articles of the Venice Charter are worth quoting here:

Article 1 The concept of an historic monument embraces not only the single architectural work but also the urban or rural setting in which is found the evidence of a particular civilization, a significant development or an historic event. This applies not only to great works of art but also to more modest works of the past which have acquired cultural significance with the passing of time.

Article 3 The intention in conserving and restoring monuments is to safeguard them no less as works of art than as historical evidence.

Article 5 The conservation of monuments is always facilitated by making use of them for some socially useful purpose. Such use is therefore desirable but it must not change the lay-out or decoration of the building. It is within these limits only that modifications demanded by a change of function should be envisaged and may be permitted.

It can immediately be seen that with regard to the principles set down in the Venice Charter must inform understanding of the nature and extent of impacts on architectural heritage. It is clear that altering the setting of an item of built heritage, or modifications or additions to it have all the potential to impact negatively upon architectural heritage. On the other hand

maintaining a building or structure in use is positive.

The principles for protection of the interior and setting of a heritage structure as set down in the Venice Charter have been incorporated in the Planning and Development Act 2000, both in the definition of ‘structure’ and in the concept of ‘attendant grounds’.

5.9.3.2 RECEIVING ENVIRONMENT

The lands through which the Luas Line B1 alignment runs are at the southern periphery of the city, between new and established residential, commercial and institutional lands and farmland stretching up to the foothills of the Dublin Mountains. Development is planned on all the farmland near the Luas Line B1 alignment. The buildings of heritage value in the area are generally large 19th century houses or institutions, buildings associated with the former Harcourt Street Railway, and some medieval and earlier remains. The number of these buildings and structures is comparatively few. Gates, gatehouses, boundary walls and landscapes associated with any such buildings or structures may also be of architectural heritage value in themselves, or may contribute to the character of a heritage structure.

The proposed Luas Line B1 alignment will interfere with a flank wall at the entrance to Glencairn, and will run along the old Harcourt Street alignment at Carrickmines Station. There will, therefore, be direct impacts resulting from the Luas works at these two locations. There will also be impacts associated with the demolition of Clonlea House, but these impacts more properly result from proposed widening and realignment of Murphystown Road, than from the Luas works.

5.9.3.3 METHODOLOGY

The methodology used in preparing an assessment, for the purposes of this EIS, of the impacts of the development on architectural heritage included:

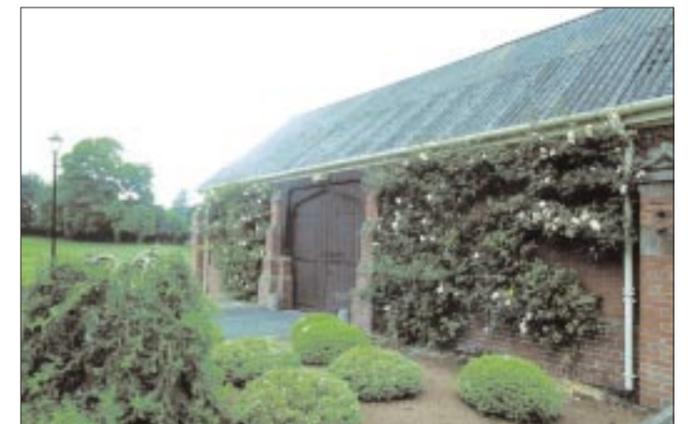
- A survey seeking to identify buildings and structures of architectural heritage value, and an evaluation of the



The former Stillorgan Station House



Leopardstown Park



Former stables at Leopardstown Park



relative importance of buildings and structures so identified.

- Research into the history and development of buildings and structures.
- An assessment of the potential impacts of the development on architectural heritage, of the benefit of any mitigation measures, and of the predicted impacts of the development on architectural heritage.

The carrying out of this survey, research, evaluation and assessments of impacts, had regard to:

- The provisions of the Heritage Act, 1995.
- The provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999.
- The listing of buildings and structures by local authorities.
- The status of listed buildings as 'protected structures' under the provisions of the Planning and Development Act 2000.
- Conservation principles and practice generally.

5.9.3.4 THE HISTORY AND PROVENANCE OF BUILDINGS OR STRUCTURES

Given that the definitions of architectural heritage above refer repeatedly to historical, cultural and social interest, it is appropriate to investigate and have regard to the history of buildings or structures; and to their associations with any historical figures or events. A survey was carried out which sought to identify buildings and structures of architectural heritage value. In the first instance this survey identified buildings and structures, on or close to the route, which had been included by Dun Laoghaire-Rathdown County Council in the Record of Protected Structures. Where possible, these buildings and structures were visited and photographed. Relevant protected structures are tabulated in this section.

The assessment of the impacts of the proposed Luas works on architectural heritage had regard to the characteristics of the proposed development in each location, and to any mitigation measures proposed. The assessment of impacts on architectural heritage had regard to the Guidelines on the



Trees and wall at the western boundary of Leopardstown Park



The ornate main gate of Glencairn



The eastern gate of Glencairn

Information to be Contained in Environmental Impact Statements prepared by the Environmental Protection Agency (2002), and to the European Communities (Environmental Impact Assessment) (Amendment) Regulations, 1999.

History of the Development of the Harcourt Street Line

The development of early Irish railways, such as the Harcourt Street Line, has some parallels with rail and light rail developments being undertaken now. In the mid 19th century, a group of investors would propose the route for a new railway, and submit their proposals to Parliament for approval in the form of a Bill. If the proposal was successful, Parliament would pass an Act approving the railway company and the carrying out of railway works, including the purchase of lands for such works. The Board of Works would appoint an arbitrator to prepare valuations of lands to be taken for use by the railway; the arbitrators fees and costs being paid by the railway company.

The Act of Parliament setting up the Dublin, Dundrum & Rathfarnham Railway (DD&RR) was passed on the 16th of July 1846. Running powers on that railway were granted to the Waterford, Wexford, Wicklow and Dublin Railway (WWW&DR) whose proposal for a line south from Dundrum were approved by an Act passed the same day. Section 27 of the DD&RR Act empowered the WWW&DR to take over the construction of the line between Dublin and Dundrum should the DD&RR not complete it within two years. The contract for construction of the DD&RR was awarded to William Dargan who started work in 1849. It appears that negotiations between the two railway companies continued over several years. The WWW&DR reduced its ambitions seeking to build only as far as Wicklow. The DD&RR abandoned its proposed branch to Rathfarnham but sought instead to go to Bray. There were new Acts and new names, the WWW&DR becoming the Dublin & Wicklow Railway, and the DD&RR becoming the Dublin & Bray Railway. The stipulation that the Dublin & Bray Railway, if it failed to complete construction on time, could be taken over by the larger company was restated in the new Acts (Shepherd).

The minutes of the Board of the Dublin & Wicklow Railway record the process of the takeover of the Dublin & Bray



Glencairn – change from cut stone to coursed rubble walling



Clonlea House



Detail of the parapet of the overbridge at Carrickmines

Railway starting with negotiations in May of that year, with the formal takeover effectively complete in October. The first passenger service of the Dublin & Wicklow Railway between Dublin and Bray opened on the 10th of July 1854. It is noted in the minutes that among the directors of the Dublin & Bray Railway were a Mr Manders, a Joseph Cowper, and a William Frederick Darley. The last two became directors of the D&WR.

The Waterford, Wexford, Wicklow and Dublin Railway was much the more ambitious of the two concerns. It had been set up as part of a proposed new route from Dublin to London, with a port connecting by sea to Fishguard to be built at Greenore Bay (Rosslare Harbour). It was promoted by the Great Western Railway in England, who also supported the development of the South Wales Railway who would connect to Fishguard. The early ambitions of the W&WR were eventually realised. By 1866 the railway had become the Dublin, Wicklow and Wexford Railway.

5.9.3.5 CRITERIA FOR THE RATING OF IMPACTS

5.9.3.5 Definition of Impacts

The list of definitions given below is taken from Section 5: Glossary of Impacts contained in the *Guidelines on the Information to be Contained in Environmental Impact Statements* prepared by the Environmental Protection Agency. Comment is given below on what these definitions might imply in the case of architectural heritage. The definitions from the EPA document are in italics.

Imperceptible Impact

An impact capable of measurement but without noticeable consequences. The definition implies a small but measurable change in the character of heritage structures or in the character of their setting, capable of detection, but not readily noticeable.

Slight Impact

An impact which causes noticeable changes in the character of the environment without affecting its sensitivities. For this



Rail overbridge at Carrickmines from the east



Stables of Priorsland with Carrickmines Station House behind



Carrickmines Station House

definition to apply, a development would be noticeable, and would also bring about a change in the character of heritage structures or in the character of their setting. However, apart from the development itself, the sensitivity of the remaining setting or structures should remain unchanged.

Moderate Impact

An impact that alters the character of the environment in a manner that is consistent with emerging trends. In this case, a development must bring about a change in the character of heritage structures or in the character of their setting; and this change must be consistent with a pattern of change that is already taking place or emerging.

Significant Impact

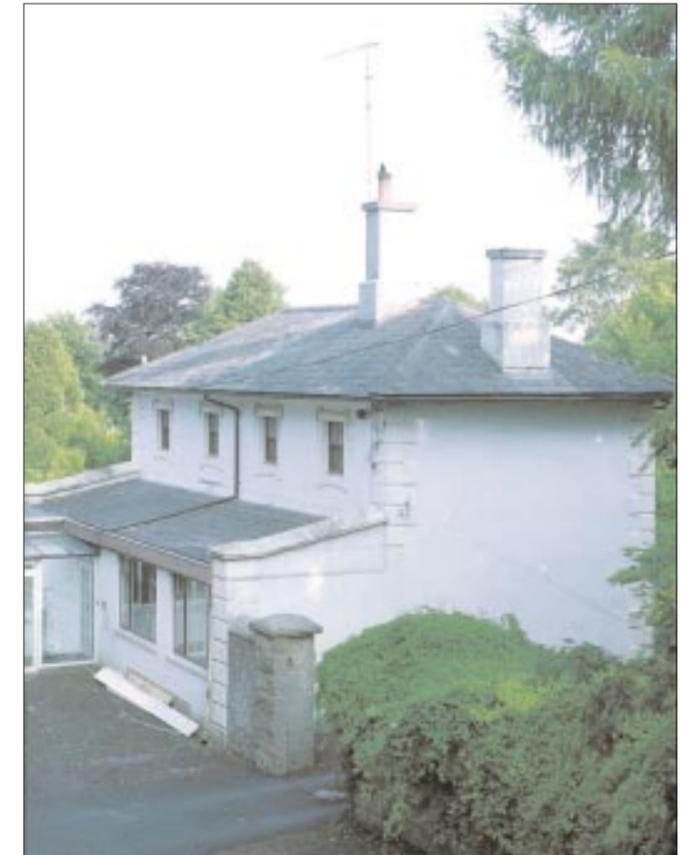
An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment. This implies an impact which would materially change the character of heritage structures or the character of their setting.

Profound Impact

An impact which obliterates sensitive characteristics. A profound impact would result from the demolition of monuments or heritage structures, or from their being changed beyond recognition.

5.9.3.6 Consideration of Impacts

Given that the areas through which Luas Line B1 is proposed to run are undergoing very substantial change because of works associated with the M50 and other extensive new developments, the construction of Luas might properly be seen as part of the emerging character of the area. This being so, extensive impacts associated with the Luas may appropriately be termed as 'moderate', since they are part of an emerging trend or pattern of change. The setting of a protected structure is only taken as relevant in so far as it contributes to the heritage character of the protected structure. A complete change in the setting of a protected structure would not of itself bring about a profound impact on the structure itself, if the structure were still recognisable for what it was. Impacts resulting from changes to the setting



Carrickmines Station House from the bridge



Former platform and shelter at Carrickmines



would usually be less significant than those resulting from changes which directly affect a heritage structure.

The definitions of impacts above define the extent of impact, but not whether that impact might be positive, negative or neutral. It is obvious that the destruction of a heritage item would result in a negative impact, but its retention would not, of itself, result in a positive impact. The retention and care of built heritage is a legal duty set down in various statutes. Therefore, simple retention, though regarded as a good thing, cannot result in a positive impact. If what was there already is simply retained unchanged, there would be no impact. If restoration were needed, restoration would have a positive impact, the significance of the impact depending on the extent and quality of restoration. Moving proposed works so as to avoid demolition of or damage to a heritage structure would be regarded as positive mitigation. Carrying out alterations to make a heritage structure more useful, and therefore extend its life would be positive in a general sense, although whether the alterations themselves would be considered positive, negative or neutral would depend on the extent to which they were necessary in the first place, and, if necessary, on their quality and appropriateness. Salvage of a heritage structure, in whole or in part, would result in a negative impact since the structure is not retained in place and intact, but it would be less negative than complete destruction. Recording a heritage structure in every detail, before demolition, would be a positive mitigation measure. It would not avoid the profound negative impact of demolition on the structure itself, but it would, to some extent, mitigate the impact on built heritage in general.

Impacts on any individual heritage structure would result in some impact on built heritage as a whole. It could be argued that the loss of an individual structure, though profound for that structure itself, might be insignificant for built heritage generally. If one of ten thousand identical heritage structures were demolished, it might be profound for the structure itself, significant in the area in which it stood, and arguably only a slight impact on architectural heritage as a whole. It could not be imperceptible, since the loss of a structure would always be noticeable. Given the force and spirit of legislation in place to protect architectural heritage, it may be reasonable always to describe the loss of an individual structure as a significant negative impact on the sum of built heritage.



Priorsland

5.9.3.6 SUMMARY OF PREDICTED IMPACTS

The closure of the former Harcourt Street Railway has long been lamented. There are many heritage structures, associated with the railway, along the old line; and the reopening of the line and the bringing of these structures back into use is entirely consistent with best conservation principles. In this regard, the construction of the Luas Line B1 where it runs along the alignment of the former Harcourt Street Railway has the potential to result in a significant and positive impact on architectural heritage. The Luas Line B1 alignment departs from the old line between Sandyford and Carrickmines. Thereafter it follows the old route, with some minor departures from the old line at Laughanstown.

There are only five heritage structures on which the Luas Line B1 alignment will have a direct impact between Sandyford and Cherrywood. Otherwise the alignment may have an impact only on the setting of items of architectural heritage. The five are: the western boundary of Leopardstown Park Hospital, the gateway at Glencairn, Clonlea House, the former Carrickmines Station and Priorsland.

The western boundary of Leopardstown Park Hospital is a stone wall, generally some 2.5 metres high. There are mature trees along the boundary. Under the provisions of the Planning and Development Act, 2000, these trees and the boundary fall within the definition of 'protected structure', since they form part of the character of the setting of

Leopardstown Park. The impact of the Luas Line B1 alignment works on these structures themselves will be profound and negative, and on the architectural heritage of the area, significant and negative. These impacts will be mitigated by the erection of a new stone boundary wall of similar construction to the existing, and by the planting of new trees. The works at the gateway to Glencairn have potentially negative impacts on architectural heritage, but the careful reconstruction of that part of the wall which is to be demolished, together with the design of the Luas stop, which extends a wall southwards in a manner that matches existing construction, are likely to result in a positive impact overall. The demolition of Clonlea House will result in a profound negative impact on the building itself, and a slight to significant impact on the architectural heritage of the area. The partial demolition and reconstruction of the railway bridge at Carrickmines will result in a significant negative impact, mitigated by the careful removal of the cast iron elements and their reuse as a boundary between the Luas alignment and the former Station House. The demolition of the extension to the former Carrickmines Station House will result in a significant positive impact on the building. The restoration of the Station House itself is outside the remit of the Luas Line B1 project. The demolition of a former platform shelter will result in a significant negative impact. The reuse of stonework from the Harcourt Street line, such as former platform edges and capping stones, will result in slight positive impacts. The construction of access to the new Carrickmines Stop across the lands of Priorsland will result in a significant negative impact on the heritage value of the house, mitigated by landscaping.

5.9.4 ARCHAEOLOGY

5.9.4.1 INTRODUCTION

This section of the EIS assesses the archaeological importance of the land under consideration for the proposed Luas Line B1 alignment from Sandyford to Cherrywood. The purpose of the study is to assess the impact of the development on the receiving archaeological environment

and to propose ameliorative measures to safeguard any monuments, features or finds of antiquity. It forms part of an environmental impact statement and was prepared on behalf of the Railway Procurement Agency.

South County Dublin is one of the richest archaeological landscapes in Leinster, with a wide range of prehistoric, Early Christian and medieval monuments, sites and finds. Many of these are preserved in the foothills of the Dublin Mountains, which until recently were relatively undisturbed by agriculture and development. Recent housing, industrial and infrastructural developments in the area, and particularly in Carrickmines, Laughanstown (or Lehaunstown), and Cherrywood have produced large numbers of sites that had no visible surface indications, suggesting an even greater density of archaeological activity than the standing monuments alone would indicate.

The proposed light rail development runs for approximately 7.6 km through the townlands of Tipperstown, Murphystown, Carmanhall, Carmanhall/Leopardstown, Ballyogan, Carrickmines Little, Brennanstown, Laughanstown and Cherrywood. As part of the scheme there are twelve proposed Luas stops, two overbridges over the recently constructed M50, a roundabout overbridge and a road underpass and four substations. The proposed scheme runs through the zone of archaeological potential of three recorded archaeological (RMP) sites namely Murphystown Castle (DU023:025), the 'site of' a possible enclosure (DU026:001) in Ballyogan, which has been built upon and the site of a military encampment (DU026:127), part of which has been extensively tested.

5.9.4.2 METHODOLOGY

This Environmental Impact Assessment report is based on a desk study of published and unpublished documentary and cartographic sources, supported by a field inspection of the proposed route. Archaeological test trenching was also carried out at key locations along the route alignment and is referred to in detail under the relevant Areas of Volume 2. The desk study availed of the following sources:



Record of Monuments and Places (RMP)

The primary source of information for the archaeological assessment of the site is the Record of Monuments and Places (RMP) maintained by Department of the Environment, Heritage and Local Government (DoEHLG). The Sites and Monuments Record (SMR), as revised in the light of fieldwork, formed the basis for the establishment of the statutory RMP pursuant to Section 12 of the National Monuments (Amendment) Act, 1994. The RMP documents record known upstanding archaeological monuments, their original location (in cases of destroyed monuments) and the position of possible sites identified as cropmarks on vertical aerial photographs dating to before 1700 AD (with some later ones also being included). It is based on a comprehensive range of published and publicly available documentary and cartographic sources.

The information held in the RMP files is read in conjunction with constraint maps, published at reduced six-inch scale, on which recorded sites are clearly marked. Maps for Dublin are now published in digitised format at scales of 1:5,000 and 1:12,000. The RMP sheets relevant to the present proposal are sheets 023 and 026 for Dublin or, based on the 1:5,000 map series, sheets 3392, 3393, and 3456.

Topographical Files of the National Museum of Ireland

The topographical files of the National Museum of Ireland (NMI) identify recorded stray finds that have been donated to the state in accordance with national monuments legislation and are now held in the national museum's archive. The files are provenanced to townland. They sometimes include reports on excavations undertaken by NMI archaeologists.

Excavations Bulletins and Excavations Database

'Excavations' is an annual bulletin, which contains summary accounts of all excavations carried out annually in Ireland. The bulletins range from 1969 to 2000, and can now be accessed on the Internet at www.Excavations.ie. Both the bulletins and database were consulted to establish whether excavations have been previously carried out in the vicinity of the proposed development.

Cartographic Sources

The following cartographic sources were consulted: Rocque

1756 Taylor's map of the environs of Dublin, dated 1816, and the 1843, 1866 and 1889 editions of the Ordnance Survey six inch maps. With the exception of Rocque, the maps were sourced in the Map Library, Trinity College, Dublin 2.

Other Documentary Sources

Additional documentary and literary references consulted are listed in the bibliography at the end of the report.

Field Inspection

A field inspection was undertaken to assess current and previous land use, access to the site, local topography and any additional environmental information relevant to the appraisal. It also sought to identify potential low-visibility archaeological sites or features and/or areas of archaeological potential that will possibly be subject to direct or indirect impacts as a result of the proposed development.

Invasive Archaeological Test Excavation

Archaeological test excavation, under licence to the Department of the Environment, Heritage and Local Government (DoEHLG), was carried in two areas which were considered to have a significant archaeological potential i.e. the section of route that runs through the zone of archaeological potential of Murphystown castle (DU023:025) and the proposed 'Park and Ride' site at Carrickmines Great as it is in close proximity to the remains associated with the Carrickmines castle (DU026:005, a National Monument) the extent of which is considerably larger than previously recorded in the Record of Monuments and Places.

5.9.4.3 CRITERIA FOR THE RATING OF IMPACTS

The rating of impacts used throughout the Archaeology section of the EIS is as follows:

Profound:

Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise where an archaeological site is completely and irreversibly destroyed by a proposed development.

Significant:

An impact which, by its magnitude, duration or intensity alters an important aspect of the environment. An impact like this would be where the part of a site would be permanently impacted upon leading to a loss of character, integrity and data about the archaeological feature/site.

Moderate:

A moderate direct impact arises where a change to the site is proposed which though noticeable, is not such that the archaeological integrity of the site is compromised and which is reversible. This arises where an archaeological feature can be incorporated into a modern day development without damage and that all procedures used to facilitate this are reversible.

Slight:

An impact which causes changes in the character of the environment which are not significant or profound and do not directly impact or affect an archaeological feature or monument.

Imperceptible:

An impact capable of measurement but without noticeable consequences.

5.9.4.4 SUMMARY OF PREDICTED IMPACTS

Construction Phase

It is predicted that archaeological features, finds and material will be revealed along the Luas Line B1 given the results of previous excavations in the area. Should such material be disturbed during the insertion of the Luas Line B1 alignment into the existing environment, it will result in a significant impact in terms of archaeology. With regard to any archaeological sites identified during the construction process, the developer is aware of their responsibilities under the National Monuments Acts 1930-2004. All archaeological issues will have to be resolved to the satisfaction of the Department of Environment, Heritage and Local Government and the National Museum of Ireland.

Operational Phase

No likely and significant impacts on archaeology are predicted during the operation of the Luas Line B1 alignment.

Construction Scenario



5.10 DIRECT AND INDIRECT EFFECTS RESULTING FROM THE USE OF NATURAL RESOURCES

The Luas Line B1 alignment runs both within a built up suburban area, and along what is primarily a dedicated reservation through undeveloped lands, currently in passive agricultural use. The likely significant direct and indirect effects on the environment of the proposed development which may result from the use of natural resources, in this case the natural resources being the land encompassed within the subject alignment, have been comprehensively assessed in this Environmental Impact Statement as required under Section 39 of the Transport (Railway Infrastructure) Act, 2001. Furthermore it is expected that the building materials required for the construction of the Luas Line B1 alignment will be sourced primarily in Ireland and elsewhere within the EU.

5.11 DIRECT AND INDIRECT EFFECTS RESULTING FROM EMISSION OF POLLUTANTS, CREATION OF NUISANCES AND ELIMINATION OF WASTE

Details of emissions arising from the development were outlined in sub-sections set out above and also in the relevant sub-sections of Chapter 7 dealing with the aspects of the environment considered in relation to the three areas through which the Luas Line B1 alignment will pass. There will be no likely and significant direct or indirect effects arising from these sources.

5.12 FORECASTING METHODS USED FOR 5.10 AND 5.11

The methods employed to forecast the effects on the various aspects of the environment are standard techniques used in the particular professional disciplines. The methodology employed by each of the specialist consultants is outlined in the relevant sub-sections set out above. The general procedure employed was to address the receiving environment in a dynamic fashion, to add to that a projection of the "loading" placed on aspects of the environment by the development in it, mitigated by appropriate measures and thereby arrive at a net or predicted impact.

6.0 Interactions

6.1 INTRODUCTION

The content of this Environmental Impact Statement has been completed in accordance with the provisions relating to the specified information to be contained in such a statement, as set out at Section 39 of the Transport (Railway Infrastructure) Act, 2001. .

This Chapter deals specifically with the specified information under Article 39(2)(b) of the Transport (Railway Infrastructure) Act, 2001, which states as follows:-

“(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 :-

(b) a description of the aspects of the environment likely to be significantly affected by the proposed railway works, including in particular :

- human beings, fauna and flora*
- soil, water, air, climatic factors and the landscape,*
- material assets, including the architectural and archaeological heritage, and the cultural heritage,*
- the inter-relationship between the matters referred to in this paragraph”*

This Chapter considers likely and significant interaction between the specified topics, where such an interaction exists, and is additional to their respective likely and significant impacts as specific topics, which are fully recorded in Chapter 7 of this EIS.

In preparing this Chapter of the Environmental Impact Statement, regard was had to the “*Advice Notes on Current*

Practice in the Preparation of Environmental Impact Statements” and also to the “*Guidelines on the Information to be Contained in Environmental Impact Statements”*, both issued by the Environmental Protection Agency in 2002. The EPA Advice Notes on Current Practice state that,

“All environmental factors are inter-related to some extent. This heading draws attention to significant interaction and interdependencies in the existing environment. In practice interactions between one topic and another are usually discussed under each of the those topic headings rather than in a specific “Interactions” section.”

In this regard it should be noted that interactions where relevant are also discussed within the environmental assessment of the various topics.

The operation of the Luas Line B1 will be an extension of the Luas Green Line and will provide a new permanent public transport linkage between Sandyford Industrial Estate and Cherrywood, and linking ultimately to Dublin City Centre. The establishment of the Luas Green Line and B1 Line amounts to the introduction of a state of the art public transport system extending from St. Stephen’s Green to Sandyford Industrial Estate, Stepaside, Carrickmines and Cherrywood. This will contribute to the achievement of planning policy and objectives as stated in the statutory development plans.

In operation, Luas Line B1 will provide a new permanent public transport service along the route corridor. The alignment runs parallel to the road network at Sandyford Industrial Estate and Ballyogan Road, as well as the planned alignments of the Murphystown Parallel Access Road, and Cherrywood spine road. As such, it conforms with the DTO Strategy proposal to make better use of existing resources by means of balance of use of part of the road network being adjusted in favour of public transport. This will lead to an interaction between Human Beings - sub-headings of Vehicular and Pedestrian Traffic and Safety; Land Use Planning and Development and Community Severance. The Luas Line B1 alignment will lead to a reduced requirement for private traffic flows associated with existing and planned

future development along the route. This will lead to an improvement in the pedestrian environment including a reduced pedestrian severance compared to existing or potential future severance caused by heavy traffic flows in the absence of a viable or adequate public transport alternative.

The construction of the Luas Line B1 alignment will lead to interaction between various sub-headings under the Human Beings, including disruption to Vehicular and Pedestrian Traffic and potential impact on Community Severance and on adjoining Land Use and Development. The proposed Luas Line B1 will also provide a positive interaction between Human Beings and the landscape. The insertion of the Luas Line B1 alignment and its associated structures will in overall terms improve the physical environment, particularly in the existing built-up areas by means of the provision of new and appropriate hard and soft landscaping. These issues are comprehensively addressed in Chapter 7 under the relevant sub-headings.

6.2 GLOBAL CONTEXT

Luas comprises one component of the Dublin Transportation Initiative Recommended Strategy, as updated in the Dublin Transportation Office transportation strategy, “Platform For Change”. Together these proposals are intended to shape the transportation infrastructure of the Dublin Region.

The DTO Strategy confirms the positive interaction between land use and transportation. This can equally be applied within the parameters of Luas Line B1. The development and operation of Luas Line B1 alignment from Sandyford Industrial Estate to Cherrywood will generate a likely and significant interaction between the mobility and accessibility of the catchment population, and the land use and development trends along the route corridor.

The purpose of the proposed public transport investment as recommended in the DTO Strategy and as subsequently approved by Government includes:-

- linking the City Centre with the outer suburbs and the large employment centre at Sandyford Industrial Estate, thereby ensuring the continued economic viability of the core of the City, while providing improved access to employment for people living in suburban and peripheral areas, and
- affording the car its rightful place in the transport system, but ensuring that it does not dominate this.

The Luas Line B1 alignment would generate a series of positive interactions related to the above in consideration of the project overall.

The operation of the Luas Line B1 alignment along the proposed route corridor will provide a new permanent public transport linkage between Dublin City Centre and the suburban areas of Sandyford Industrial Estate, Leopardstown, Stepaside, Carrickmines and Cherrywood. This will contribute to the achievement of planning policy and objectives as stated in the current County Development Plan and the adopted Stepaside Action Plan and Draft Carrickmines-Cherrywood Action Plan with regard to the provision of a public transport system along this route corridor. This will lead to a positive interaction between human beings and material assets as the increased accessibility along the proposed Luas Line B1 alignment, influences new investment.

In operation, the Luas Line B1 alignment will provide a new permanent public transport service along the route corridor, and will make better use of existing resources by means of the balance of use of part of the road network being adjusted in favour of public transport. This will lead to an interaction between the Human Beings sub-headings of Vehicular and Pedestrian Traffic and Safety, Land Use Planning and Development, and Community Severance. Luas Line B1 will also provide a positive interaction between Human Beings and the Landscape, as its insertion, including its associated structures and remedial landscaping measures will improve the physical environment.

The construction of the Luas Line B1 alignment will lead to

interaction between various sub-headings under Human Beings, including disruption to Vehicular and Pedestrian Traffic and potential impact on Community Severance and on adjoining Land Use and Development. These issues are comprehensively addressed in Chapter 7 of this EIS under the relevant sub-headings.

6.3 AREA BY AREA ASSESSMENT

Within the Area by Area environmental assessment of the Luas Line B1 alignment set out in Chapter 7 of this EIS, where an interaction has been identified that is likely and significant it has been recorded. These interactions have been described below for convenience.

6.3.1 AREA 13: SANDYFORD INDUSTRIAL ESTATE TO GLENCAIRN (MURPHYSTOWN ROAD)

Material Assets/Human Beings

The operation of Luas Line B1 will provide a new permanent public transport service linking the significant employment area of Sandyford Industrial Estate with the evolving residential areas of Glencairn and Murphystown. Significant employment and other commercial development at Sandyford Industrial Estate, Central Park and within the IDA South County Business Park, Leopardstown will also be served by this efficient public transportation mode. This will lead to a significant positive interaction between Material Assets and Human Beings, and will also achieve planning policy and objectives for Area 13 relating to public transport.

The operation of Luas Line B1 will result in a significant local adverse impact on the property of No. 27 Woodford, as the western section of this property including the existing garage will be acquired. It will result in a profound local impact on Clonlea House, (a Protected Structure) which will require to be demolished in its entirety. However, it should be noted that Clonlea House will require to be demolished in any case in

order to accommodate the planned alignment of the Murphystown Parallel Access Road, which is a short-term Local Roads Objective of the Statutory Development Plan.

Landscape/Human Beings/Visual Issues

The operation of Luas Line B1 in Area 13 with the associated remedial landscaping measures, particularly in the area of the Sandyford Industrial Estate will provide a significant positive interaction between Townscape and Human Beings. It is likely that Human Beings will quickly become accustomed to the new built form elements in the townscape, including new bridge structures in the area.

Climate/Human Beings

The operation of the Luas Line B1 alignment will provide for positive interaction between human beings and Climate (Air Quality) as a meaningful alternative to the private car. On the other hand, the provision of this public transportation facility may indirectly result in an overall increase in vehicle numbers in Area 13, as a higher density of development may subsequently be permitted in the area.

Material Assets/Flora and Fauna/Trees

The main interaction between Flora/Trees and Fauna is that the loss of vegetation necessary for the proposal will result in a loss of cover and habitat for insects, birds and mammals, and disturbance along the route which will reduce its use as a corridor for animal movement. This will particularly occur along the south-eastern boundary of the lands of Central Park, and in the vicinity of the reservation of the South-Eastern Motorway (SEM). However, it should be noted in this regard that some significant amount of flora, including mature trees, will require to be removed in this vicinity to facilitate the planned new Motorway alignment.

Human Beings/Material Assets/Landscape/Air

The Luas Line B1 alignment will run along a landscaped corridor, a significant proportion of which is segregated from the existing road infrastructure, whether by bridge or by reservation. This will ensure a minimum of conflict with existing and planned future vehicular or pedestrian traffic movement in the area.

6.3.2 AREA 14: GLENCAIRN STOP (MURPHYSTOWN ROAD) TO BALLYOGAN WOOD

Human Beings/The Landscape/Visual Issues

The Luas Line B1 alignment together with its overhead lines and ancillary structures will be observed by pedestrians and residents as they become accustomed to the new environment. Whilst the construction phase will initially have an adverse effect on the visual and residential amenities of the area, this will be outweighed by the long term positive visual impacts resulting from environmental improvements associated with the Luas Line B1 alignment, and the maturing of remedial landscaping provision.

Flora/The Landscape/Human Beings

The removal of existing foliage during construction of the Luas Line B1 alignment will interact with the existing landscape environment. However, in particular along the planned alignments of the Murphystown Parallel Access Road and Ballyogan Road, this will occur in any case with the upgrading of these routes, which are specific local objectives of the current County Development Plan. The introduction of new planting where appropriate alongside the Luas Line B1 alignment, and along the planned road alignments will help to establish a new landscape and flora.

Material Assets/Human Beings

The operation of the Luas Line B1 alignment following the planned Murphystown Parallel Access Road and Ballyogan Road will provide a new permanent public transport service for this residential area, which is planned to accommodate a significant new resident and employment-related population. Luas Line B1 will provide an efficient public transport alternative to the private car, and will link the area to the existing or planned employment areas of Sandyford Industrial Estate, Cherrywood and Dublin City Centre. This will lead to a significant positive interaction between Material Assets and Human Beings, and will also achieve planning policy and objectives for Area 14 relating to public transport.

Material Assets/Flora and Fauna

The main interaction between Flora and Fauna is that the loss

of vegetation necessary for the proposal will result in a loss of cover and habitat for insects, birds and mammals, and disturbance along the route which will reduce its use as a corridor for animal movement. This will particularly occur along Ballyogan Road. However, it should be noted that the re-alignment of this route has previously been confirmed by the Planning Authority and is an objective of the Statutory Development Plan. New landscape planting is a significant element of the overall Luas Line B1 proposal.

Human Beings/Material Assets/Landscape/Air

Luas Line B1 will run along a landscaped corridor, which is segregated from the existing road infrastructure. This will ensure a minimum of conflict with existing and planned future vehicular or pedestrian traffic movement in the area.

6.3.3 AREA 15: BALLYOGAN WOOD TO CHERRYWOOD-RATHMICHAEL

Human Beings/The Landscape/Visual Issues

The Luas Line B1 alignment, together with its overhead lines and ancillary structures, including a bridge at Ballyogan and an overbridge crossing over the Wyattville Link Road, will be observed by pedestrians and residents as they become accustomed to the new environment. The provision of the bridge at Ballyogan will have a significant local impact upon the existing landscape. However the construction of the SEM has served to alter this landscape even in the absence of the Luas Line B1 alignment.

The elevated viaduct across the Wyattville Link Road will also have a significant visual impact upon the existing landscape in this area. However, the ongoing development works at Cherrywood will alter the existing landscape character in this area even if the Luas Line B1 alignment is not inserted into the landscape. It is envisaged that the scale of development planned at Cherrywood will assist in absorbing the visual impact of the bridge into the landscape.

Whilst the construction phase will initially have an adverse effect on the visual and residential amenities of the area, this

will be outweighed by the long term positive visual impacts resulting from environmental improvements associated with Luas Line B1, and the maturing of remedial landscaping provision. Furthermore, it should be noted that the wider area and landscape environment of the alignment is planned to be significantly altered by major new development, and by the provision of new local, regional and National roads infrastructure.

Flora/The Landscape/Human Beings

The removal of existing foliage during construction of Luas Line B1 will interact with the landscape environment. The introduction of new planting where appropriate alongside the operational Luas Line B1 will help to establish a new landscape and flora.

Material Assets/Human Beings

The operation of the Luas Line B1 alignment in Area 15 will provide a new permanent public transport service for this outer suburban residential area, which is planned to accommodate a significant new resident and employment population. The Luas Line B1 alignment will provide an efficient public transport alternative to the private car, and will link the area to the existing or planned employment areas of Sandymount industrial Estate, Cherrywood and the City Centre. This will lead to a significant positive interaction between Material Assets and Human Beings, and will also achieve planning policy and objectives for Area 15 relating to public transport.

Material Assets/Flora and Fauna

The main interaction between Material Assets and Flora and Fauna is that the loss of vegetation necessary for the proposal will result in a loss of cover and habitat for insects, birds and mammals, and disturbance along the route which will reduce its use as a corridor for animal movement. This will particularly occur along the alignment of the former Harcourt Street Railway. New landscape planting, as well as the retention of a significant extent of existing flora in the area will ensure a slight overall impact in terms of interaction between material assets and flora and fauna.

Human Beings/Material Assets/Landscape

The construction of the planned Luas Line B1 alignment will run along a landscaped corridor, which is predominantly segregated from the existing road infrastructure. This will ensure a minimum of conflict with existing and planned future vehicular or pedestrian traffic movement in the area.

Difficulties Encountered in Compiling This EIS

8.1 INTRODUCTION

Section 39(2) of the Transport (Railway Infrastructure) Act, 2001 stipulates that 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 :-

(d) an indication of any difficulties (technical deficiencies or lack of know-how) encountered by the Board in compiling the required 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.";

The purpose of this chapter of the EIS is to address this requirement and to set out a number of important factors which have been identified in the course of compiling this EIS and which come within these particular considerations.

8.2 TRAFFIC MANAGEMENT MEASURES ASSOCIATED WITH LUAS LINE B1 WILL BE ONGONG

In undertaking the traffic impact assessment of the Luas Line B1 alignment, detailed consultations were undertaken with the relevant road authorities and with Dublin Bus to ascertain future proposals for area traffic management and public transport provision. This involves the upgrading of major distributor routes in the local and wider vicinity, outside the scope of works associated with this particular proposed development.

With the implementation of these measures on an

incremental and ongoing basis, it is not possible to predict for specific areas, the performance of such measures until they are in place and operational. It is, however, envisaged that these measures will be complementary to the Luas Line B1 alignment when this is in place.

At the time of writing this EIS, however, it is not possible to ascertain precisely what effects these proposed traffic management measures will have on a particular area at a particular time in the context of the implementation and operation of the Luas Line B1 alignment. It is reiterated that, in overall terms, the introduction of the Luas B1 alignment, coupled with these various traffic management measures is expected to deliver positive economic, social and environmental benefits for the areas through which the Luas Line B1 alignment will pass.

8.3 TRAFFIC

The DTO model has been discussed in terms of its origin and policy content. It should be noted here that notwithstanding its size and complexity it is not an ideal tool for environmental assessment of projects such as the Luas LRT system. The extent, size of cells, and the length of links used in the model do not always match the potential effects associated with the Luas system. Arising out of these difficulties, some enhancement of the DTO model in the study area was undertaken to more accurately reflect both the highway network and the development projections for the study area.

Where data has been insufficient, or the DTO model has had major limitations, professional judgement has been exercised in this assessment. The objective of the assessment under legislation is to identify likely and significant effects from changes in the traffic environment. Local changes, which may be of very short duration, will be matters for subsequent detailed studies by, amongst others, Dun Laoghaire Rathdown County Council.

8.4 WATER

Data on water quality is uneven in distribution and quality. Nevertheless, in terms of the level of impact which the construction and operation of the Luas Line B1 alignment may be expected to have on the receiving aquatic environment, it is considered that sufficient detail of the watercourses of the area was available to undertake the assessment.

8.5 ELECTROMAGNETIC ASPECTS

As regards limitations of data, the main limitation on available data has been the lack of knowledge of existing ultra-sensitive equipment in premises adjoining the corridor. This particularly concerns the FAAC Electronics Ltd. premises in immediate proximity to the route on the southern side of Burton Hall Road. Discussions are ongoing between the RPA and the Management of this Company, in order to clarify the impact that the operation of the Luas Line B1 alignment may have on the operation of this company.

8.6 PUBLIC UTILITIES

Data Collection

The main problem facing utility designers on Luas Line B1 is the lack of accurate records showing the positions of existing utilities. Plans are generally indicative and are only intended to give an indication of the number and configuration of services at a particular site. The collection of comprehensive data regarding the position of existing utilities from the statutory undertakers' record drawings and supplemented by non-destructive mapping techniques and investigative slit trenching is a considerable task being undertaken by the Utilities Department of the Railway Procurement Agency.

The complexity of public services in an urban area has been alluded to in chapter 5 of this EIS. Not only is the number and layout of services complex but so is the process of obtaining

details of what may exist. A relatively new possibility which has become available is the investigation of underground services by tracing them in-situ. Although electronic means of tracing pipes by metal detectors have been available for many years, recent developments have introduced great advances. Buried services can be mapped to a high degree of accuracy and the information transferred into a 3-D CAD system. The investigation is carried out by means of a combination of electro-magnetic locators, CCTV and ground probing radar. Data capture in digital form allows the transfer into a CAD package. Software has been developed to complement the survey which allows the computer to draw sections through a surveyed area showing the apparatus in their true relationships with one another and with other features. Due to their complexity it is necessary to assess spatial arrangements in carriageways and footpaths to ensure adequate spacing for proposed diversions and to clear the space required for civil structures in the scheme. The subsurface survey combined with a topographical survey of surface features such as manholes, valves and hydrants is the most efficient way of tracing underground apparatus in order to plan the sequence of utility diversions at a particular site and minimise the disruption caused to the public by careful traffic management.

Age and Condition

Insufficient data exists to make a detailed judgement based on the age or material used for existing services and associated risks in disturbing them. It is clear, however, that old cast iron or stoneware pipes are at more risk of fracture than more modern facilities e.g. plastic pipes.

Diversions

As data becomes available on the positions of existing services, proposals are discussed with the utility companies. These can then be incorporated into the design of the Luas Line B1 alignment, and co-ordinated with other services associated with the tram operations including ducts carrying power supplies and telecommunications, signalling and CCTV and also associated track drainage and overhead pole foundations.

8.7 TREES

Trees within Clonlea House were assessed without entering the property, which restricted a detailed inspection of their lower stems, which may have defects.

this area. It has however been designed in close consultation with both the third party developer/landowner at Cherrywood and with Dun Laoghaire-Rathdown County Council. It can and would operate independently of the development of the planned plaza area and District Centre at Cherrywood. The third party developer would finalise proposals having regard to the permitted Luas Line B1 alignment at this location.

8.8 ARCHAEOLOGY

An assessment of archaeological impact is rather different than say for traffic, where it can be established with relative certainty beforehand where and how the construction of a project will have an impact. With archaeology, it is more difficult to pre-determine with any certainty the likelihood of an impact. This particularly applies in existing built up urban areas where typical urban construction occurs on a continuing basis. Thus it is only during the actual construction process that the likelihood and the rating of an impact can be established. For this reason great importance is placed in archaeological monitoring especially in areas of high archaeological potential. It should be noted however that detailed assessment including test trenching has been carried out as part of this EIS.

It is similarly envisaged that the proposed Park and Ride facility at Carrickmines would ultimately be incorporated into a third party plans to develop this site. This again is outside the scope of this Railway Order application in which a surface park and ride facility is proposed. Such additional development is outside the scope of this Railway Order application.

8.9 CHERRYWOOD DISTRICT CENTRE

The Cherrywood Stop will be located within the planned urban centre at Cherrywood. Although referred to in the County Plan as a Town Centre it is zoned as a District Centre but planned to accommodate development in excess of that normally associated with a District Centre. Development is to take place on a phased basis subject to the provision of rail links, a sufficient resident population and the preparation of an approved urban design Master Plan.

The delivery of the Luas is clearly an important element in facilitating the development of Cherrywood to its full envisaged potential. No planning permission has been secured or proposals finalised with respect to the development of Cherrywood. The Luas Line B1 alignment has thus been designed in the absence of firm proposals for

Select Glossary of Technical Terms

AADT

Annual Average Daily Traffic (total annual traffic flow divided by 365).

Amelioration

Measures to diminish a negative impact.

Archaeological Watching Brief

This describes where an archaeologist is present to monitor earthmoving works and any associated ground disturbance during the construction phase of a project. This ensures that any archaeological soils, features or deposits which may be exposed during the works are recognised immediately and that appropriate measures are taken to record such finds. This may be by means of a full archaeological excavation depending on the importance of the find. The scale of the monitoring, may be full time or part time. In areas of very low archaeological potential watching briefs may be based on periodic inspection of construction works.

Archaeological Site

This encompasses all upstanding and buried archaeological monuments, deposits, and features which pre-date the year 1700AD. All monuments which are listed in the Sites and Monuments Record of the Department of Arts, Heritage, Gaeltacht and the Islands (formerly OPW). All sites described and mapped by the SMR has the full protection of National Monuments legislation (1937-1995).

At Grade

At public carriageway level (as opposed to underpass or bridge over).

Avifauna

Birds (of district, country) collectively.

Bedrock

Solid rock underlying alluvial (earth, sand) deposits.

Boulder Clay

Boulder Clay generally consists of variable amounts of gravel embedded in a firm to very stiff clayey, silty matrix. Water saturated granular materials occur locally within the Boulder Clay as lenses and pockets.

BS 5489

British Standard Guidance Document on Road Lighting.

cd/m²

Candela per square metres (a measurement of lighting).

CENELEC

European Committee for Electrotechnical Standardisation

CIBSE

Chartered Institute of Building Surveyors and Engineers.

CIE

Coras Iompair Eireann.

CO

Carbon Monoxide

dB (Decibel)

The basis unit for sound measurement. Decibels are measured on a linear scale which defines a logarithmic amplitude scale, thereby compressing a wide range of amplitude values into a small set of numbers.

dba

A frequency weighting applied to sound measurements which approximates to the frequency response of the human ear.

Demography

Study of population statistics

DMRB

Design Manual for Roads and Bridges, UK.

DTI

Dublin Transportation Initiative.

DTO

Dublin Transportation Office

Do-Nothing Scenario

The situation which would exist if no intervention or development were carried out.

EIS

Environmental Impact Statement.

EU

European Union.

Fauna

Animals.

Findspot

Location of an archaeological find.

Flora

Plants.

Grade Separated

Road junction at which at least one alignment passes over another.

Groundwater

Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material.

Guide Value

Specified in EU Air Quality Directives as a concentration of a pollutant which should be achieved in order to improve the protection of animal health and the long term protection of the environment.

HGV

Heavy Goods Vehicle.

L_{Aeq}

The equivalent continuous noise level. The notional steady dBA level that would produce the same A-weighted sound energy level as the actual, time varying sound, over a stated period.

LA10/LA90

The noise levels in dBA that are equalled or exceeded for the 10%/90% of the sample time.

L_{Amax}

Maximum peak noise level.

Land Use

The activities which take place within a given area of space.

LUX

The metric unit of illumination equal to 1 lumen per square metre. A lumen is a unit of light flux.

LRT

Light Rail Transit.

Luas

Dublin's LRT.

Mitigation

Measures designed to avoid, reduce or remedy adverse impacts.

NO²

Nitrogen Dioxide.

NOX

Nitrogen Oxide.

NRA

National Roads Authority

OHLE

Over Head Line Equipment.

Pantograph

Device mounted on roof of a tram and used to convey electrical current from the overhead wiring (OHLE) to the tram.

PCU

Passenger Car Unit

PM10

Particulate matter measuring less than 10 microns in diameter.

PNR

Private Non Residential (car parking)

ppb

parts per billion.

µg/m³

microgrammes per cubic metre - a measurement referring to air quality.

Public Utilities

Water supply, drainage, gas, electricity, telecommunications systems as controlled operated and maintained by statutory bodies such as local authorities, Bord Gais etc.

Receiving Environment

The existing environment into which the Luas is to be inserted.

Remedial or Reductive Measures

Measures designed to avoid, reduce or remedy adverse impacts.

RPA

Railway Procurement Agency.

Severance

The separation/reduction in separation of population from facilities and services they use within their communities.

S.I.

Statutory Instrument

SMR

Sites and Monuments Record (of the Department of Arts, Heritage, Gaeltacht and the Islands).

SO²

Sulphur Dioxide.

Subsoil

Soil lying immediately under ground surface.

VOC

Volatile Organic Compounds.

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