Dublin Light Rail
Environmental impact Statement

Line C1
Connolly to The Point Depot

ERM

RPA
Railway Procurement Agency

Photomontage showing proposed Luas Stop on Mayor Street

Availability of the Environmental Impact Statement (EIS)

Copies of the EIS including the Non Technical Summary are available for inspection and purchase at the following locations:

Railway Procurement Agency
Parkgate Business Centre,
Parkgate Street,
Dublin 8.

Dublin Transportation Office
69 – 71 St. Stephens Green,
Hainault House,
Dublin 2.

The EIS is also available to download (free of charge) through the RPA website: www.rpa.ie

Copies of this EIS can be purchased for a sum of €15.00 each;
A CD version of the EIS can be purchased for a sum of €5.00;
Copies of the Non Technical Summary of this EIS may be purchased for a sum of €3.00 each at the above locations.

Chapter 1

INTRODUCTION

1.1 Objectives of the Environmental Impact Statement

The purpose of this Environmental Impact Statement ('EIS') is to present the results of an independent assessment of the significant environmental impacts associated with the construction and operation of a light railway line ('Luas Line C1') aligned between Connolly Station and The Point in the Dublin Docklands area.

As part of the Environmental Impact Assessment ('EIA') process, the Study Team has analysed the potential environmental and social effects of the Luas Line C1 light rail transit ('LRT') scheme to ensure that it is designed and constructed to minimise significant impacts, whilst maximising social benefits. As such, the objectives of the EIA may be summarised as follows:

- to identify the significant environmental impacts of the Luas Line C1 scheme, taking account of the characteristics of the proposed scheme, the sensitivity of the local environment and the concerns of locally and nationally interested parties;

- to predict and evaluate the extent and significance of potential impacts;

- to identify measures that should be taken to mitigate potential adverse impacts;

- to assess the significance of residual impacts if any remaining after proposed mitigation measures are implemented; and

- to identify appropriate means of monitoring the identified environmental effects of the Luas Line C1 LRT scheme during its construction and operation.

This Environmental Impact Statement, as the principal output of the EIA process, will inform decision-making on the approval of the Luas Line C1 scheme. The information presented in this document has also assisted the Railway Procurement Agency in the design and planning of the construction programme so that the LRT scheme may be developed focusing on the minimisation of negative impacts.

ERM Environmental Resources Management Ireland Ltd ('ERM') was commissioned, by the Railway Procurement Agency ('RPA'), to prepare an independent assessment of the environmental impacts of the scheme and its associated environmental impacts. ERM was assisted in the assessment process by specialist subcontractors in the fields of cultural heritage and of traffic and transport (refer to *Table 1.8a*). As the environmental assessment specialists and lead environmental consultants, ERM takes responsibility for the information and recommendations contained in this EIS document.

1.2 Background to the Luas Light Rail Scheme

The Dublin Transportation Initiative (DTI), published by the Department of Transport in 1994, presented an integrated transport strategy for the Greater Dublin Area. Among other measures, it recommended the construction of a three line LRT system, linking Tallaght, Ballymun and Cabinteely to the City Centre. In1996 the Transport (Dublin Light Rail) Act, 1996 was enacted and provides a legal framework whereby Córas Iompair Éireann (CIÉ) might apply to the then Minister for Public Enterprise for "Light Railway Orders" (LROs), granting CIÉ powers to construct, operate and maintain light railways.

In October 2000 the Dublin Transportation Office (DTO) published "A Platform for Change - Outline of an integrated transportation strategy for the Greater Dublin Area - 2000 to 2016" incorporating Luas and Metro lines. In December 2001 the Transport (Railway Infrastructure) Act 2001 was enacted and the Transport (Dublin Light Rail) Act 1996 was repealed. The new Act contains provisions similar to the repealed act in respect of Luas and Metro systems. In December 2001, the RPA was

established and subsumed the role of the former CIÉ Light Rail Project Office.

1.3 Outline of the Luas Line C1 Development

Luas Red and Green Lines were constructed and commenced operation in June and September 2004 respectively. Luas Line C1, which is the focus of this Environmental Impact Statement, is an extension of the Luas Red Line and will operate from the existing terminus at Connolly Station to The Point.

Line C1 is approximately 1500m in length and comprises a double track extension from the existing line at Store Street. This extension runs for a short distance along Amiens Street before turning eastwards across the junction of Harbourmaster Place and Mayor Street Lower. At this location there will be a "delta junction" constructed to facilitate the passage of trams from Connolly Terminus and through traffic by-passing Connolly Terminus. Luas Line C1 continues to run eastwards along Mayor Street Lower, crossing Georges Dock via the existing bridge. The route continues along Mayor Street Lower, crossing Guild Street and over the Grand Canal via the construction of a new bridge. The route will continue through the Spencer Dock Development and re-establish the connection between Mayor Street Lower and Upper. The route will then cross New Wapping Street and Castleforbes Road, continuing along Mayor Street Upper before terminating at The Point. The Dublin Dockland Development Authority has placed a Compulsory Purchase Order on a road to the west of the Point Theatre.

The principal components of Luas Line C1 comprise:

- trams (similar to those currently in operation on the Red and Green Lines);
- tram stops;
- track;
- an overhead electricity supply; and
- bridge over Grand Canal and associated fixtures and structures.

The trams currently in operation are 30m and 40m in length and can carry 235 and 310 passengers respectively. The passenger carrying capacity and the service frequency of trams can be adjusted to offer a wide range of line capacities. The vehicles are powered by electricity drawn from overhead wires at 750V DC and operate to a maximum speed of 70km/h. Within the city centre, the trams are restricted to relevant traffic speed limits.

A detailed description of the Luas Line C1 is presented in *Chapter 4.*

1.4 Policy and Legislative Background

In the 1990's, the *Dublin Transportation Initiative* and the *Transport (Dublin Light Rail) Act 1996* laid down the conceptual need and the legislative powers to develop the Luas scheme in Dublin. The Dublin Transportation Office (DTO) was established in 1995.

In 2000, the DTO published "*A Platform for Change – Outline of an integrated transportation strategy for the Greater Dublin Area – 2000 to 2016* "which incorporated Luas and Metro lines within its overall strategy. *A Platform for Change* provides an overall planning framework for the development of the transport system in the Greater Dublin Area. Regarding the LRT proposals, the DTO strategy recognises the importance of the Luas scheme in contributing towards increasing public transport capacity from 70,000 in 2001 to 300,000 in 2016. The scheme is intended to be integrated with Quality Bus Corridors, DART and Metro Services and cycle and pedestrian routes to create an integrated transport network.

In 2001, the *Transport (Dublin Light Rail) Act, 1996* was replaced by the *Transport (Railway Infrastructure) Act, 2001* which established the Railway Procurement Agency ('RPA') as an independent statutory agency responsible for the procurement of railway infrastructure.

In addition to the transport-specific policy and legislative instruments described above, the Luas Line

C1 complies with a range of other current and evolving polices. These include the following:

• *Regional Planning Guidelines (RPGs) for the Greater Dublin Area 2004;*
• *Dublin City Development Plan 2005 -2011 (adopted March 2005);*
• *Dublin Docklands Masterplan 2003;* and
• *Dockland North Lotts Area Planning Scheme 2001.*

These documents are reviewed in more detail in *Chapter 5*.

1.5 Requirement for Environmental Impact Assessment

1.5.1 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:

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

"(i) 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 envisages 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 languages 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) (iii))

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 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.

1.6 Scope of the EIS

An important stage in the EIA process is the early determination of the technical issues associated with the construction, operation and decommissioning of Luas Line C1. This is important as the particular activities arising from different developments will require specific assessment approaches, determined by the potential impacts arising from the development and the sensitivity of the chosen location. Early planning of the assessment, through the application of systematic scoping techniques, ensures that resources are effectively deployed and efficiently focussed.

The understanding gained from the scoping process then provides direction in relation to the type and level of information that will need to be gathered in order to adequately assess impacts.

Whilst the design Luas Line C1 will focus largely on the intended route and its immediate surrounding area, an EIA is required to take a wider view (or geographical scope) in determining the full environmental consequences of a proposed development. For example, the EIA will be required to address the environmental consequences of issues such as:

- any developments that may occur as a consequence of the Project (e.g. provision of additional passenger facilities);
- areas outside the project sites which may be affected by any emissions or effluent discharges during construction (e.g. particulate, wastewater, hazardous materials);
- existing activities which will be altered or cease as a consequence of the Project (e.g. residential or recreational activities);
- the main environmental effects of Luas Line C1 compared with the existing land use or an alternative land use, and
- other existing or planned developments with which the Project could have cumulative effects.

ERM has undertaken this EIA and prepared this EIS in accordance with these requirements.

1.7 Timetable of Technical Studies

The EIA Study was commissioned in October 2001. Scoping was carried out between October 2001 and January 2002. Technical studies for the EIS largely commenced in the summer of 2002 and were completed by Spring 2005.

The EIA process culminates in the publication of an EIS and Non-Technical Summary (NTS). These documents inform decision-makers during the approval process. The EIS also plays an important role in informing the Luas Project Management Team as to the implementation of specific environmental management and monitoring tasks.

1.8 EIA Study Team

ERM mobilised a team of experienced consultants to undertake the individual stages of the EIA. Their names and responsibilities are listed in *Table 1.8a*:

ERM formed part of the Line C1 Design Team – a multi-discipline team managed by the RPA, including Traffic specialists, Safety specialists, Engineers, Environmental specialists and Architects etc.

Table 1.8a EIA Study Team

Function	Name	Organisation
Project Director	Peter Marsden	ERM
Project Manager	Ruth Minogue	ERM
Soils, Geology and Hydrogeology	Clare Glanville Tracey Ryan	ERM
Air Quality	Nicola Walden Georgina le Neve Foster	ERM
Ecology	Aileen McSwiney	ERM
Noise	Steve Mitchell Mike Fraser Aileen McSwiney	ERM
Vibration	Rob Barlow	ERM
Archaeology	Lisa Courtney Jackie Jordan	Margaret Gowen & Co Ltd
Landscape and Visual	Neil Elliot Sam Oxley Ruth Minogue Eimear O'Connor	ERM
Electromagnetic	Peter Dray	ERM
Traffic and Transport	Alan O'Brien Andy Blanchard Jonathan Noonan	Faber Maunsell
Consultation	Paul Scott Peter Marsden	ERM
Planning	Alison Harvey	ERM
Socio-economic	Kirsten Williams Rachelle Marburg	ERM
EIS Preparation	Peter Marsden Ruth Minogue Paul Scott	ERM

1.9 Consultees

Although there are no legal requirements regarding consultation at the pre-submission stage of the EIA process, it is considered beneficial and prudent to consult with interested parties at an early stage of the project planning and development process.

In order to ensure that the EIS covers all relevant issues, members of the project team consulted with a wide range of organisations whose interests might be affected by Luas Line C1. These include both statutory bodies and non-governmental organisations with relevant interests. The pre-submission consultations, undertaken as part of the EIA process, took place in parallel to the RPA's own public consultation exercise. However, the RPA consulted a broader range of interested parties as part of the process of selecting a preferred route and did not limit its scope to environmental issues.

ERM's approach to 'scoping the issues' was to discuss the scheme, obtain information relevant to the assessment and identify any environmental issues of concern to the consultees that should be addressed in the EIA. Details of the consultation process and outcomes are outlined in *Chapter 2.*

1.10 Glossary of Terms and Abbreviations

Table 1.10a explains certain terms and abbreviations used throughout the rest of this document, which will aid the reader in their overall understanding of the EIS.

Table 1. 10a Glossary of Terms

Terms & Abbreviations	Definitions
aOD	Above Ordnance Datum
At Grade	At public carriageway level (as opposed to underpass or bridge overpass)
CIE	Córas Iompair Éireann
Cumulative Impacts	These occur when the effects of an action are combined or interact with other effects in a particular place and within a particular time
dB(A)	A frequency weighting applied to sound measurements which approximates to the frequency response of the human ear
DART	Dublin Area Rapid Transit
DDDA	Dublin Docklands Development Authority
Do-Nothing Scenario	The situation, which would exist if no intervention or development, was carried out.
DTO	Dublin Transport Office
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EU	European Union
Fauna	Animals
Flora	Plants
Groundwater	Water that occupies pores and crevices in rock and soil, below the surface and above a layer of impermeable material.
GSI	Geological Survey of Ireland
IFSC	International Financial Services Centre
L_{AeqT}	A widely used noise parameter that calculates a constant level of noise with the same energy content as the varying acoustic noise signal being measured. The letter "A" denotes that the A-weighting average has been included and "eq" indicates that an equivalent level has been calculated. Hence, L_{Aeq} is the A-weighted-equivalent continuous noise level. L_{Aeq} is used as the basis for defining limits under the EPA Act.
L_{Aeq10}	The level of A- weighted noise exceeded for 10% of the 15-minute measurement time. This parameter is used to give a single figure result for higher noise levels and the impulse noise levels measured during the sample.
L_{Aeq90}	The level of A-weighted noise exceeded for 90% of the 15minute measurement time. This parameter is used to give a single figure result for noise level without any incidental or impulse noise and is often used as a measure of the background noise level.

LRV Light Rail Vehicle, more commonly known as tram. The name tram is more usually referred to throughout this document.

LRT Light Rail Transit – a generic term for the light rail system.

Mitigation Measures Measures taken to avoid, reduce or minimise predicted impacts

Monitoring The repetitive and continued observation, measurement and evaluation of environmental data to follow changes over a period of time, also used to assess the effectiveness of control measures.

NO_x Nitrogen Oxide

NO_2 Nitrogen Dioxide

OCS Overhead Conductor System

OHLE Overhead Line Equipment

PAH Polycyclic Aromatic Hydrocarbons

PM_{10} Particulate matter measuring less than 10 microns in diameter.

ppb parts per billion

Receiving Environment Existing environment within which the LRT is to be developed.

RMP Record of Monument and Places

RPA Railway Procurement Agency

SMR Sites and Monuments Record

SPA Special Protected Area

SAC Special Area of Conservation

SO_2 Sulphur Dioxide

Scoping The process of identification of the most significant issues to be addressed within the environmental impact assessment process.

ug/m^3 Micrommes per cubic metre, a measurement referring to air quality.

VDV Vibration Dose Value

VOC Volatile Organic Compounds.

1.11 Acknowledgements

ERM would like to thank the RPA for their commitment to the project and acknowledge the individual ERM contributors who have assisted in the production of this EIS.

In addition, ERM would like to thank the various specialists for their individual technical inputs to the EIS. These include:

- Faber Maunsell - *Impacts on Traffic and Transport.*
- Margaret Gowen and Company Limited - *Archaeological Assessment*
- MC3-D - *Photomontages for Visual Impact Assessment.*

1.12 EIS Structure

The remainder of this EIS document is structured as follows:

Chapter 2: Public Consultation

This chapter describes the consultation process undertaken in order to identify key environmental and socio-economic aspects/issues of the study. Details of the issues raised are also summarised and included in this chapter.

Chapter 3: Consideration of Alternative Routes

European and national EIA law require an EIS to include a description of alternatives considered during the design and selection of development proposals and to explain the reasons for selecting the chosen route including environmental reasons. This chapter therefore presents an overview of the Luas Line C1 route selection process, which determined the preferred route option.

Chapter 4: Luas Red Line Extension

Chapter 4 describes the development that is being proposed. It includes details on the spatial and temporal phasing of the development and, using maps and scaled diagrams, it explains the detailed layout of the completed development. It should be noted that certain information on materials, construction machinery and techniques are not yet confirmed and are not included in the scope of this study.

Chapter 5: Planning and Land Use Context
This chapter describes the past, present and proposed landuse within the study area. Strategic policies, development plans and other relevant information is reviewed in the context of the Luas Line C1 scheme.

Chapters 6-15: Environmental Impacts
Chapters 6-15 describe the impacts of the proposed development on the various aspects of the environment. Each chapter will follow a common structure as set out below.

- *Methodology* – sources of information and methods used to study the environmental impacts;
- *Technical limitations* – details of any problems encountered during the impact assessment process and how these limitations have been taken into account;
- *Receiving Environment* – description of the environment as it presently exists;
- *Potential impacts* – identification of sources of potential impacts and magnitude and significance of the potential impacts of the development in the absence of any precautionary controls;
- *Mitigation Measures* – measures taken to avoid, reduce or minimise any impacts predicted in the previous Chapter;
- *Predicted Impacts* - magnitude and significance of impacts that may occur after mitigation measures have been applied; and
- *Monitoring requirements* – details of a monitoring programme that will be undertaken to detect any impacts during construction and operation of the new Luas line extension.

The aspects of the environment are divided into the following categories:

Chapter 6: Socio Economic Context

Chapter 7: Traffic and Transportation

Chapter 8: Ecological Resources

Chapter 9: Soil

Chapter 10: Water

Chapter 11: Noise and Vibration

Chapter 12: Electromagnetic Effects

Chapter 13: Air Quality and Climate

Chapter 14: Landscape and Visual

Chapter 15: Cultural Heritage

Chapter 16: Impact Interactions
This chapter looks at the pattern of impacts both spatially and temporally and assesses if the Luas Line C1 may cause an accumulation of impacts in one area or aggregated impacts over time. It also looks at how certain aspects of the Luas Line C1 scheme may cause multiple impacts, the occurrence of secondary impacts and how these may be mitigated.

Chapter 17: Statement of Assessment
This chapter provides a formal statement of the findings of the EIA process.

The EIS is supported by a number of Annexes as follows:

Annex A: Landscape Insertion Plans.
Annex B: RPA Newsletter.
Annex C: Supporting Information on Climate and Air Quality.

Chapter 2

2 PUBLIC CONSULTATION

2.1 Introduction

This section of the EIS describes the approach taken during the EIA-related consultation and public participation programme. The current legal requirements for consultation during the EIA process are outlined, the methods used by ERM to obtain submissions from statutory consultees are described and a summary is provided of the key issues raised in such submissions.

2.2 Requirement for Consultation

In Ireland, the legal requirements with regard to consultation on new railway infrastructure are contained within the *Transport (Railway Infrastructure) Act, 2001*. This Act includes specific requirements regarding the content of an EIS and requires that the EIS be advertised after the application for the Railway Order has been made.

The European EIA Directive (*Council Directive 85/337/EEC (as amended) on the assessment of the effects of certain public and private projects on the environment*) sets the basic requirements for the EIA process for specific projects in all EU Member States. As such, it includes EIAs for "*Tramways, elevated and underground railways, suspended lines or similar lines of a particular type, used exclusively or mainly for passenger transport*;"(Annex 2: 10(h)).

The Directive requires that consultation with the public and the environmental authorities must take place prior to the decision-making stage but does not necessarily require that any consultation take place prior to submission of the EIS. Nevertheless, it is considered beneficial and prudent to consult with key interested parties at an early stage of the project planning and development process. This benefits the EIA process through:

- enhancing transparency in decision-making through the provision of information which allows for early identification and mitigation of potential impacts;
- providing a more comprehensive understanding of the baseline environment and relevant key individual and community issues and values (so more comprehensive data can be integrated into the development design);
- facilitating the acquisition of information on the potential environmental effects at an early stage of the EIA process; and
- increasing understanding, avoiding unnecessary controversy and delays in the decision making process at later stages arising from lack of understanding.

2.3 Consultation Process

2.3.1 Overall Luas Consultation Programme

As part of the EIA process, pre-application consultations were undertaken in parallel to the RPA's own public consultation exercise. The RPA consulted a broader range of interested parties as part of the process of selecting a preferred route and did not limit its scope to environmental issues.

ERM's approach to 'scoping the issues' was to discuss the scheme, obtain information relevant to the assessment and identify any environmental issues of concern to the consultees that should be addressed in the EIA.

2.3.2 RPA Consultation Programme

The RPA initiated public consultation in relation to Luas Line C1 in April 2003. The launch of the process was marked by a joint RPA/DDDA initial media briefing where commencement of public consultation, focusing initially on the selection of the preferred route option for Luas Line C1, was announced. The media briefing was well attended and was successful in prompting a significant amount of media coverage, which served to alert members of the public to the proposed line extension and the associated public consultation process.

The launch of the public consultation process was

followed by the distribution of approximately 10,000 newsletters targeted at all addresses - business, residential and institutional - in the vicinity of the indicative route options for Luas Line C1.

The form and content of information dissemination is outlined below.

Newsletter

The newsletter included maps showing identified route options and possible stop locations and a list of key issues to be considered in identifying the best overall route option. It confirmed the RPA's interest in obtaining the views of interested parties and representatives. Amongst the information included in the newsletter was a description of the overall process governing the making of railway orders, which served to place the public consultation process in an appropriate context.

The newsletter was accompanied by a Freepost response postcard for return by the recipient indicating their willingness to participate in the public consultation process; the postcard also provided recipients with an opportunity to communicate views and preferences to the RPA. *Annex B* presents the RPA Newsletter.

Newspaper Notices

Newspaper notices (approximately A4 size) were published in national newspapers following the launch of the public consultation process. Providing key information in relation to proposals for Luas Line C1 these notices again underlined the RPA's interest in receiving views and comments from interested parties. The notices incorporated a Freepost cut-out section to be completed and returned by interested parties confirming their willingness to participate in the consultation process. Respondents were sent a copy of the newsletter.

Meetings

In April 2003 the RPA initiated meetings with interested parties. In most instances meetings were arranged at the request of the RPA. *Table 2.3a* lists the interested parties that were consulted at this early stage.
In November 2003, IFMS (Integrated Facility Management Service, a property management company responsible for a large proportion of the IFSC) with which RPA had consulted, convened a general meeting, at which presentations were made by RPA representatives regarding the selected route option and work on the design of the Luas Line C1.

Table 2.3a RPA Consultation with Interested Parties

Residents of Mayor Street Upper
Brook Thomas
Jones Oil
ABN Amro
The Vaults
Residents of Custom House Harbour Apartments
Custom House Plaza Management Company
Harbourmaster Bar
SPAR, Gandon House and Custom House Square
McCann FitzGerald
NCB
WGZ Bank
HVB Bank
Depfa Bank
NAB CRL
IFMS
IFSC Steering Committee
Lisney/AIG
Citigroup
Insignia Richard Ellis Gunne
Gunne MacKenzie
Montgomery Oppenheim
Eircom
McKeever Rowan
Fitzpatrick's Menswear
Excise Bar
JP Morgan
Grafton Barbour
Platform 11

Open-Day (December 2003)

Following the selection of the chosen route, and the subsequent development of more detailed design proposals, an open-day was held in December 2003 at the National College of Ireland in the IFSC.

Persons who had responded to the RPA's consultation initiatives and had been entered on to a database were invited to attend and a notice referring to the open-day was posted on the RPA and the DDDA web sites. An organisation with a database of contacts in the IFSC area agreed to incorporate notification of the open-day in a newsletter being distributed by e-mail prior to the open-day.

Apart from drawings of the route for Luas Line C1, a dynamic graphical simulation model of the shared running section between Amiens St and Commons St was developed and exhibited at the open–day. In part, the simulation was intended to illustrate how shared running would operate and thereby counter concerns and misunderstandings, which had arisen from the earlier stages of the consultation process.

Open-Day (January 2004)

Following the open-day held in December, a second open-day was organised for January 2004 to display the most recent draft proposals and a graphically enhanced version of the dynamic traffic simulation model.

Large scale notices were published in national newspapers inviting members of the public to attend, letters were sent to all database members advising of the open-day and notices were posted on the RPA and DDDA web sites.

In December 2004, a third open-day was held to update interested members of the public on the progress of Line C1 and to provide the RPA with an opportunity to respond to queries and obtain comments. Notices were published in national newspapers inviting members of the public to attend and invitations were sent to persons listed on the RPA database.

Draft drawings of a design based on the Mayor Street alignment (the chosen route for the proposal) were available for inspection. Attendees were also informed that a more detailed examination of an alternative route option along the Quays had been prompted by feedback from public consultation (see Section 2.3.3 below). Copies of the RPA's document outlining the results of this route option examination were available for inspection and were issued to attendees. CD versions of the document were also issued. Attendees were informed that a final decision in relation to the Quays option to be pursued was imminent.

The product of the preliminary electronic mapping exercise was a graphical animation showing the output of a utilities survey was made available to the public for inspection. Development and implementation of a risk mitigation strategy for utility diversions was further discussed.

Correspondence & Telecommunications

A significant number of letters, e-mails and telephone calls were received from interested parties. As a matter of policy, the RPA responds to all such correspondence.

2.3.3 Further RPA Consultation with IFSC Business Community in August 2004

Arising from the on-going public consultation process, a number of concerns were raised, principally by the business community in the IFSC. The key concerns related to impact upon telecommunications infrastructure and construction stage impacts.

In recognition of the criticality of the telecommunications services to IFSC business interests and in order to mitigate the risk of their disruption, RPA gave a commitment during consultation to develop and implement a risk mitigation strategy. The aim of this strategy is to minimise the impact associated

with construction activities to existing utilities.
A significant amount of opposition to the selection of the Mayor Street Alignment was encountered by the RPA. The IFSC Steering Committee which was established in 2004 to oppose the scheme promoted the view that a better alignment option along the North Quays was available.

As a consequence of these concerns, the RPA agreed to reinvestigate an alternative Line C1 alignment along the Quays. A report reassessing this option was prepared by the RPA in August 2004. This report concluded that adoption of a Quays option would give rise to unacceptable and severe traffic impacts and disruption, in addition to environmental impacts, and significant cost increases. Further details of this assessment are provided in Chapter 3, Consideration of Alternatives.

2.3.4 Summary of Issues Arising from RPA Consultation with IFSC Community

A wide range of issues were raised and responded to during the course of the consultation process. Issues included:

• measures to avoid damage to critical communications cables (which led to the re-examination, and rejection, of the Quay option as discussed previously);

• temporary traffic management measures necessary to facilitate the construction of Luas Line C1;

• traffic management measures which would be required to be introduced on an indefinite basis to facilitate the efficient running of trams following the commissioning of passenger services;

• the maintenance of access to residences and business premises during the construction phase for pedestrians and vehicular traffic;
• the provision of loading/unloading facilities;

• provision of resident parking facilities;

• noise, dust and vibration during construction and operation of the line;

• spacing between stops; and

• interchange with existing and proposed Iarnród Éireann services.

2.3.5 Statutory EIA Consultations

ERM contacted a range of organisations in order to inform them of the nature of Line C1 and to determine the nature of any concerns or issues that they wished to have raised during the EIA process. To facilitate the consultation process, all organisations were sent a copy of the Line C1 Route Options Newsletter, published by the RPA, and a copy of the Executive *Summary of the Environmental Desktop*

Connolly Station (front)

Connolly Station (rear)

Study completed by ERM in 2001.

Table 2.3b lists the bodies that were consulted, the type of consultation (meeting or letter) and whether a response was received. The bodies are all listed as "prescribed bodies" under Section 28 of the *Planning and Development Regulations, 2001* (S.I. 600 of 2001). These bodies may be consulted by a local authority upon receipt of relevant planning applications.

All organisations were initially contacted by letter; those that did not respond after several days were then followed up with a telephone call.

ERM personnel attended meetings with four prescribed bodies. These were regarded as being the organisations that will have the closest involvement with the project during its construction and operation.

Table 2.3b 'Prescribed Bodies' consulted by ERM

Organisation	Meeting	Letter	Response
Dublin City Council	✓		✓
Dublin Docklands Authority	✓		✓
Dublin Transportation Office	✓		✓
Department of Transport	✓		✓
An Taisce		✓	
National Roads Authority		✓	
Dúchas		✓	✓
An Chomhairle Ealaion		✓	
Bord Fáilte Éireann		✓	
Commission for Electricity Regulation		✓	✓
Minister for Community, Rural and Gaeltacht Affairs		✓	✓
Regional Fisheries Board		✓	
Environmental Protection Agency		✓	✓
The Heritage Council		✓	✓
Health Board		✓	
Minister for the Marine and Natural Resources		✓	✓
Minister of Justice, Equality and Law Reform		✓	
Waterways Ireland		✓	✓
Irish Aviation Authority		✓	✓

2.4 Summary of Issues

2.4.1 Issues Arising from ERM's Consultation Activities

Table 2.4a list the issues that were raised by the Dublin Docklands Development Authority, the Dublin Transportation Office, the Department of Transport and Dublin City Council. The Table also identifies where, in the EIS, these issues have been addressed.

Table 2.4a Issues Raised during Consultation Meetings

Consultee	Issue	Section where issue is addressed in EIS.
Dublin Docklands Development Authority	Potential for soil contamination.	Chapter 9
	Flood levels along Mayor Street.	Chapter 10
	Integration of Point Depot with other transport nodes.	Chapter 7
	Visual impact of "wirescape" and integration of design into existing townscape.	Chapter 14
	Wheel squeal in residential areas.	Chapter 11
	Pedestrian safety.	Chapter 7
	Access by other traffic.	Chapter 7
	Visual and heritage issues related to Spencer Dock Bridge.	Chapter 14
	Interchange with other modes of public transport.	Chapter 7
	Capacity of Line C1.	Chapter 7
	New policy in the DDDA Masterplan 2003 which reserves canal crossing for public transport, cycling and pedestrians.	Chapter 6 and 7
Dublin Transportation Office	Assumptions made in traffic modelling/junction strategies.	Chapter 7
	Integration with other modes of transport	Chapter 7
	Roll-out of *Platform for Change*	Chapter 7
	Impacts at different scales	Chapter 7
	Use of models	Chapter 7
	Cycling/walking	Chapter 7

Table 2.4a Issues Raised during Consultation Meetings (continued)

Consultee	Issue	Section where issue is addressed in EIS.
Department of Transport	EIS must be compliant with Transport (Railway Infrastructure) Act 2001.	All of EIS.
	Should address issues raised at previous Luas Public Inquiries (particularly noise and vibration).	All of EIS, particularly Chapter 11.
	Non-technical summary should be carefully focused.	NTS
Dublin City Council	Definition of corridor.	Chapter 4.
	Need to look at Landscape Framework Plan and Urban Design Plan.	Chapter 14.

Table 2.4b summarises the key issues that were raised by those organisations who were contacted by letter. The Table also identifies where, in the EIS, these issues have been addressed.

2.5 Conclusion

The submissions that were received during the consultation process aided in the scoping of the EIA process and in the identification of potential impacts, key environmental sensitivities and aspects of the project that required clarification from the Design Team.

Throughout 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.

The development proposals which constitute the subject matter of this environmental impact statement reflect the contribution of those who opted to participate through the public consultation process and the RPA design team's preparedness to accommodate ideas, views and concerns as far as is reasonably practicable and appropriate.

In this regard and in recognition of the criticality of the communications services to IFSC business interests, RPA gave a commitment to implementing a utility risk mitigation strategy to minimise the risks to continuity of service associated with diversion of utilities.

Table 2.4b Issues Raised by Organisations Contacted by Letter

Organisation	Issue	Section where issue is addressed in EIS.
Environmental Protection Agency	Refer to EPA Advice Notes that have been revised or are undergoing revision	All of EIS
Waterways Ireland	Refers to details already discussed with DDDA and RPA regarding Spencer Dock Bridge.	Chapter 4 and remainder of EIS
Commission for Electricity Regulation	No comments	-
Minister for Community, Rural and Gaeltacht Affairs	No comments	-
Irish Aviation Authority	No significant effect on the safety of civil air navigation.	-
National Parks and Wildlife Service (formerly Dúchas)	Referred to Applications Section and to the Regional Ecologist	Chapter 8
Minister for Communications, Marine and Natural Resources	No comments	-
The Heritage Council	No comments. Recommended contacting National Parks and Wildlife Service.	Chapter 8

Interested parties were requested not to forego the opportunity which would be provided to inspect the plans, the environmental impact statement and other documents accompanying the railway order application as these might incorporate changes or additional information of interest to them.

Chapter 3

3 CONSIDERATION OF ALTERNATIVES

3.1 Introduction

This chapter discusses the approach taken in the comparative evaluation of alternative Luas Line C1 routes and the selection of the preferred route.

With respect to the Luas Line C1, the following sections discuss the rationale for the extension of the Luas Red Line beyond Connolly Station, the route identification process and a description of how the routes were assessed.

3.2 Environmental Rationale for the Extension of Luas Red Line

The policy review outlined in Chapter 1 confirms the need for a LRT system in Dublin in order to contribute to an integrated public transport system to and within the city centre. In the absence of the Luas Line C1, the Red Line terminates at Connolly Station and there will be no link to the Point. Although the North Lotts Planning Scheme, within the overall Dublin Docklands Development Area, would continue as planned, the Luas Line C1 is an integral part of the redevelopment of the Docklands and will be an important node for development in this area. A proposed stop at Spencer Dock and a terminus at the Point will provide access to and from these areas by public transport. The area will have a limited degree of private vehicle access in order to provide a better living environment oriented around public transport nodes. Furthermore, in the absence of the improved access that proposed Luas extension would provide, City areas between Connolly Station and Dublin Port would be excluded from the opportunities for development and regeneration.

In line with the *Directive 85/337/EEC* (as amended by *Directive 97/11/EC*), the early determination of the technical issues associated with the construction, operation and decommissioning of the proposed development is required. Early planning of the assessment, through the application of systematic scoping techniques, ensures that EIA resources are effectively deployed and efficiently focussed.

The *Environmental Desktop Study* was undertaken by ERM in 2001 as part of the examination of route alternatives. Three initial route options were considered and assessed for their potential environmental impacts. Further discussion on this process is presented in the following section.

3.3 Identification of Routes

3.3.1 Route Identification Process

The route identification process was undertaken by a multi-disciplinary team comprising RPA's Luas Line C1 design team, representatives of Dublin City Council and the EIA study team.
The route identification methodology comprised the following six stages:

1. Identification of feasible alignment options for Luas Line C1.

2. Elimination of unreasonable options based upon traffic, cost, built environment, safety and broad engineering grounds.

3. Identification of a short-list of route options for more detailed evaluation.

4. Evaluation of the short listed route options based upon operational, environmental, topographical, geotechnical, cost, built environment and more detailed engineering grounds.

5. The undertaking of Public Consultation on the three route options.

6. The identification of the preferred route.

Overview of Initial Routes

The overall route selection process began with the identification of all possible route options that meet the overall development objective of providing a light rail link from Store Street (off Amiens Street) to the Point .

3

Beginning in early 2001, a wide range of route options and alignment variants were developed and evaluated by the RPA in consultation with Dublin City Council. During the evaluation of this 'long list' of options, a number of key criteria were applied, including:

- engineering feasibility/practicability/ constructability/operability;
- disruptions to traffic flow (during both construction and operation of the line);
- cost considerations;
- consideration of the built environment; and
- disruption associated with the relocation of services and utilities.

Many route corridors were considered during this initial exercise. In order to assess the corridors effectively, the corridors were broken down into their individual streets and the streets were evaluated to identify which of these streets posed significant restrictions.

3.4 Selection Process

3.4.1 Route Selection Criteria

Part of the options appraisal process involved deciding which aspects of the environment needed to be addressed and which aspects are less likely to be significant. The assessment of environmental considerations against each route option involves the ongoing application of selection criteria in a consistent manner. Best practice and emerging guidelines on the environmental aspects to be considered were taken into account during this stage.

Table 3.5a below indicates which aspects are considered to be the key environmental issues that were addressed in the route selection process.

Table 3.5a Key Environmental Issues

Environmental Topic	Environmental Aspect	Key Environmental issue
Human Beings	Economic Activity	✓
	Social Patterns	✓
	Land-use	✓
	Employment	✓
	Health & Safety	✓
Flora and Fauna	Communities	
	Terrestrial/Aquatic/Marine	
	Seasonality	
	Succession	
	Existing Management	
	Critical Requirements	
	Protection Status	
	Habitats	
	Breeding/Feeding/Roosting	
	Routes	
	Mammals/Birds/Fish/Insects/	
	Reptiles	
	Population	
	Stability/Management	
	Critical Resources	

Table 3.5a Key Environmental Issues (continued)

Environmental Topic	Environmental Aspect	Key Environmental issue
Soil	Geology (e.g. Karst environments)	✓
	Mineral Soils	✓
	Peat/Fens	
	Estuarine Sediments	✓
	Agricultural Capability	
	Engineering Characteristics	✓
Water	Ground/Surface/Estuarine/ Marine	✓
	Physical	
	Chemical	
	Biotic	
	Beneficial Uses	
Air	Air Quality	
	- Pollutants	✓
	- Suspended Particles	✓
	Odour	
	Noise	✓
	Vibration	✓
	Radiation *(Electromagnetic)*	✓

Table 3.5a Key Environmental Issues (continued)

Environmental Topic	Environmental Aspect	Key Environmental issue
Climatic factors	CFCs	
	Acid Rain	
	Thermal Pollution	
	Micro-Climate Change	
	Pollution Transport	
Landscape	Landscape Character	✓
	Landscape Context	✓
	Views & Prospects	✓
	Historical Landscapes	✓
	Manmade Landscapes	✓
Material Assets	Building & Structures	✓
	Infrastructures	✓
	Natural Resources of Economic Value	✓
Cultural Heritage	Archaeology	✓
	Folklore/Tradition/History	
	Architecture/Settlements	✓
	Monuments/Features	

In addition, as part of the scope for the desktop study a review of comments made during the oral hearings of previous Luas routes was undertaken. Some of the key concerns noted during public inquiries for the previous Luas Lines included:

- impact on local communities;
- traffic management arrangements;
- access arrangements (in particular loading/ unloading at premises along the route of Luas Line C1);
- noise and vibration;
- disruption during construction (in particular noise and dust impacts, and pedestrian movement); and
- concerns regarding the use of Connolly Station Ramp for a Luas stop.

In line with the information presented above, the comparative appraisal of the route options was undertaken on the basis of the following key criteria, which were regarded to be the most pertinent issues for this options appraisal:

- socio-economic factors;
- potential soil/groundwater contamination;
- landscape/heritage factors; and
- traffic.

3.4.2 Route Options

The initial route options were carefully assessed against a number of key considerations. They were all eliminated on a number of grounds, frequently due to engineering feasibility constraints, disruption to traffic flows, built environment considerations.

A number of options including single and dual tracks for Store Street, Talbot Street, Memorial Road, Beresford Place, Custom House Quay, Amiens St and Connolly were eliminated primarily due to disruption to traffic flows, disruption associated with relocation of services and facilities and engineering feasibility constraints.

A variety of options and combinations were also considered for the Commons Street, Guild Street, New Wapping Street, Sheriff Street, Seville Place and Harbourmaster Place areas.

Following the evaluation of the long list of route options, broken down into the individual streets, the RPA and representatives of the Dublin authorities developed a 'short list' of three routes that were identified for more detailed assessment.

Each of the routes shared a common alignment between Commons Street and the terminus at the Point . For ease of integration with the existing Luas Red Line and to ensure optimal flexibility from an operational perspective, all routes also have their western end linking up with the Luas Red Line at Store St (off Amiens St) and all serve Connolly Station, As a result all route options considered involve reconfiguration of the track arrangements crossing Amiens St.

Route Option A proposed the straightest and shortest of the three routes. From Store Street the line would head across the main junction with Amiens Street and along Mayor Street Lower adjacent to the IFSC. The route would then cross Guild Street and across a new bridge over Spencer Dock, over the CIÉ site and on to the Point terminus. The line would be twin-tracked along its length. (See *Figure 3.5.2a*).

Route Option B would head across the junction between Store Street and Amiens Street and Connolly Station and run northeast up Harbourmaster Place alongside Connolly Station where it would become single-track in order to pass through the narrow section at the northern end of Harbourmaster Place. The alignment then reverts to twin tracks in Sherriff Street and continues east along Commons Street and Mayor Street across a new bridge over Spencer Dock to the proposed terminus at The Point. (See *Figure 3.5.2b*)

Route Option C proposed a line with a single-track loop extending from the existing cross over arrangements located south of the terminal stop at Connolly Station, eastbound Luas vehicles would travel along the east side of the station building through the narrow lane before turning into Sherriff Street Lower. and down Commons Street. At the junction of Mayor Street Lower and Commons Street the track reverts to a twin track arrangement and continues east across a new bridge over Spencer Dock to the proposed terminus at The Point or to continue clockwise to close the loop at the junction with Harbourmaster Place. The westbound Luas vehicles would run along Mayor Street Lower to Store Street. (See *Figure 3.5.2c*)

As is apparent from the route descriptions above, the three route options under consideration shared common sections such that three route section components could be defined:

Route Section 1 - from Store St, Amiens Street along Sherriff Street Lower and Common Street to the junction with Mayor Street Lower;

Route Section 2 - from Store St, Amiens Street along Mayor Street Lower and to the junction with Commons Street; and

Route Section 3 - from the junction with Commons Street along Mayor Street Lower, connecting with Mayor Street Upper to the Point.

These route sections were combined in the route options under consideration in the following manner:

Route Option A combined Route Section 2 and Route Section 3; and

Route Option B combined Route Section 1 and Route Section 3;

Route Option C combined Route Sections 1, 2 and 3.

Given that Route Section 3 was common to all three Route Options (and therefore is a neutral element in any comparative assessment of the three options), a comparison of the options available comprised: Route Section 1 versus Route Section 2 versus Route Sections 1 & 2 combined.

It is clear that any such comparison would result in either Route Option A or B being found favourable to Route Option C as the latter would combine the physical impacts of all the options under consideration.

Re-assessment of an Alternative Route along Quays

Following the formal consideration of the route options, and the subsequent public consultation process, a number of specific concerns continued to be expressed in relation to that section of the proposed alignment along Mayor Street, in the vicinity of the IFSC. In particular, the IFSC Steering Committee raised concerns regarding the potential impacts upon existing telecommunications infrastructure, which is critical to business continuity, and of temporary construction stage impacts, which they perceived as having a potentially long term negative effect upon a number of local businesses. Access to underground parking facilities during construction has also been expressed as a concern. As part of this consultation process, a route via the Quays was suggested by the IFSC Steering Committee as an alternative. This had been considered by RPA during the early stage route assessment process and had been rejected mainly due to traffic considerations. However in view of the serious concerns voiced by the IFSC Steering Committee, RPA undertook to re-assess the Quays route.

Several options for a route along the Quays were considered. The first 500-750m of the route between Connolly and the Quays was shared by all of these options (if one assumes that the line must connect with Connolly). Alternatives which bypass Connolly and Busáras were also considered including a link directly back to Abbey Street. The traffic impacts of these variants would be significant and

the loss of integration with Busáras and Connolly Station essentially ruled these options out.

An alternative route using the first section of Harbourmaster place was also considered, with the tram crossing Georges Dock via a bridge structure.

Three options for routes proceeding along the Quays were identified:

• Route Option 1 a route between two adjacent carriageways in the centre of the existing road;
• Route Option 2 would stay on the North side of Custom House Quay; and
• Route Option 3 would place the route along the Campshires.

The IFSC steering committee in response to the options identified above proposed a further variation on an alignment on the north side of the Quays which was also assessed

The environmental impacts of the various Quays options are discussed in further detail below.

3.5 Summary of Assessment of Routes

3.5.1 Socio-economic Factors

As each of the non-quays route options lay within the same broad corridor, their potential for impacts were similar. The main difference between the options related to the alignment of the track between Amiens Street and Commons Street, within Custom House Dock. However since redevelopment of this area is well advanced there would be little or no impact on the development profile of the area as a result of any of the proposed routes. The greatest impact of the scheme would be to the east of Spencer Dock where the regeneration potential is the greatest. All of the options followed the same route in this area and hence there were no differences between the impacts of the three options.

The appraisal of the socio-economic difference implications of the alternative route options concluded that the options were broadly similar in their effect, with a minor preference for Route Options B and C due to the improved accessibility between Connolly DART station and Luas. All of the route options would temporarily adversely affect communities during construction but these impacts were balanced against the improved accessibility and reduced journey times that the Luas will ultimately provide.

The appraisal also concluded that the degree of difference between the options is relatively narrow and did not warrant the exclusion of any of the Route Options based on socio economic factors at this stage.

In relation to the identified Quays Options when compared with the Mayor St alignment three significant factors were identified which predicted negative impacts in relation to passenger access and capital costs:

1. The Quays alignment options are located a considerable distance from the proposed Spencer Dock Station, a critical transport hub for the docklands area. There is also a large residential community to the North of the preferred alignment, which would be disadvantaged by moving the alignment further south.

2. The location of the line along the Quays leaves Luas Line C1 with a catchment limited to the north side rather than both north and south, which would be the case if the line were located on Mayor Street.

3. The alternative routes along the Quays would require more property acquisition and demolition and so add significantly to the capital cost. The Campshires option (“Route Option 3”) would

require demolition of the two restaurant buildings and would result in major impacts on the environmental improvement works recently undertaken by DDDA. The route long Mayor Street is mainly in public roadway or along lands reserved as part of planning permissions already issued; this route therefore requires no demolition of existing properties.

3.5.2 Potential Soil/Groundwater Contamination

The appraisal of potential soil and/or groundwater contamination identified potentially significant issues along each of the route options. It is expected that the construction of Luas Line C1 will involve relatively shallow excavations between 800 to 1500 mm below the surface at any location along the route options with the exceptions of bridges and substations. However, the potential for encountering contaminated material within this depth range was considered greater in the Sherriff Street area (due to historic industrial rail uses associated with Connolly Station) when compared with Mayor Street Lower; accordingly Route Option A was the preferred option since it avoided this potential area of environmental concern.

The Quays Options, by being routed to the south of the core areas of historic industrial use, are likely to encounter areas with a lower contamination potential. However, since the Route Option A, B, C evaluation exercise was undertaken, the progressive development of the Spencer Dock area has been accompanied by land remediation measures such that the risks of encountering unforeseen contamination have been reduced.

Overall, it should be noted, that the appraisal also concluded that the degree of difference between the options is relatively narrow and did not warrant the exclusion of any of the Route Options at this stage. Remediation of any areas of significant contamination, albeit at a cost, can resolve any issues associated with contaminated soils.

3.5.3 Landscape/Heritage Factors

The appraisal of landscape and heritage issues identified the impact to the heritage and townscape resources (specifically, the protected structures) on Mayor Street Lower as a potentially significant difference between the three route options; albeit these effects would be reduced through sensitive design. Nonetheless, the appraisal concluded that there was a slight preference for Route Option B (which avoids particularly sensitive features along Mayor Street Lower) over the other two options.

The appraisal also concluded that the degree of difference between Route Options A to C is relatively narrow and did not warrant the exclusion of any of these Route Options at this stage.

The Quays route options would avoid impacts to heritage resources on Mayor Street. However, each of these options would require the crossing of the Scherzer Bridges, which are protected structures. The dimensional clearances of the trams are such that a single Scherzer bridge could not accommodate the passage of two trams. However, this does not warrant the exclusion of the Quays options based on landscape/heritage factors.

3.5.4 Traffic

A detailed appraisal of the potential traffic implications of the route options and a consideration of available traffic management options was undertaken. A particular emphasis was placed on the traffic implications of each of the route options including those associated with the proposed Macken Street Bridge development, Dublin Port Tunnel, and other proposed developments that may create new traffic cells. For each of the route options, an overall traffic scheme for the study area, compatible with the on-street light rail running, was developed.

This appraisal concluded that Route Option C appeared to be the least preferred route as it combined the physical impacts of all the route options under consideration and increased the numbers and locations of potential sensitive receivers. The appraisal also identified Route Option A as the pre-

ferred route. However, the appraisal noted that the degree of difference between the Options was relatively narrow and did not warrant the exclusion of any of the Route Options at this stage.

The Quays Options

The Quays route options posed a number of significant traffic and road user safety implications which are outlined below:

Key issues associated with the alignment options for routes proceeding along the Quays:

• Route Option 1 a route between two adjacent carriageways in the centre of the existing road;
• Route Option 2 would stay on the North side of Custom House Quay; and
• Route Option 3 would place the route along the Campshires.

Traffic: an alignment along the quays would result in significant impacts on traffic. The Port Tunnel and Macken Street bridge are key components in Dublin City Council's traffic management strategy for the City. Modelling of traffic in the area indicates that whilst large trucks would be removed from the Quays by the Dublin Port Tunnel, there is a potential for increased traffic volumes along Custom House Quay. The only alignment option along the Quays that would result in less significant traffic impacts during operation would be a fully segregated alignment along the Campshires. Otherwise there would be a number of difficult track crossings and interface points between the Luas line and the existing north-south routes through the area. Traffic impacts would be most significant in the area of Custom House Quay and Busáras. These options are not acceptable to Dublin City Council.

Compatibility with Macken Street Bridge: each of the Quays options also has difficult issues with regard to compatibility with the proposed Macken Street Bridge and the entrance to Spencer Dock. Achieving sufficient headroom for the access to the canal with a fixed bridge would result in an unworkable interface with Macken Street Bridge, with the result that an opening bridge would be the only option to facilitate a crossing of the canal. The proximity of the alignment to the Macken Street Bridge makes a future connection crossing the bridge very difficult.

Safety: the Quays options pose a number of significant risks for roadusers for example on Memorial road the potential for traffic and trams travelling in opposing directions on the wrong side of the road. Footpaths and roadway widths are minimised, cycle lanes removed pedestrian crossings become difficult resulting in pedestrians having to negotiate traffic and trams travelling in several different directions with no space for staggered crossings. Complex tram/road user interactions, especially at junctions and crossings can lead to higher risk of accidents.

Integration with other modes of public transport: the Quays alignment options are located a considerable distance from the proposed Spencer Dock Station, a critical transport hub for the docklands area.

Passenger access: the Quays options limits the Luas Line C1 catchment to the north side rather than both north and south if the line were located on Mayor Street. The proposed new pedestrian and road bridges across the Liffey would help to reduce this somewhat. However, there is a large residential community to the North of the preferred alignment, which would be disadvantaged by moving the alignment further south.

Loss of amenity: the alignment option along the Campshires would require major changes to this newly created public amenity. The Campshires are a linear recreation area parallel to the river, with ample cycle and walking facilities and river-side seating. The removal or permanent reduction in scale of the Campshires would have a negative effect on the quality of environment for the Docklands community Trees that have recently been planted along the Campshires may have to be removed to facilitate construction and temporary

diversions of services and traffic. Space restrictions may prevent these being replaced following construction. The Famine Memorial would have to be relocated and two newly established restaurants demolished.

The principle issues associated with the shared section between Connolly and the Quays are:

Traffic Disruption: Amiens St is one of the main traffic arteries for the city's traffic management strategy. The Quays options would require a full delta junction arrangement to be located in Amiens Street. This would interfere with traffic flow through reduced traffic lanes and the introduction of signals to control tram movements across the delta junction are complex. A connection from the Quays back to Connolly Station would result in severe traffic impacts on Memorial Road and around the Custom House. The alignment would remove a minimum of two lanes from in front of the IFSC (La Touche House) and would restrict car park access on the quays. The need to reduce the number of lanes on the southern end of Amiens Street, such a proposal is not acceptable to Dublin City Council.

Pedestrian, Cyclist, Road User Safety signals, moving points and metalwork in the road carriageway would make the Amien St junction a difficult and confusing crossing, in particular for pedestrians and cyclists. The Mayor Street proposed alignment places the delta in Harbourmaster Place in a traffic-free area. Reducing the risks to all roadusers. Also, the potential for opposite direction running of trams on Memorial Rd, introduces greater risks for tram, road user interface.

The alternative route using the first section of Harbourmaster place, with the tram crossing Georges Dock via a bridge structure has the advantage of avoiding the predicted traffic impacts at Memorial Road. Demolition of a small shop unit would be required and the requirement for a new bridge across the dock would have a significant impact on the amenity of the newly renovated dock. A high level bridge would be required to cross the roadway and then ramp down onto the Campshires (pedestrianised area adjacent to the Liffey) to avoid an at-grade crossing.

3.5.5 Overall Comparative Appraisal

As indicated above, Route Option C appeared to be the least preferable option as it combined the physical impacts of all the other route options under consideration and increased the numbers and locations of potential sensitive receivers. At the same time however, Route Option C would allow maximum accessibility to the Docklands Area for Luas Line C1 passengers. However, it is important to note that each of the technical appraisals also concluded that the differences between the route options did not warrant the exclusion of any of the non-Quays route options at this stage. This is due to the scale and/or duration of identified potential impacts, which can potentially be mitigated through the detailed design process and through the application of best practice in site management during construction and operation.

The comparative environmental appraisal indicated that none of the non Quays Route Options are likely to give rise to impacts that would warrant their exclusion from further consideration. Similarly, there appeared to be no clear preference across the environmental factors appraised for one Route Option to be considered the preferred option.

The route selection process also considered non-environmental issues, such as engineering feasibility, financial considerations, and provision of passenger services. It was concluded therefore that environmental considerations should be given relatively low weighting in the route selection process and that other factors (engineering feasibility, passenger service provision, cost, etc) would be used as the primary determinants of route selection.

Comparison of the Quays route options with the Mayor St alignment concluded that the Quays route options would result in significant traffic management, economic and environmental impacts that, in combination, warranted the exclu-

sion of the Quays route option from further consideration. In addition, the two principal concerns, in relation to the Mayor Street option, were analysed and appropriate risk avoidance and management measures were proposed:

Communications network risk can be minimised by the use of improved mapping information. To this end, the RPA have undertaken detailed ground radar investigations and are using this information to carefully plan and phase utility works in conjunction with the business community in the area. Alternative and backup routes can help to avoid downtime or potential accidental disruption.

Construction Impacts There will be significant, but temporary, construction impacts during the building of the line along Mayor Street. However the RPA considers these will not be as significant as perceived by local residents and occupants of the adjacent buildings. By the use of good planning, proper liaison, construction innovation, prefabrication, flexible working, these impacts will be minimised. The construction impacts are short-term in nature and will be offset by the gains which the final scheme brings. During construction access to premises and underground carparks will be maintained.

3.6 Emergence of Route Option A as the Preferred Route

The results of the initial comparative evaluation of route options identified Route Option A as the preferred route.

However, the decision to proceed with this route option was suspended in the summer of 2004 following representations from local business interests that requested that options routed along the Quays be considered within the overall route evaluation exercise.

As discussed in Section 3.5 above, a re-evaluation of the original short listed route options against the Quays route options has demonstrated that the Quays options would result in significant environmental, traffic management and economic impacts that, in combination, warranted the exclusion of the Quays route option from further consideration.

The overall conclusion of the consideration of alternative route options is that Route Option A is the preferred route. This route is the straightest and shortest of each of the routes considered and comprises a twin tracked alignment from Store Street, across the main junction with Amiens Street and along Mayor Street Lower adjacent to the IFSC. From the IFSC the route would cross Guild Street and Spencer Dock and on to the Point terminus.

This selected route has been subjected to full requirements of the EIA process as reported in the EIS Chapters that follow.

Photomontage showing
proposed Luas line on Mayor St.

Chapter 4

4 LUAS RED LINE EXTENSION: PROJECT DESCRIPTION

4.1 Introduction

This chapter describes the extension of the existing Luas Red Line from Connolly Station to The Point, known as Luas Line C1. The objective of this chapter is to present the main activities associated with the development of the Luas Line C1, including scheme description, construction activities and operational activities.

4.2 Context of Scheme

The Dublin Transportation Office (DTO) published '*A Platform for Change'* in 2000, which outlined an integrated transportation strategy for the Greater Dublin area. One of the recommendations of this report was the extension of Luas Red Line (Lower Abbey Street to Connolly Station) to the Docklands area. This Luas extension is planned within the wider context of a number of proposed developments within the Docklands area including:

- the construction of the Macken Street Bridge across the River Liffey;
- the construction of the Interconnector rail link between Heuston and a proposed Spencer Dock Terminus;
- the construction of the Dublin Port Tunnel;
- the overall development of Docklands area including Spencer Dock and the proposed Linear Park and National Conference Centre, and
- the construction of the Irish Rail Surface Station at Spencer Dock.

4.3 Objectives of Scheme

The following design objectives were considered during the development of the Luas Red Line Extension.

The new LRT route should provide connection to Luas Red Line (as previously approved and constructed);

The new route should serve The Point, as indicated in the DTO publication 'A Platform for Change';

The new LRT route should allow for a possible link to the proposed heavy rail station beneath the Spencer Dock Site and the Irish Rail Surface Station at Spencer Dock;

The new route should allow for possible future extension to Dublin Port and the South side of the city via the proposed Macken St Bridge;

- LRT route to service existing and proposed development within the Custom House Docks area;
- The LRT route should comply with the DDDA planning scheme for the extended Custom House Docks area;
- The new LRT route should avoid demolition of existing properties; and
- The new LRT route should support sustainable development of the docklands area.

4.4 Detailed Description of the Proposed Scheme

4.4.1 Design Principles

In addition to the objectives detailed in *Section 4.3* above, a number of design assumptions were also made and these are presented below:

- the extension of the Red Line will be designed to accommodate the current vehicles operating on the Red and Green Lines;
- the route will be predominantly at street level;
- no separate depot will be provided;
- the route should be suitable for future development via the proposed Macken Street Bridge; and
- stops will be similar to those used on the existing Red and Green lines, i.e. 50m long platforms.

4.4.2 Route Alignment

The Red Line extension is approximately 1,500m in length and comprises a double track extension from Store Street; close to the existing terminal stop at Connolly Station. This alignment turns eastwards across the junction of Harbourmaster Place and Mayor Street Lower from the existing Red Line stop at Connolly Station. At this location there will be a "delta junction". The design of this junction at Mayor Street, Amiens Street and Harbourmaster Place allows the greatest level of flexibility opera-

tionally with different service patterns possible from each arm in both directions.

The Red Line extension continues to run eastwards along Mayor Street Lower, crossing Georges Dock via the existing bridge. The route continues along Mayor Street Lower, crossing Guild Street and over the Grand Canal via the construction of a new bridge with two vehicle carriageways, two footpaths and two LRT tracks. The route will continue through the Spencer Dock Development and re-establish the connection between Mayor Street Lower and Upper. It will cross New Wapping Street and Castleforbes Road, continuing along Mayor Street Upper before terminating at The Point.

There are four proposed stops along this alignment at the locations detailed below.

- George's Dock at Mayor Street Lower.
- Mayor Square on Mayor Street Lower.
- Spencer Dock Stop (within the Spencer Dock Development).
- The Point Terminus.

4.5 Key Elements of the Project

4.5.1 LRT Rolling Stock

As with the Luas system as a whole, the Luas Line C1 extension to The Point will be operated using Light Rail Vehicles (LRV), hereafter referred to as trams. Initially the type of tram utilised will be similar to those in use on existing Red and Green lines.

Each tram will have capacity to accommodate 235 passengers on 30m trams and 310 passengers on 40m trams, based on 5 persons per m^2. Standing passenger numbers will depend on demand and on the perception of comfort levels. Each tram will have a driver's compartment at either end and will be bi-directional. It will have a low floor level for most of its length to facilitate easy access for the mobility impaired.

The main performance characteristics of the trams are presented in *Table 4.4a* below.

Table 4.4.a Performance Characteristics of the Tram

Performance topics	Characteristics
Maximum speed	70 km/hour
Initial acceleration	1.2 m/s^2 approximately eight seconds from 0 – 30 km/hour
Average deceleration in operation	1.2 m/s^2

4.5.2 Track

Luas Line C1 will run along streets and a grooved rail will be used as per the existing Red Line. The track will adopt the standard European LRT gauge of 1435mm. As the system will be double track throughout, the overall track bed width will be 6.2m on a straight alignment and 6.6m where the track bed contains axial poles. The areas between and beside the rails will be paved/surfaced. The type of paving/surfacing depends on the character of the surrounding area and the nature of any non-LRT traffic that may run over the track bed.

4.5.3 Stops

The stops will be of a similar design as the existing Red and Green line stops. Each of the four proposed stops will comprise raised platforms approximately 281mm high and 40m long, with a 5m ramp at either end where required. The platforms will be a minimum of 3m wide and, wherever possible, will be situated on either side of the tracks (lateral platforms). These allow for level boarding and alighting by all passengers.

4.5.4 Canal Bridges

The development of Luas Line C1 will involve the widening of Mayor Street Bridge and the construction of a new bridge over the Grand Canal at Spencer Dock.

The Mayor Street Bridge widening scheme will involve widening and strengthening the current bridge to allow for the running of the Luas Line C1. The bridge deck will be widened as required to achieve the minimum width requirements including footpaths and the external longitudinal beams will be strengthened. Where feasible, all parapets, granite kerbing, cobbles and other surfaces will be reused in order to retain the appearance of the existing bridge.

A new bridge will be constructed over the Royal Canal at the Spencer Dock site, adjacent to the intersection of Guild Street and Mayor Street Lower. It will form a key feature in the proposed Linear Park within the wider Spencer Dock development. It has been designed to accommodate the dual track for the tram, two footpaths and two vehicular carriageways.

4.5.5 Power Supply

The trams operate on 750 volts direct current (d.c.). Substations are required to house the necessary equipment to transform and rectify a supply at 10kv from the national electricity grid and output to the LRT traction system at 750 d.c.

Electricity to Luas Line C1 will be supplied via overhead power lines, at a minimum height of 6.0m above the ground in areas where road traffic can run directly on the alignment, supported by poles positioned either alongside or between tracks, or by cables fixed to building facades. Power will be supplied to the OCS (Overhead Conductor System) via multi-tubular cable ducts that form one edge of the track bed foundation; on the other side of the track bed there will normally be a parallel set of ducts carrying communications and signalling cables.

One new substation will be required to service the Red Line extension. It is proposed that this substation will be located at the Spencer Dock stop. In addition, there is a requirement for OCS Lineside Feeder Boxes. These are used for interconnection and, in some cases, for the switching of parallel feeder cables supplying the OCS. The number of parallel feeder boxes will depend on the final design but it is estimated that a maximum of four feeder boxes will be utilised for the Red Line extension.

Technical cubicles are located at the tram stops; these contain the equipment relating to each individual tram stop such as electrical power supplies, telecommunications equipment, cable transmission network (CTN) equipment and automatic vehicle location system (AVLS). The cubicles contain the telecommunications equipment for the fixed equipment at the tram stop such as passenger information displays (PIDs), public announcement (PA), etc.

4.6 Construction of the Scheme

4.6.1 Introduction

Typically, the construction of a linear scheme has certain specific characteristics. Work is typically started at a number of locations simultaneously with many work activities running concurrently. In this way, as construction work progresses along the route different activities will happen in different places and at different times. This is particularly true of the Luas Line C1 project where a clear sequence of activities described below has to be followed:

- site preparation and investigation;
- utility diversion;
- foundation excavations;
- installation of ducting and drainage along and adjacent to the route;
- installation of track bed and rails; and
- surface finishes and installation of electrical and operating equipment.

The successful completion of these pre-construction and construction phase activities will ensure completion of the works within a reasonable timeframe and aim to minimise inconvenience within the alignment area.

4.6.2 Sequence of Construction Activities and Utilities Diversion

Introduction

The initial phase construction activities will involve the mobilisation of the appointed contractor, 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, guardrails, directional signs, letterboxes, etc. The development of the proposed alignment does not require the demolition of any existing buildings. The implementation of temporary traffic measures will be required in order to facilitate future construction activities.

Identification of sub-surface features

As part of the design process utilities (and other sub-surface) components that may interface with those areas that will incorporate the Luas trackbed and overhead catenary system are identified. Once identified and located, the level of interface is assessed and the components modified or designed around as deemed necessary. The cooperation of IFSC occupants was sought as part of this process. Thereafter sophisticated electronic mapping was deemed necessary to visualise the sub surface structures as records of locations were often not up-to-date, or lacked detail within its contents data, in particular with regard to buried basements, decommissioned utilities and reinforced protection slabs.

The following information has been gathered:

- Location and identification of all utilities with respect to their horizontal profile and depth.
- Location of basements
- Location of subsurface structures, voids, culverts, watercourses, etc that may not have been identified from general records.
- Geotechnical data.
- Non-identified potential archaeological sites (mainly structures).

Due to the sensitive nature of the financial district area, intense investigation was required to achieve a high level of confidence in the location of all subsurface infrastructure. To maintain this level of confidence further indepth investigation be carried out. This information will support the detailed design and construction stages of the Luas Line C1 project.

Utilities Diversion

To ensure that Luas Line C1 operations are not affected by future utility maintenance or diversion activities, where appropriate existing utilities will be diverted from beneath the proposed Line C1 route. Utilities will generally be relocated away from the track bed area but provision for suitably protected crossing will be made where existing or future development requires it. Principally these works will involve the diversion of water mains, storm water drains and sewers, electricity cables, gas pipes and telecommunications and TV cables. Where sewers are of large diameter and are buried at substantial depths they will not be relocated but any access manholes will be relocated off the track bed.

Bord Gais has a 40bar 500mm diameter transmission main traversing the Sherriff Street-East Wall area known as the Abbotstown-Ringsend line. Part of this line interfaces with the proposed alignment between the junctions of New Wapping Street and Castleforbes Road in a West/East direction along Mayor Street Upper. This line feeds the power station at Ringsend.

In consultation between Bord Gais it was agreed to construct the trackbed above the gas main. The design and construction of the trackbed will be agreed with Bord Gais prior to construction to satisfy construction, maintenance and safety standards.

Works associated with utility diversions are within the scope of major renewals or diversions which

utility organisations may expect to undertake from time to time. All utility diversions will be complete in conjunction with the relevant utility provider and will be in compliance with their requirements and relevant codes of practice.

The importance of continuity of service to receptors within the study area is recognised by RPA. In recognition of the criticality of the communications services to IFSC business interests, RPA informed relevant interests at various meetings and has confirmed that they are committed to implementing a utility risk mitigation strategy.
This includes:

• Location and identification of all services through the use of Geo-radar, record information and hand dug trial holes/slit trenches.

• Appointment of a project manager specifically for the diversion of utilities

• Verifying existing back up facilities and alternative routes/supplies

• Designing diversion works including provision of additional alternative routes if required which can be left in place permanently

• Preparation of detailed works programme including traffic management strategies

• Supervision and monitoring of the works and

• Establishment of a liaison group as a mechanism to update stakeholders regularly

Enabling Works and Bridges

To facilitate the most efficient construction methodology, both Mayor St Bridge and Spencer Dock Bridge are likely to be constructed prior to commencement of work on the track. Construction of the bridges will follow the sequence of events below:

• prepare site;
• construct bridge foundations;
• construct frame of bridge deck; and
• pour concrete to create bridge deck.

Construction Access

The contractor will require site access at all times. Site access will be restricted to construction personnel only. Arrangements to dig across access points to underground car parks will be by agreement with the owners. The use of ramped access is envisaged to maintain these access points.

Management of the construction traffic will be in line with the *Traffic Management Plans* that will be implemented for the duration of the construction works. It is likely that there will be a requirement for 'out of hours' delivery of some materials to the site to minimise traffic impacts.

Storage of Materials

Materials will be stored at the designated main compounds and delivered onto site as required. As the sites progress there can be a certain element of storage on site. For the storage of materials and/or substances that are potentially hazardous on site, due consideration will be given to the storage area and to the findings of chemical agent risk assessments.

Identification of sub-surface features

As part of the design process it was necessary to identify any utilities (and other sub-surface) components that may interface with those areas that will incorporate the Luas trackbed and catenary system. Once identified and located, the level of interface will be assessed and the components modified or designed around as deemed necessary. Electronic mapping was deemed necessary as records of locations were often not up-to-date, or lacked detail within its contents data, in particular with regard to buried basements, decommissioned utilities and reinforced protection slabs.

The following information has been gathered:

• Location and identification of all utilities with respect to their horizontal profile and depth.
• Location of basements
• Location of subsurface structures, voids, culverts, watercourses, etc that may not have been identified from general records.
• Geotechnical data.
• Non-identified potential archaeological sites (mainly structures).

Due to the sensitive nature of the financial district area, intense investigation was required to achieve a high level of confidence in the location of all subsurface infrastructure. To maintain this level of confidence further intense investigation will be required and is ongoing. This information will support the detailed design and construction stages of the Luas Line C1 extension project.

4.6.3 Principal Construction Activities

Track Bed and Track Construction

Track bed construction will generally entail the excavation of a 6.0 to 7.0m wide trench varying in depth to between 0.8 and 1.5m. Multi-tubular ducts, which carry the power supply cables and the communications links required for the trams, are installed at track bed construction stage, as is the required drainage system. This work will be carried out either below or adjacent to the track bed.

On completion of the ducting works, the track bed formation is compacted and levelled with a layer of blinding concrete or granular fill. Typically, the track bed is then prepared with the installation of steel reinforcement and the fixing of the rails to their final line and level prior to the pouring of the concrete slab. Concrete will be poured to varying depths below the top of rail level to suit a range of surface finishes. The foundations for the poles, which support the overhead line equipment (OHLE), are also laid at this stage.

Delta Junction

Construction of the delta junction will necessitate the closure of Connolly Terminus for a period of up to six weeks. The alterations will require existing sections of track to be removed and a new track layout incorporating switches and crossings and a new OHLE arrangement to be constructed

The reconstruction of the track within the Connolly Terminus will require the removal of a section of the new retaining wall along Harbourmaster Place. The construction of the wall incorporates a movement joint to facilitate this. The reconstruction of the track at this location will occur at the same time as the Amiens Street works in order to minimise programme delay.

The works will also entail the removal and repositioning of the overhead power supply, the relocation of underground ductwork, cables, public lighting, services and drainage.

Track Laying

The rails are delivered in lengths of up to 18m and this can cause short term disruption to traffic flows. The RPA is currently investigating the possibility of the construction of sections of trackbed utilising prefabrication techniques, which may help to reduce the duration of works particularly at road junctions. There is also a possibility that some works (such as trackbed and pole foundations) could be carried out as part of other development along the alignment, thereby helping to speed up the construction process.

Surfacing and Equipment

The final stage of surface works comprises the surfacing of the track bed, the reinstatement of all disturbed surfaces on pedestrian footpaths and carriageways, and the completion of civil works at the stop platforms. In some areas, the construction of pole foundations and the erection of support poles may be undertaken as a subsequent series of tasks.

OHLE, Power Supply and Cable Installation

The installation of the overhead lines and the power supply facilities will occur once the track bed has been completed. The support pole foundations will have been installed at the same time as the track bed formation. The erection of the support poles will comprise a rapid operation using mechanical equipment.

Cable installation will involve industry best practice and a similar method will be used for the threading of other signalling and communication cables.

Landscaping

Based on the character of the area, landscaping will be confined to hard landscaping including the surfacing of the track bed and the completion of civil works at the stop platforms. Landscaping will commence on completion of the track laying and erection of the OHLE poles.

Any additional landscaping will be outside the scope of this current proposed scheme and the powers of the RPA.

4.6.4 Construction Scenario

Programming and Phasing of Construction

For the purposes of this EIS the following assumptions can be reasonably made:

- work will start simultaneously at a number of locations;
- the overall duration of construction activity will be approximately 20 months, with enabling works likely to commence before this activity: and
- a period for testing and commissioning of the new system will be required in addition to the above referenced time periods.

It is anticipated that construction will be undertaken within normal contract hours: 0800 to 1800 Monday to Friday and 0900 to 1600 on Saturdays. However, it is likely that work will also take place on Saturday and Sunday. Works across certain junctions will need to be undertaken outside of peak periods. Such working hours and traffic management arrangements will be agreed with the local authority where required. The planning of such works will also take consideration of the residents. Night work would normally cease at 2300 hours unless the area is non- residential.

Location of Site Works

There is a requirement for a large compound storage area and currently a portion of The Point Car Park near Mayor Street Upper is considered a suitable site.

There will also be a requirement for a small compound area within Spencer Dock. In addition, temporary compounds will be required to facilitate the bridge construction as well as to facilitate the Spencer Dock Stop and substation construction. There will be constant liaison and close coordination of works to ensure safe and efficient construction.

Finally, a site compound will be required on the east side of the Canal to facilitate construction of the bridge abutments.

Spoil Disposal

All construction activity typically gives rise to significant amounts of nominated spoil. The disposal of spoil will be the responsibility of the contractors. For track bed excavation, excavated material will be reused where appropriate. Where this is not possible, waste material will be recycled. Where end disposal is required, it will be removed by a permitted haulier to an approved and licensed disposal facility.

Quantities and type of waste for disposal have been estimated as being approximately 20,000 cubic metres of clay spoil and 2,000 cubic metres of asphalt.

4.7 Operation of the Luas Red Line Extension

4.7.1 Operation

The trams are driven on a line of sight basis in a similar fashion to road vehicles. At certain locations where trams need to change tracks, a localised signalling system may be installed to ensure that they can operate safely over points and to ensure that no conflicting movements between trams can occur. In these locations, the points will be mechanised.

The main control centre for Luas operations is located at the Red Cow Depot building. All trams are in radio contact with the main control centre and a computerised display is available to the controllers showing the position of the tram on the line at any point in time.

A monitoring system will be provided to provide information on critical elements of the power supply. The controller will grant isolations of the overhead power systems for maintenance and in emergencies. A video security monitoring system at the proposed stops and at key junctions in the system will be displayed at the control centre.

Accessibility is also an important operational feature. In order for the tram to comply with accessibility requirements for mobility impaired people the internal floor level is maintained, for at least 70% of the total length of the vehicles at a maximum height of 350mm from the rolling surface. The exchange rate is at least 20% (the exchange rate is the ratio between total door width and length of tram). The minimum width for a double door leaf is 1,300mm.

All servicing and maintenance of trams operating on the Red Line Extension will take place at the Red Cow Depot.
Diversion of the majority of utilities outside the Luas trackbed minimises the risk of disruption of service due to typically minor public utility repairs. This is important for maintaining a reliable public transport service.

Table 4.6.a Indicative Timetable for Red Line extension

Mondays–Friday (0700 – 1000 & 1600 – 1900)	**Mondays–Friday (0530 – 0700)**	**Mondays–Friday (1000 – 1600 & 1900 –2230)**	**Mondays–Friday (2230 – 0030)**
5 min	10 min	7.5 min	15 min
Saturday (6.30 – 9.30)	**Saturday (9.30 – 19.00)**	**Saturday (19.00 – 0.30)**	**Sundays, Public Holidays (8.00 – 0.00)**
10 min	7.5 min	10 min	10 min

4.7.2 Frequency and Hours of Service

The headway between trams in each direction of travel on each section of the system on weekdays, Saturdays, Sundays and Public Holidays is detailed in *Table 4.6a* below.

Although the intended timetabling is as indicated in Table 4.6a, the system will have the potential to operate 24 hours a day, seven days a week on 365 days of the year.

4.7.3 Ticketing Arrangements

All stops on Luas Line C1 will have ticket machines that accept coins, notes and credit cards. Existing Red and Green Line ticket options include single, return and one day journeys for Luas only tickets. For Luas only or Luas + Bus, ticket options include a seven day, monthly or annual journey ticket.

Other aspects of existing ticketing arrangements

include but are subject to change:

• a selection of tickets valid on Luas for the journey between Connolly and Heuston and Heuston to Connolly as a feeder option;

• tax-saver commuter tickets;
• Student travel identity cards; and
• pre-paid tickets available for ticket agents at retail outlets.

The Luas Smart Card will be available for use on the Luas Line C1. This is a durable card the size of a credit card which allows Luas customers to pay-as-they-go when they travel on Luas. This provides the customers with a quick, reliable and easy way to pay for their journeys on Luas. The Luas Smart Card is an important step in launching a fully integrated ticketing system for public transport in Dublin.

To use the smart card to travel on Luas, customers must validate their card before boarding and after exiting the tram. To validate their card customers must present it in front of the highlighted area of a platform validator. There are at least two vailda-tors at all Luas stops.

4.8 Conclusion

This Chapter has provided an overview of information currently available on the proposed development and operation of Luas Line C1 extension. In particular, the project description has aimed to provide as much detail as is currently available on issues relating to alignment, construction programme and operation. In turn, the information contained within this chapter has informed the subsequent specialist topics particularly in relation to assessing the potential impacts of the proposed development.

Chapter 5

5 PLANNING AND DEVELOPMENT CONTEXT

5.1 Introduction

5.1.1 Overview

This chapter presents an overview of the planning and development context of the area within which the Red Line extension to The Point is to be developed. It describes relevant national and local planning documents, and their implications for the study area, as well as current planning and development activity along, and adjacent to, Luas Line C1.

5.1.2 Methodology

The review and evaluation of the planning and development context within which Luas Line C1 be constructed and the extent to which the extension is in compliance with this context comprised the following tasks:

a desktop examination of relevant planning documents in order to assess their significance to the study area and Luas Line C1. These include:

- *Regional Planning Guidelines for the Greater Dublin Area 2004.*
- *Dublin City Development Plan 2005 – 2011.*
- *Dublin Docklands Masterplan 2003.*
- *Dockland North Lotts Area Planning Scheme 2002.*
- *DTO Land Use and Transport Strategy, A Platform for Change, 2001.*
- *National Spatial Strategy.*
- numerous site visits undertaken between October 2001 and January 2005 to ascertain current land use in the study area;
- the compilation of a description of current land use, outlining the types of activities that occur within the study area;
- a series of discussions with the personnel from the planning section of the DDDA and DCC in relation to the planning and development applications that have been recently approved within the study area, some for very large developments, and include the recent Compulsory Purchase Order of a road to the west of The Point, within the Spencer Dock Development; and
- an assessment to contrast existing land use in the study area against the current planned developments, to highlight the change in the nature of land use within area, and to provide an indication of the wide scale change that is likely in the future.

The review of the documents focused primarily on the future development of the area and the likely pattern of future land uses. It also included a comprehensive review of transport and access policies.

5.1.3 Limitations

Development planning is a dynamic and evolving process and it is not possible to accurately predict the precise land use and social patterns that will emerge in the medium to long term within the study area.

As a consequence, the documentary basis for this assessment (development plans and policies, planning applications, strategic documents, etc) provides a number of statements of intent and policy guidance, which are likely to evolve and change over time and may not be fully realised.

5.2 Description of the Receiving Environment

5.2.1 Overview

For the purposes of the evaluation of the planning and development context, the study area is considered to extend from Connolly Station in the west, to The Point in the east and from North Wall Quay in the south to Upper Sheriff Street in the north.

Luas Line C1 will run from Store Street; close to the Connolly terminus; along Mayor Street Lower, an area surrounded by modern 4-5 storey mixed use buildings. At Commons Street, the line will cross the junction and will bridge across Spencer Dock, which is currently owned by Waterways Ireland. The route is then aligned across the open area used for freight storage, railway sidings and the CIE owned North Wall Container Depot. The whole of this area is part of the proposed Docklands North Lotts Planning Scheme and is being cleared and

developed as part of the overall Dublin Docklands Development Authority's Master Plan. This area will see the development of Spencer Dock as a commercial, residential and leisure centre of importance to the Docklands, Dublin area and wider region. Proposals to locate the national Conference Centre at this site also exist which would make the area significant nationally.

The route will rejoin the existing road network at Mayor Street Upper and will run along this road directly to The Point. Several warehouses at the eastern end of Mayor Street Upper have recently been demolished thereby allowing easier construction of Luas Line C1.

5.2.2 Existing Land Uses within the Study Area

General Description

The study area can be divided into two distinct halves. The western section is heavily influenced by the large-scale office and residential developments centred on the International Financial Services Centre (IFSC). In the past 10 years, the land use of this area has undergone extensive change, with resultant changes in social patterns and linkages. Further development is planned or underway, including a new retail development at George's Dock and the construction of large commercial buildings and apartment complexes and associated retail food outlets

The eastern section of the study areas is predominately characterised by industrial land use, with open yards and large low-rise industrial buildings on a large grid street pattern. The predominant land uses are warehousing, distribution, and light industry with relatively small pockets of residential development. There are also some office and small-scale retail outlets. The Point, which is located at the eastern end of the study area, is a national entertainment and events venue. Please see *Figure 5.2a* for an illustration of current land use (*Dublin City Development Plan 1999*).

Land Use from Connolly Station to Spencer Dock

Incorporating the IFSC, land use in this area is predominately office and residential accommodation.

Approximately 14,000 people work in the area in a variety of sectors including banking and finance, though there are also a growing number of retail and retail service outlets being developed, including the new retail development at Georges Dock. The area currently contains over 300,000sq m of commercial space.

This area is substantially developed, and there is little opportunity for further new development. Construction works will take place within the context of existing land uses, with no demolition of property required.

Land Use from the Royal Canal Dock to New Wapping Street

This area is largely owned by Iarnród Éireann and The Spencer Dock Development Company and is predominately used for rail freight handling, associated office use, some storage and light industrial uses. The area is characterised by '*discontinuous frontages and open character*' (Docklands North Lotts Planning Scheme 2002, p 8), with no through access currently being provided to the site. The Freight railway lines run through the northern portion of the site, whilst the southern portion is currently being developed with two major commercial blocks under construction. There are a number of ancillary buildings on the site, some of which are likely to be demolished as part of the wider development of the area. Many of these buildings are currently vacant.

There is a very small section of residential development within the area, this being located on the west end of Mayor Street.

New Wapping Street to Castleforbes Road

The predominant land use in the southern section of the area is warehousing and distribution, with a small amount of retail services located along North Wall Quay. The northern section is predominately

storage and distribution, though this area also contains a considerable amount of residential development, particularly fronting Mayor Street and New Wapping Street. Some of the major businesses in this area include Brooks Thomas (warehousing/timber) and Jones Oil.

Castleforbes Road to The Point

There are two small pockets of residential development, these being located in Sheriff Street Upper and Mayor Street Upper. In addition, a new commercial/residential mixed use development is being developed near the corner of Castleforbes Road and Sheriff Street Upper, incorporating 125 apartments, 7,762 sq m of office space, restaurant and crèche. A second phase of this development is currently under construction.

The Point (a protected structure) is located at the eastern end of the study area and is a national entertainment/events venue, attracting large numbers of visitors to the area. There are plans to redevelop the venue and the area to the north of Mayor Street.

Protected Structures

There are a total of 19 protected structures within the study area, though none of these are directly located along the proposed route. Further discussion of protected structures is provided in *Chapter 15 Cultural Heritage.*

5.2.3 Planned Developments in the Study Area

The dockland area is undergoing enormous change. Traditional land uses for dock areas, such as warehousing and light industry, are making way for residential and commercial land uses. This regeneration and change of use is consistent with many other docklands areas worldwide and current planning policy for the area has been formed to accommodate regeneration and redevelopment (see *Section 5.3* below).

A review of recently granted planning applications for the study area reveals the nature of the change of land use in the area. Over 1,650 residential units (ranging from 1 to 4 bed units) and a total of over 138,000m^2 of non-residential development (office, retail, tourism, recreational, educational etc.) have planning permission in the Docklands Area.

Included in this overall volume of planned development is the National Conference Centre on the site bounded by Guild Street, North Wall Quay and the former railway lines. The development is to consist of hotel facilities (including 218 rooms) and an exhibition/Banquet Hall seating 2,000 people. In total, the development will extend to an area of 78,172m^2.

In summary, land use in the docklands area is undergoing considerable change, and it is expected that future developments will continue this trend. Current development proposals are in keeping with the planning and development context for the area, and it is likely that the development of Luas Line C1 will have a positive impact on the future growth of the area. The DDDA Masterplan states that '*The construction of this Luas extension at an early stage, prior to development of sites, would ensure that it acts as a tool for regeneration, stimulating early redevelopment of the North Lotts area'* [(1)] .

It is forecast that population through the area will increase from 2,000 to 12,000 by 2016 with the majority of this growth concentrated in the North Lotts area. In the same period it is expected that employment in the area will reach 29,000 as compared to 20,000 in 2002. The growth in employment is again forecast to be concentrated east of Commons Street.

A significant development in the area will be the provision of Spencer Dock Station. This will be the terminal station for all Western Suburban services from Maynooth/Mullingar and possibly the terminal location of other commuter and intercity services.

(1) *DDDA Masterplan 2003, p.63*

The delivery of this station can only occur in conjunction with the provision of high quality public transport links to the city centre.

5.3 Planning and Development Context

5.3.1 Overview

This section reviews the statutory and non-statutory guidelines, strategies and plans, which are relevant to Luas Line C1 development within the North Wall/Dublin Docklands Area:

- *Regional Guidelines for the Greater Dublin Area (SPGs) 2004.*
- *Dublin City Development Plan 2005-2011.*
- *Dublin Docklands Masterplan 2003.*
- *Dockland North Lotts Area Planning Scheme 2001.*
- *National Spatial Strategy.*

The content and intent of each of these documents is discussed in greater detail in the subsections that follow.

5.3.2 Regional Planning Guidelines for the Greater Dublin Area (RPGs) 2004

The Regional Planning Guidelines for the Greater Dublin Area were produced on behalf of the Dublin and Mid-East Regional Authorities in 2004. The Guidelines set out a broad strategic planning and development framework for the Greater Dublin Area (GDA), which provide an overall context for the preparation of Local Authority Development Plans and are consistent with the national development strategy outlined in the National Spatial Strategy. The RPGs are an update of the 1997 Strategic Planning Guidelines.

Under the *Planning and Development Act 2000*, Local Authority Development Plans must have '*regard to*' the guidelines and the strategy for future investment in housing, transport, sanitary services and other infrastructure within the overall GDA.

The Strategy distinguishes between the Dublin Metropolitan Area and the rural Hinterland Area. In line with the overall vision, the strategy for the Metropolitan Area is to follow a development path that will:

- *Consolidate development within the area.*
- *Increase overall densities of development.*
- *Thereby facilitate the provision of a considerably enhanced public transport system and facilitate and encourage a shift to public transport* [1].

The Regional Planning Guidelines, '*support the projects proposed under the Infrastructure and Services Improvements element of the Platform for Change, the implementation of which will aim to create extensive, high quality, fully accessible, integrated networks for DART/suburban rail, Luas, Metro, bus and roads*.' [2]

The guidelines see the development of a rail station in the Docklands (Spencer Dock Station) as being of strategic priority for the development of high quality rail services in the region and assumes that the provision of Luas to this point will exist to allow easy interchange between the different rail modes.

The location of Luas Line C1 is in accordance with RPGs development and public transportation objectives for the Dublin Metropolitan Area. The development will also encourage and facilitate major sustainable development on brownfield lands within the Docklands area.

5.3.3 Dublin City Development Plan 2005 - 2011

The *Dublin City Development Plan 2005* sets out Dublin City Council's strategic transportation, planning and development, and conservation aims, policies and objectives for the city-at-large.

[1] *Regional Planning Guidelines, 2004, p.15*
[2] *Regional Planning Guidelines, 2004, p.143*

Transportation

Chapter 7 of the City Development Plan sets out the Transportation aims, policies and objectives for the Plan period. The Plan states that:

'*Dublin City Council is committed to providing efficient access to the city core and maintaining and consolidating this core as the primary economic, cultural and social heart of the wider metropolitan region. To achieve this objective the City Council is pledged to working with the relevant transport agencies to create a connected city with improved linkages and accessibility at peak and off-peak times for work shopping and leisure purposes. It is also committed to strengthening the link between land use policies and the implementation of an integrated set of transport policies*'. [(1)]

(Dublin City Development Plan, Section 7.0.0.)

Within the Dublin City Development Plan, the transportation policy objectives that are relevant to the proposed light rail development, are *Policies T1, T2* and *T4*.
Policy T1 aims to ensure that land use and zone are integrated with transportation. *Policy T2* aims to promote modal change within the city from private car use towards public transport. *Policy T4* aims to provide additional rail capacity and efficiency within the city through cooperation with the relevant transport agencies including the Railway Procurement Agency.

It may be noted that Dublin City Council also support the measures currently being proposed by the Railway Procurement Agency, namely the extension of Luas to the Point [(2)].

Land Use Zoning

Chapter 14 of the Plan entitled 'Land Use Zoning' sets out the zoning objectives and development control standards for all lands within the administrative area of Dublin City Council. The City Development Plan makes provision for fifteen Land Use Zoning Objectives, which cover land use issues ranging from commercial and residential conservation to open space and river amenities. A number of zonings are relevant to the proposed light rail development.

The proposed Luas route traverses, or is located adjacent to, seven zoning objective areas within the North Wall/Dublin Docklands Area, as set out in the *Dublin City Development Plan (Maps E and F)*. These zoning objectives are described in *Table 5.3a* below.

[(1)] *Dublin City Development Plan, Section 7.0.0*
[(2)] *Dublin City Development Plan, Section 7.4.0*

Table 5.3a Description of Relevant Land Use Zoning Objectives

Zoning Objective	Dominant Land Use	Objective
Z1	Residential	*To protect, provide and improve residential amenities.*
Z4	Mixed Use Facilities	*To provide for and improve mixed services facilities.*
Z5	Central Business Area (CBD)/Central Area	*To consolidate and facilitate the development of the central area, and to identify, reinforce, strengthen and protect its civic design character and dignity.*
Z6	Enterprise	*To provide for the creation and protection of enterprise and facilitate opportunities for employment creation.*
Z9	Recreational Amenity and Open Space	*To preserve, provide and improve recreational amenity and open space.*
Z11	Canal, Coastal and River Amenities	*To protect and improve canal, coastal and river amenities.*
Z14	Social, Economic and Physical Rejuvenation	*To seek the social, economic and physical rejuvenation of an area with mixed use of which residential and 'Z6' would be predominant uses.*

Source: Dublin City Development Plan, Chapter 14.4.0.

5.3.4 Dublin Docklands Masterplan 2003

The Dublin Docklands Masterplan 2003, (adopted in September 2003) which replaces the original 1999 Masterplan, guides the social, economic and physical regeneration and development of the 'Dublin Docklands Area' (526 ha surrounding the north and south banks of the Liffey to the east of Amiens Street and Pearse Street, as defined by the Dublin Dockland Development Authority Act, 1997). The 2003 Masterplan aims to 'secure the sustainable social and economic regeneration of the Area, with improvements to the physical environment being a vital ingredient [(1)]' and outlines a range of objectives for the area, including:

The development of sustainable neighbourhoods with sufficient 'critical mass' that will support services such as quality public transport, improved retail facilities and other new amenities.

The development of sustainable transportation for the area, including the promotion of public transport, walking and cycling as alternatives to the private car and improved circulation within the Area.

The improvement of infrastructure of amenities in the Area concurrently with, or in advance of residential, commercial and industrial development.

The renewal of Dublin City as a whole and the linking of the city centre to Dublin Bay and in turn, connecting the Docklands Area to the life of the city.

The proposed light rail route is in accordance with the above objectives and the general spirit of the Docklands Masterplan 2003. Indeed, the development will enable the realisation of the Masterplan's long-term objectives and will facilitate the social, physical and economic regeneration of the Docklands Area.

[(1)] *Dublin Docklands Area masterplan,2003, page 4*

5.3.5 Docklands North Lotts Area Planning Scheme 2002

The Docklands North Lotts Area is an area of 32.7

ha (80.8 acres) located immediately east of the IFSC, which is bounded by the Campshires on North Wall Quay, East Wall Road, Sheriff Street Upper/Lower and Guild Street and extends to the centre line of the River Liffey.

For the purposes of implementing the planning scheme, the North Lotts Area has been divided into eight development zones. Proposed developments within the area include:

- residential – density ranging from 247 units to 325 units per ha;
- retail – e.g. 500 sq m gross at Station Square, 3,000 sq m at the Point Village, etc.
- office and enterprise – e.g. Types A and B.
- entertainment, culture, events and tourism – e.g. National Conference Centre.

According to the Planning Scheme, the nature and extent of the proposed development within the Docklands North Lotts Area will:

'*be dependent on the delivery of the Interconnector and other transport proposals*'[1].

With a view to optimizing the development of the north Docklands area, the Docklands Authority has proposed a number of draft amendments to the North Lotts Planning Scheme which focus specifically on the Point Village area. The amendments proposed include the expansion of the Point Theatre; the increase in height of the permitted tower to 100 metres; the facilitation of the Luas extension beyond the Point; and the development of a retail centre close to the Point.

The Planning Scheme also outlines the creation of a central public transport spine along Mayor Street including provision for bus movements, particularly in the short term pending the introduction of Luas Line C1. Mayor Street Upper and Lower would therefore effectively be linked and the new Mayor Street would integrate Luas, bus, private vehicle and underground rail Interconnector access to the new area of development.

5.4 Assessment of Compliance with The Established Planning Regime

The development of Luas Line C1 to The Point is in accordance with the relevant statutory and non-statutory development plans for the Dublin Region, Dublin City and Docklands Area. The proposed development also complies with the objectives for the proper planning and sustainable development of the Docklands Area.

The proposed extension is also in accordance with the long-term objectives for the development of the City and will enable the realisation of the planning objectives and the desired long-term land use in the area.

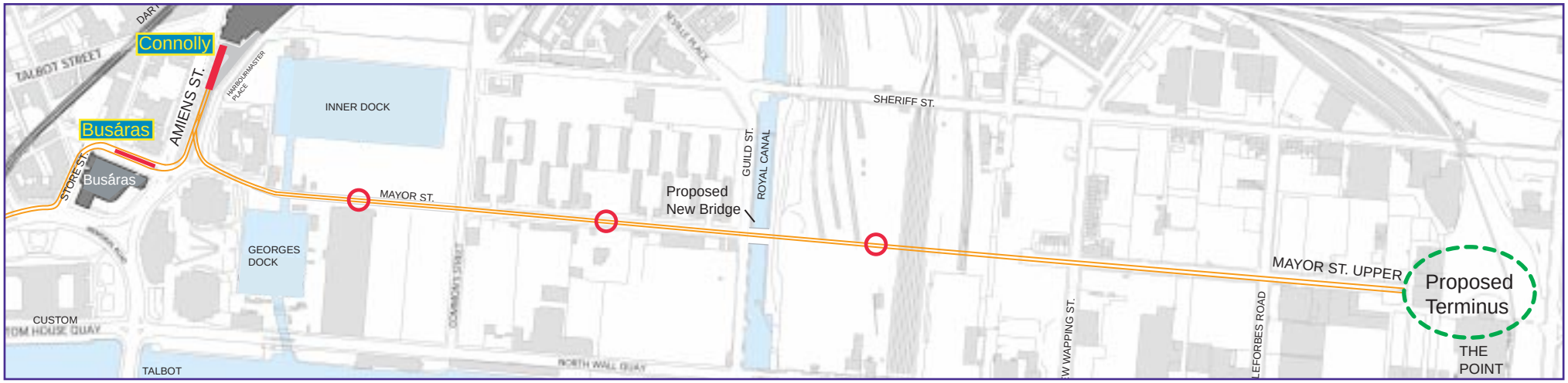
5.5 Conclusions

In summary, there is a very strong case for Luas Line C1 development, under the provisions of the relevant statutory and non-statutory development guidelines, plans and strategies.

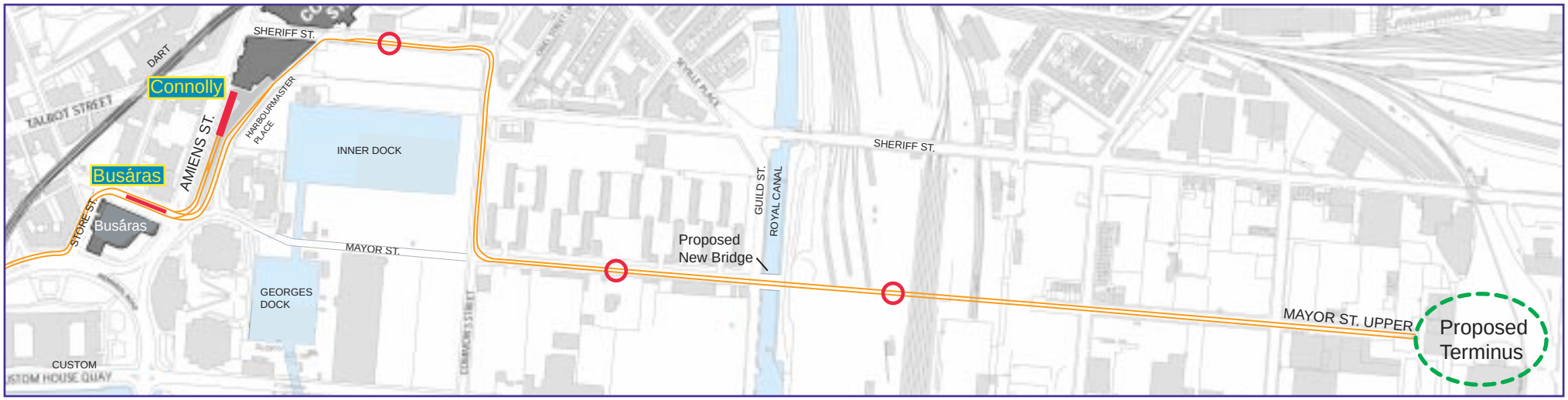
In addition, it is considered that the proposal is an appropriate response to the need for a modern and sustainable transportation system within Dublin City, to facilitate the social and economic regeneration of the Docklands Area and economic growth in the wider City area.

[1] *Docklands north Lotts Area Planning Scheme 2002, page 19*

Proposed Option A (source: RPA Consultation Newsletter see page 175)

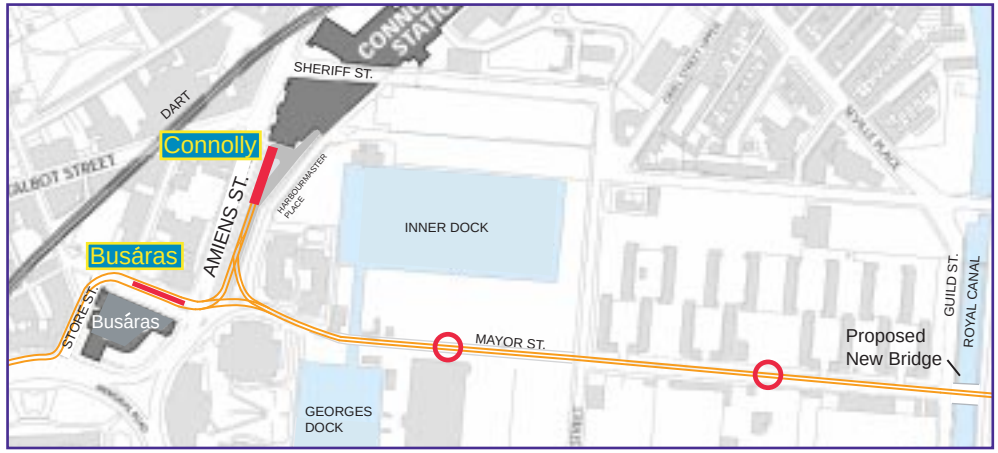


Proposed Option B (source: RPA Consultation Newsletter see page 175)



Proposed Option C (source: RPA Consultation Newsletter see page 175)

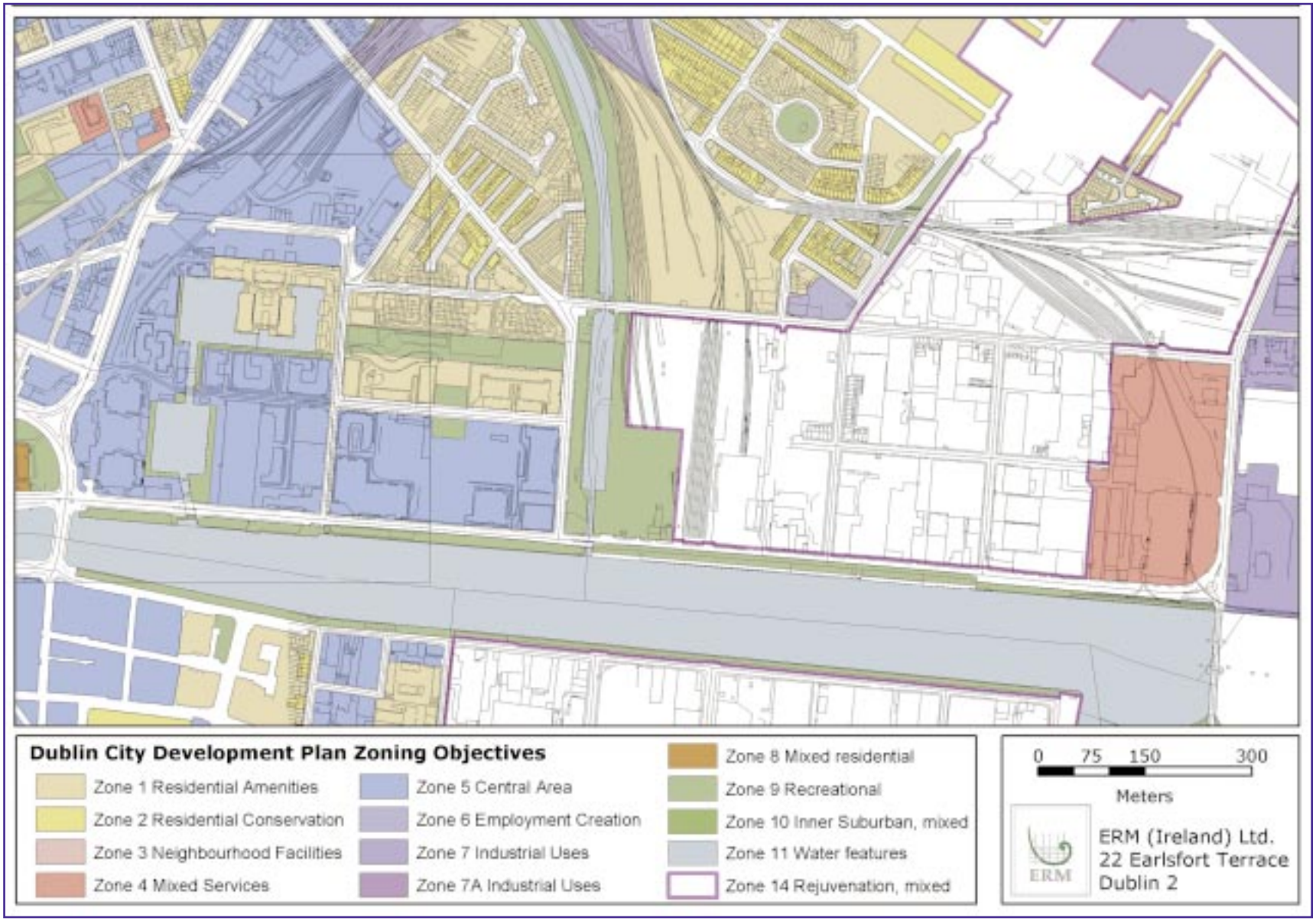
Luas Line C1



Note: This shows the delta arrangement on Amiens St. for Proposed Option A. This is the preferred option for Luas Line C1 - Connolly to The Point.

Legend

Figure 5.2a Land Use Map



Chapter 6

6 SOCIO-ECONOMIC CONTEXT

6.1 Introduction

The Transport (Railway Infrastructure) Act 2001, S39.2 (b) (i), includes the assessment of impacts on 'human beings' and requires that proposed developments are examined in terms of their impacts on people. Potential impacts to people arising from Luas Line C1 include noise and dust nuisance, social disruption and severance, improved accessibility and travel time, urban regeneration, employment and indirect job creation and improved or reduced pedestrian and vehicular safety. Most of these issues are addressed in specific chapters within this EIS including *Chapter 7, Traffic and Transportation*; *Chapter 11, Noise and Vibration;* and *Chapter 13 Climate and Air Quality*.

During the Scoping Phase of this EIA, a number of specific socio-economic issues were identified as requiring particular consideration within this assessment, namely demographic, employment and community severance issues. This Chapter provides an appreciation of the social and economic context within which Luas Line C1 is to be developed and provides a detailed assessment of these issues. Additional social issues have been referenced. Furthermore, key measures to reduce impacts upon the community have been identified.

6.2 Methodology

6.2.1 Development of a Social Profile

A social profile of the study area has been prepared which describes the existing social environment. This social profile has been developed based on:

- an analysis of the current and historical demographic characteristics of the study area;
- a description of the employment patterns of the resident labour-force;
- the identification of existing and proposed local land use;
- the identification of local businesses, services and facilities;
- a desk based assessment to broadly identify social patterns and linkages; and
- a review of available information and documents from previous studies, as detailed in *Section 6.2.2*.

Based on this information the potential a) construction and b) operation related social impacts of the proposed works have been identified, analysed and discussed.

6.2.2 Principal Sources

The social assessment was based on the following key documents:

- *CSO Census data* from 1991, 1996 and 2002; including the Small Area Statistics for North Dock B & C;
- Williams, J. and O'Connor, M. *The Employment and Socio- Demographic Profile of the Dublin Docklands Area* The Economic and Social Research Institute, 2000;
- *Docklands North Lotts Planning Scheme*, 2002;
- Dublin Docklands Development Authority, "*Master Plan*", DDDA, Dublin, 2003;

Environmental Impact Statement of Development Proposals contained in the Draft Planning Scheme for the Extended Custom House Docks, 2001;

- Railway Procurement Agency; *Line C1 EIA Consultation: Public Consultation, 2004;* and
- other relevant Chapters of this EIS supplemented by direct information exchange with the specialist chapter authors.

6.3 Description of the Receiving Environment – A Socio-Economic Profile

6.3.1 Overview

In order to gain an appreciation of how Luas Line C1 will impact the Docklands area and its population, it is important to understand the existing social dynamics of the study area. To this end, the EIA study team has prepared a 'snap shot' of the Dublin Docklands area, largely based on: 2002 and 1996 Small Area Statistics Census data for the District Electoral Division (DEDs) of North Dock B and North Dock C, 'the northside', a map of which is provided below; and on *'The Socio-Economic and Employment Structure of the Dublin Docklands Area'* report undertaken by the ESRI for the Dublin Docklands Development Authority (DDDA) [1] in 2000 which is based on 1996 and 1999 census and electoral role data.

Figure 6.3a District Electoral Division

6.3.2 Demographic Profile

Historical Socio-Economic Context

The social and economic profile of the overall Dublin Docklands area has changed considerably over the past 100 years. The resident population more than halved over the period 1900 to 1990; due, it is thought, to the loss of traditional jobs associated with Dublin Port as many major employers either moved out of the area or went out of business.

Since 1991, however, the Docklands has seen an increase in employment opportunities in areas such as commerce and services, many new residential units are being constructed, and there has been a considerable increase in population.

Population Size and Change

The population of 'the northside' of the Docklands increased by 23.3% (1,413 persons) between 1996 and 2002. This is compared to a much lower 6.1% growth in the wider Dublin area during the same period and an average of 8% nationally.
This recent population increase has largely been the result of an increase in the availability of accommodation in the area, particularly via the construction of a large number of new apartment complexes near the western end of the study area. The local population is expected to increase even further in the near future with, for example, over 2,500 residential units having been granted planning permission in 2003 and 2004 in the central and eastern portions of the study area.

[1] *J. Williams, M O'Connor, The Employment and Socio-Demographic Profile of the Dublin Docklands Area, Economic and Scial Research institute, 2000*

Age Profile

As can be clearly seen in Table 6.3a, the age profile of the Northside Docklands area has changed significantly since 1996. The number of people that are aged over 15 has increased, whilst the number of children has decreased.

Household Numbers

In 2002, there were 2,644 households within the north Docklands area, an increase of 419 households (18.8%) since 1996. The average household size was 2.83 persons per household, a slight increase on the 1996 average household size of 2.73 persons.

Since 2002, the number of households within the study area has increased, and is set to increase even further with additional residential units due to be constructed.

Household composition information is provided in *Table 6.3b* below.

Of note, there is a marked decrease in the number of couples with children (-20.9%) and single parents (-11.5%) living in the north Docklands area; and a strong increase in the number of 'flat share' arrangements between people that are not related (27.4%).

Residential Density

Under the *Dockland North Lotts Planning Scheme* 2002, the overall land use mix is aimed to be 40% commercial and 60% residential. The objective is to achieve a net residential density in the order of 247 dwellings per hectare, though higher densities of 325 dwellings per hectare will be permitted at Station Square and the Point Village.

Table 6.3a Changes in the Population of the Northside Docklands Area 1996-2002

Area	0-14	15-24	25-44	45-64	65+	Total Population
1996 Northside	1,423	1,072	1,873	968	730	6,066
2002 Northside	1,142	1,582	2,680	1,141	934	7,479
% change in Northside Docklands 1996 - 2002	-19.7%	47.6%	43.1%	17.9%	27.9%	23.3%

Source: Census Small Area Statistics, 1996 & 2002, North Docks B & C DEDs.

Table 6.3b Private Household Composition 1991, 1996 & 2002

	1 person	Couple	Couple with Children	Single Parent	2+ people not related	Other	Total
1996	669	274	530	355	266	131	2225
2002	713	445	419	314	339	414	2644
% change	6.6%	62.4%	-20.9%	-11.5%	27.4%	216%	18.8%

Source: Census Small Area Statistics, 1996 & 2002, North Docks B & C DEDs

6.3.3 Employment Profile

Occupational Structure

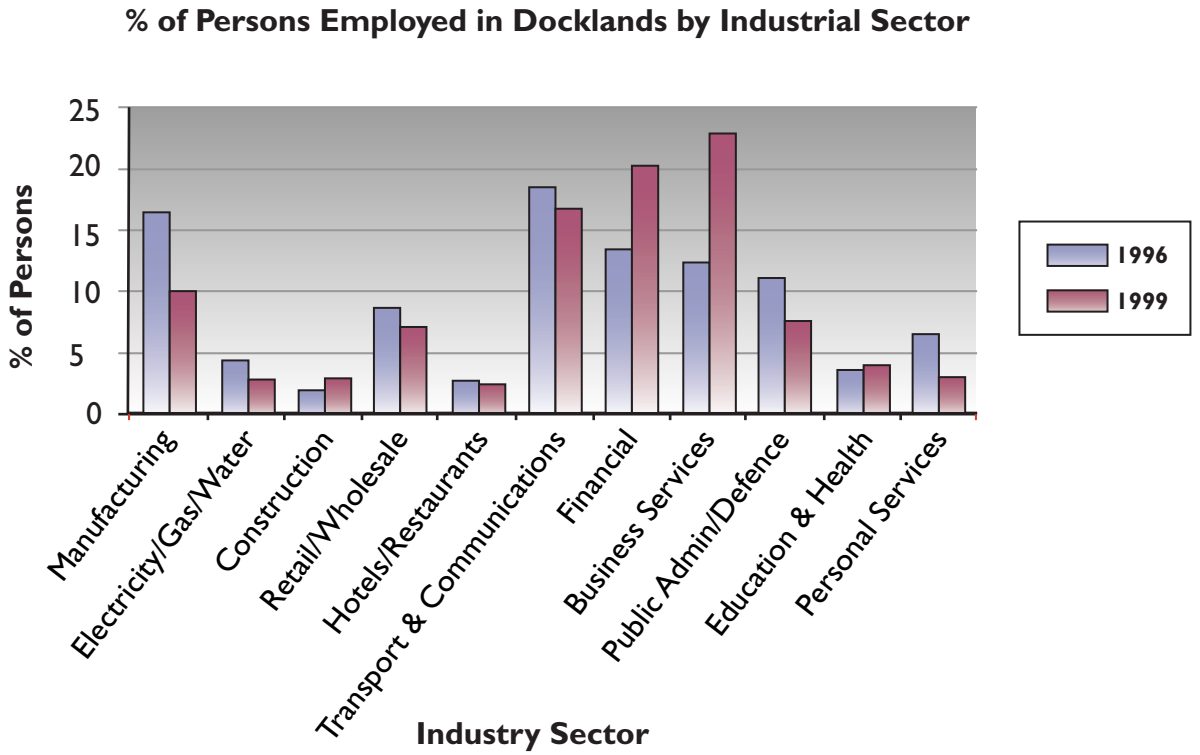
In 1996, labour force participation rates in the Dublin Docklands area were more or less in line with the rates for the City and wider Dublin area as a whole, although unemployment rates were substantially higher. In 1996, the overall northside unemployment rate was 16.8% -more than double that of Dublin generally (8.1%). Long term unemployment was also considerably higher in the northside docklands area than in Dublin, with 65.8% of those unemployed in this area having been unemployed for 3 years or more.

However, by 2002, the situation had reversed, with the unemployment rate decreasing to 4.02%. This may have been as a result of the influx of new 15-44 year old people living in the area and also due to the general benefits accruing from the Celtic Tiger.

Employment

In 1996, some 20,800 persons were employed in the Dublin Docklands Area (northside and southside), two-thirds of whom were male. By 1999, this figure had risen to some 32,000 persons, with the largest increases being in the businesses services and the financial sector. *Figure 6.3b* illustrates the breakdown of employment types within the Docklands area.

Figure 6.3b Percentage of Persons Employed in the Docklands by Industrial Sector



Source: ERSI, The Employment and Socio-Demographic Profile of the Dublin Docklands Area, 2000

A significant 8% of those employed were resident in the area. In 1999, the largest employment sector was business services, accounting for 22.8% of those employed in the study area. Other important sectors included financial services (20.2%), transport and communications (16.7%), and manufacturing (10%). Employment in more traditional sectors for the Docklands area, such as manufacturing and electricity/gas/water, saw a decline in total employment numbers between 1996 and 1999, with manufacturing down from 16.4% to 10% during this time, and electricity/gas/water reduced from 4.3% to 2.9%.

Businesses in the Local Area

Businesses currently located in the study area include over 300 banks, the insurance industry, stockbrokers, legal sector companies and asset management companies for example. Retail and service outlets include convenience stores, sandwich shops and cafes, restaurants and pubs, dry cleaners, an optometrist, a florist, hairdressers, medical centre and a crèche.

Proposed new businesses and services in study area include a number of new retail units, restaurants and a pub.
As regards the perceived desirability of the Dublin Docklands area as a location for setting up a business, a total of 66% of employers in the area feel that it is a 'good' location, 22% feel that it is 'neither good nor bad', and 12% feel that it is a 'bad' location[(1)].

6.3.4 Community Profile

Social Patterns and Linkages

Social patterns and linkages reflect the degree to which an area functions as a community. That is, the amount of social interaction and cohesion of residents and people working in the area, including their use of local facilities and participation in any organisations or club activities. Areas of exclusive interaction and strong community cohesion are typically more vulnerable to changes.

As demonstrated below, Luas Line C1 will improve accessibility to, from and within the study area and is unlikely to have negative impacts on social patterns and linkages in the area. This is largely because of the social change that has occurred in the study area as a result of the extensive redevelopment being undertaken independent of Luas Line C1.

Local Land Use

Extensive changes in land use and resultant changes in social patterns and linkages have occurred within the western section of the study area over the past five to ten years through the construction of the IFSC, the new retail development at Georges Dock, construction of the large commercial buildings and large apartment complexes and associated retail food outlets.

As currently developed, the primary residential areas of this western end of the Docklands area are located along Mayor Street Lower and around George's Dock and Inner Dock and Custom House Square (closely linked with the IFSC). These are modern, spacious apartments, some of which overlook Mayor Street Lower. The residential population is increasing due to the completion of the Clarion Apartments and the IFSC campus of the National College of Ireland (NCI), which will accommodate 286 students. Ground level units within the area are generally retail/service outlets, serving the significant population of daytime workers in this area. There is also a small amount of housing in this area along Sheriff Street and environs that pre-dates the recent redevelopment.

The eastern section of the study area (including Spencer Dock) is of lower density and is less developed than the western section, and is predominantly used for rail freight handling, warehousing

(1) *ESRI,2000*

and light industry with only a small number of residential pockets, most of which are over 50 years old. There is a small residential community along Mayor Street Upper, represented by three blocks of redbrick terraced housing around the New Wapping Street junction and near the Point. This housing also continues a short distance north along New Wapping Street.

Within this eastern end of the study area, the DDDA has approved the construction of a new access road, 1,149 new residential units, 50,669m^2 of office space, 4,474 m^2 of retail space, 1,036m^2 of leisure space, a crèche, a pub/restaurant, 888 new parking spaces, and a new National Conference Centre which will include a hotel with 218 rooms and a large exhibition hall seating 2000 people. These new developments will have huge implications on the social profile of the study area and will result in altered social patterns and linkages as new people (many of a higher income bracket) move into the study area, and as existing businesses and local residents adapt to the altered social landscape.

Local Services and Facilities

People living in the study area currently travel to the city centre for most of their shopping and recreation needs to avail of the greater range of goods and services available there. This is particularly the case on weekends, when many of the local services and facilities are closed. However, the retail outlets in the western part of the study area are heavily used during the week by the 16,000+ people that currently work in the area, and by local residents. The National College of Ireland campus and its students avail of the ever-improving services being provided locally.

To the immediate north of the defined study area, yet within a five minute walk of the Luas Line C1, there are two government schools and a church, and there is a large amount of social and affordable housing in the vicinity of Seville Place and to the north of Sheriff Street Upper. In addition, a crèche and a new restaurant are currently being built near the corner of Castleforbes Road and Sheriff Street Upper.

Entertainment venues within the study area include the many restaurants and pubs, The Point, and the proposed National Conference Centre. These venues all attract visitors to the study area. Given the growing residential and business population of the study area it is also important that adequate (quantity and quality) public open space is available. Harbourmaster Place, and the walk along North Wall Quay, for example currently provides such open space. The proposed National Conference Centre, the Linear Park, improvements to the Canal, and residential and office developments will provide additional areas of public open space.

Access to and from the Study Area

As discussed above there are many options for people to both live and work in the area, and there is reasonable access to and from the western end of the study area via public transport (Dart, suburban rail and bus) and car. In addition, a number of private buses provide access for employees to their place of work in the Docklands. Access to the eastern half of the study area is, however, not so convenient, and will be greatly improved by Luas Line C1. At present, for example, people largely travel to The Point by car, or walk to the venue from Connolly Station (20 minutes) or the city centre (30 - 40 minutes). Public transport within the study area is limited to a small number of low frequency bus services (routes 53, 53a and 90a).

Furthermore, access from the eastern end of the study area to the already developed western end is poor at present as a result of the Spencer Dock railway lines that sever the area. However access will improve as a result of the Mayor Street extension works set out in the North Lotts Planning Scheme 2002 that has been prepared by the DDDA.

Traffic along the North Wall Quay and East Wall

Road, the southern and eastern boundaries of the study area is currently heavy, as discussed in *Chapter 7, Traffic and Transportation*. Traffic along the smaller streets within the study area, and along its northern Sheriff Street boundary, is currently of reasonably light flow; although the convergence of local traffic and rat-running to avoid Amiens Street and the East Wall Road does result in some congestion, particularly at the junction of Commons Street and Mayor Street Lower.

A large number of pedestrians cross Mayor Street Lower, particularly over the bridge at George's Dock to gain access to their office or residence, particularly during week days and this is likely to extend to Mayor Street Upper when the proposed redevelopment works in this area are complete. Thus it will be important that the Luas does not pose a safety risk to these pedestrians. See *Chapter 7, Traffic and Transportation,* for more details.

6.4 Do Nothing Scenario

Should Luas Line C1 not be constructed, it is possible that some of the proposed developments for the study area will not proceed, or that the pace of redevelopment will decrease, having a negative impact on the regeneration of the area.

As discussed, the study area is likely to undergo considerable change in the coming years, with the development of Luas Line C1 playing a highly positive role in this change through the improved access to the area. While it is difficult to determine the extent of development if the Luas Line C1 does not proceed, it is likely that the full extent of the North Lotts Development Plan, in particular, will not materialise.

Conversely, the redevelopment of the study area, to which Luas will contribute, is causing a rise in land and property values in the area. This may make it difficult for first time buyers or low income earners who may have traditionally lived in the area, to purchase property or to rent social or affordable housing in the area. Those people that already own their property, however, are likely to gain significant benefit from the effect on property prices of the proposed Luas and associated redevelopment works.

6.5 Potential Socio-Economic Impacts of the Proposed Development

This section outlines the potential socio-economic impacts of the Luas Line C1, and is divided into impact for the construction and operation phases of the development.

6.5.1 Construction Impacts

Disruption, Inconvenience and Severance

During the construction of Luas Line C1 there will be some disruption and inconvenience to local residents, businesses and visitors to the area.

Construction works are likely to restrict vehicle and pedestrian movement within the area, although it is intended that they will occur for only short periods of time in any one location within the overall intended construction programme of 20 months. This issue, however, is of considerable concern to the local community, as discussed within the RPA Consultation document.

Furthermore, the construction process may generate noise and dust, thus potentially causing disruption and inconvenience. These issues are discussed in *Chapter 11, Noise and Vibration* and *Chapter 13, Climate and Air Quality*. Best practice in site management will be implemented to ensure that such disruption is kept to a minimum.

Accessibility

It is likely that local residents and businesses will face some form of temporary disruption to local access during the construction of Luas Line C1. This may be the form of a) changed traffic conditions

and b) potential reduction in on street car parking.

Given the nature of businesses in the eastern end of the study area, being predominantly warehousing and distribution, it will be particularly important that continuous access for vehicles servicing these businesses is provided. This is highlighted as a community concern within the RPA Consultation document. As discussed in *Chapter 7 Traffic and Transportation*, access will be maintained at all times, largely via a one-way westbound running lane along Mayor Street, with eastbound traffic being directed along Custom House Quay and East Wall Quay. Ensuring access for wheelchair users within the study area is a requirement that will be fulfilled during the construction programme.

Whilst the *Construction Management Plan* will ensure that safe traffic and pedestrian access is maintained to all businesses and residences throughout the study area, during the course of construction, traffic disruption is inevitable.

Employment

It is unlikely that direct local employment opportunities will be generated in relation to the actual construction of the Luas Line C1. It is, however, likely that employment opportunities will be created through the wider regeneration of the area, to which the Luas extension is acting as a catalyst.

The construction phase will be temporary and as such the socio-economic impacts arising during the construction phase will be relatively short-lived. For example, the construction works may support further employment in the local economy, via:

indirect effects, which will result from the expenditure on goods and services generated by the construction process, benefiting local suppliers (e.g. of temporary buildings, materials and sub-contractors of subsidiary construction tasks); and

induced effects**,** which will reflect the spending in the local economy of incomes earned both in the construction process and the production of the goods and services they purchase. This spending may generate further local employment.

It is likely that some 200-250 people will be involved in the construction of the Luas Line C1, with this potentially having an impact on the local economy, mainly through spending in local retail outlets on consumables such as food and drink. Additional employment may be generated in these services during the construction period.

6.5.2 Operation Impacts

Severance

A key determinant of the nature and extent of effects on social patterns and linkages will be the extent of any severance, or change in local based pedestrian or vehicular patterns to facilities and services as a result of the operation of the Red Line extension.

The Luas Line C1 infrastructure and tram movements are unlikely to cause any significant barriers to people wishing to cross the road, or to cars travelling along the road. Its built form will be such that people will be able to continue to cross the road safely, and traffic will be able to continue to use Mayor Street Upper and Lower, as discussed in *Chapter 7, Traffic and Transportation*. Therefore, it is considered that no significant severance impacts will be incurred.

Accessibility and Mobility

The Luas Line C1 will result in considerable improvements in accessibility of people to the study area; from one end of the study area to the other; and from the study area to the city centre.

Tram stops will be located approximately every 500m, and will be designed to allow level boarding

and alighting by all passengers. The trams will have a low floor level for most of its length to facilitate easy access for the mobility impaired.

Resultant improvements in accessibility to jobs, residences and services, to The Point and to the proposed National Conference Centre; and from such locations to the city centre, Connolly and Heuston Stations and the bus depot (via connecting Luas lines) will be an important element of the economic restructuring process taking place within the planned development of the area.

Regeneration and Impact on General Amenity

Improved accessibility to the Dublin Docklands Area, in particular by public transport, is an important and recognised element of a cohesive regeneration strategy for the area. It will have an important role in bringing neglected and underused land back into use. The scheme has a positive role in overcoming the negative perception of the investment market of the area on grounds of poor accessibility. The negative image of the area is already being overcome through the high quality development of Custom House Dock, the IFSC and George's Dock. However, this has only reinforced the contrast with the North Lotts area in terms of its poor environment and image. The Luas will help to open up the eastern part of the area to investment opportunities.

The route meets the strategic objectives for the redevelopment of the area in that it provides vastly improved access to key transport hubs such as Connolly Station, community and entertainment venues such as The Point, and will be a key transport feature of the wider development of the Docklands area. This can be expected to contribute to the regeneration of the area, through improving local business confidence and attracting inward investment.

Furthermore, community facilities such as health services, child care and quality open space are currently lacking in the immediate study area, thus the development of the area provides a unique opportunity for such facilities to be provided.

Pedestrian and Vehicular Safety

The Luas Line C1 will result in changed traffic conditions within the study area, and therefore will pose a potential danger to pedestrians and to drivers who are unfamiliar with the new road conditions. Appropriate signage and clear vehicle and pedestrian traffic lights will be required in order to promote pedestrian and vehicular safety. Pedestrian and Vehicular safety is addressed in detail in *Chapter 7, Traffic and Transportation*.

6.6 Mitigation Measures

Mitigation measures will be implemented to manage the impacts of the Luas Line C1 development, including:

- development and implementation of a *Construction Method Statement* to limit disruption to nearby businesses and residents through limitations on permissible hours of construction, minimised noise outputs, dust reduction.
- development and implementation of a *Traffic Management Plan* to ensure:
  - continued traffic flow through the study area; and
  - continued vehicle and pedestrian access is provided to all businesses and residences along the route.

6.7 Predicted Residual Impacts of The Proposed Development

There are no residual impacts associated with the development.

6.8 Conclusions

The short term disruption to be caused by the construction of Luas Line C1 will be outweighed by the considerable social benefits to the existing, and future, communities of the study area.

Chapter 7

7 TRAFFIC & TRANSPORTATION

7.1 Introduction

7.1.1 Background

During the development of the Luas Line C1 alignment by the RPA, it was clear from an early stage that Mayor Street could provide a suitable alignment for the route between Connolly Station and the Line C1 terminus at The Point. Mayor Street provides a continuous alignment along the full length of the route, and there is good potential for intensification of existing land-uses along this corridor.

The provision of on-street running is expected to have an impact on existing traffic flows and other transport activity along Mayor Street. This section of the report examines such impacts and sets out how they are managed as part of the proposed scheme.

As part of this section of the report, the "Study Area" has been defined as the rectangle bounded by Amiens Street, East Wall Road, Sheriff Street and North Wall Quay/Custom House Quay, and represents the area within which all significant local impacts of the scheme are expected to occur. In addition, relevant impacts of schemes taking place outside this study area have also been addressed.

7.2 Methodology

7.2.1 Approach

The traffic and transport assessment examines both the positive and negative impacts on all transport users arising out of the proposed scheme. It is stressed at this stage that the benefits of a scheme of this sort can be significant, in the form of network-wide journey time reductions, reduced vehicular emissions, reduced noise, and associated environmental degradation associated with car activity. The primary purpose of this section is to examine the more local traffic and transportation impacts which may arise out of the scheme, the extent of such impacts and the processes or measures necessary to manage them.

The traffic and transportation assessment draws on information from a number of sources to inform the work, as will be described later in this report. In essence, the assessment is undertaken in five key tasks as follows:

• Establishing an understanding of existing conditions throughout the study area, covering road and public transport infrastructure, pedestrian and cycle facilities, and existing safety issues. This enables a robust picture of the do-minimum scenario to be developed against which the proposed scheme can be assessed;

Defining the details of the proposed scheme, including the alignment, and the traffic management measures proposed through the area to support it;

Assessment and quantification of the traffic impacts through the study area, the consequential impacts on pedestrian and vehicular safety, and the key changes in traffic patterns which will result from the proposed scheme;

Discussing the traffic impacts associated with construction works as the scheme progresses on site, and how these impacts can be managed; and

Providing an overview of the impacts on existing and future public transport facilities, and the likely levels of passenger activity that the proposed scheme is likely to attract.

Junction assessments have been undertaken using traffic modelling techniques to determine delay and queuing through individual locations. The junction assessment has informed the scheme design, and ensures that the scheme will facilitate forecast peak period traffic activity through the area over the period to 2016. Further information on the Junction Assessment is provided in *Annex A.*

7.2.2 Assumptions and Limitations

The forecast traffic data over the period to 2016

forms the key source of information upon which the study has been based, and has been prepared by the Dublin Transportation Office (DTO) using their strategic traffic model for the Greater Dublin Area. The DTO model has become an accepted tool for modelling the traffic and transportation impacts of major infrastructure schemes, and was most recently updated in 2001 to more accurately reflect observed changes in traffic patterns. The model also has the capability to reflect the tendency for increased public transport use as a result of an improved service, and other management measures throughout the Greater Dublin Area.

Traffic flow information for 2003 (existing), 2008 (opening year) and 2016 (design year) was supplied by the DTO for relevant roads and junctions throughout the study area upon which to base the assessment. The data has been supplied for both the do-minimum and do-something scenarios such that the actual impacts of the scheme can be compared for each of the assessment years.

The traffic and transport assessment has broadly followed the guidance provided in the UK Institute of Highways and Transportation *Guidance on the Preparation of Traffic Impact Assessments*, the National Roads Authority *Design Manual for Roads and Bridges*, and the Irish Department of the Environment *Traffic Management Guidelines*.

7.2.3 Assessment Criteria

Continuing consideration of traffic and transportation issues has been made throughout the Preliminary Design of the Luas Line C1 scheme, and has allowed the development of a scheme that will lead to a significant improvement to transport accessibility, mobility, the local environment and the local economy within the Study Area. In preparing this section, the emphasis has been on:

• Determining the adverse impacts of the scheme;

• Identification and development of measures to be incorporated into the scheme to mitigate impacts; and

• Identifying and evaluating the residual impacts of the scheme.

In addressing these issues, a set of criteria was required to allow an examination of the relevant impacts. In establishing such criteria, the following issues were been deemed most relevant to the assessment:

• Local road and junction capacity – Is congestion or significant queuing envisaged through the junctions?

• Access and circulation – Are large volumes of traffic expected to make large diversions to reach their destination

• Traffic Safety – Do the proposals lead to concerns regarding the safety of pedestrians, cyclists or vehicular traffic?

• Construction – Can the construction be managed such that excessive disruption can be avoided?

• Public Transport – Will the scheme compliment or conflict with existing and proposed public transport?

• Residual impacts – Are they significant and can they be managed?

Addressing all such criteria will ensure that all potential impacts can be incorporated into the assessment, and a thorough understanding of the nature and extent of each can be developed. The Institute of Environmental Assessment Guidelines suggest broad rules-of-thumb which assist in identifying those impacts which can be deemed to be '*significant*'. These are:

• 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.).

On this basis, traffic flow increases directly attributable to Luas of less than 10% were not considered to be significant. Furthermore, increases of 10-30% were only considered to give rise to significant effects in specifically sensitive areas, defined in this case as any road link with more than 15 accidents in the last five year period for which data was available.

In deciding on assessment criteria for vehicular delay, guidance has been obtained from the *Design Manual for Roads and Bridges (DMRB Vol. 11 Environmental Assessment)*. This defines potential for significant delay where there is predicted to be a permanent decrease in link speeds of more than 5km/h, or where there is predicted to be a permanent increase in journey length of 500m.

7.3 Description of the Receiving Environment

7.3.1 Introduction

This section outlines the study area in its existing form. The discussion is intended to provide the reader with an overview of existing traffic and transport infrastructure through the study area, as well as current provision for taxis, parking, loading and public transport services. The discussion also outlines any road safety issues that have been observed based on accident records, and provides an overview of current traffic patterns through the locality.

7.3.2 Road Infrastructure

A number of infrastructural schemes are proposed in the vicinity of Luas Line C1, which will impact on traffic patterns throughout the area. Proposals include:

Dublin Port Tunnel: The Dublin Port Tunnel will provide direct access from the National Motorway Network at Whitehall to Dublin Port and East Wall. Although constructed primarily for goods traffic, it is expected that a notable volume of general traffic will use the tunnel. This will significantly relieve demand along East Wall Road north of Tolka Quay Road as a result of traffic using the tunnel. The impacts of the Dublin Port Tunnel have been incorporated into the do-minimum scenario for 2008 and 2016;

East Wall Road Widening: In order to support the tunnel proposals, a scheme for widening East Wall Road has also been prepared. The scheme will increase capacity between The East Link and The Port Tunnel, and combined with the reassignment of some traffic to the Dublin Port Tunnel will lead to a notable improvement in traffic conditions;

Environmental Traffic Cells: Dublin City Council proposes an environmental traffic management scheme for the Study Area. The indicative scheme incorporates a number of traffic management measures and turning restrictions to reduce through-traffic volumes as described above, and will compliment the increases in capacity on the routes around the periphery of the Study Area.

Macken Street Bridge: It has been assumed that the proposed Macken Street Bridge has been fully constructed for the design year scenario only (2016). The Macken Street Bridge provides an additional river crossing between Matt Talbot Bridge and the East Link, and is expected to attract significant cross-river trips. This will in itself lead to a notable increase in vehicular traffic onto North Wall Quay, and as such has been included in the do-minimum and do-something scenarios such that the impacts of the proposed Luas can be identified in isolation. The Macken Street Bridge scheme also incorporates a turning restriction from Sheriff Street Lower/Guild Street onto Sheriff Street Upper. This

is required to remove any potential for traffic accessing the Dublin Port Tunnel from the proposed Macken Street Bridge, which could otherwise lead to a significant increase in traffic volumes through the study area. Traffic using Guild Street would instead be required to travel to the North City via the Five Lamps and either North Strand Road or Portland Row. The Macken Street Bridge and associated traffic management measures has been approved through a separate planning procedure and a stand-alone EIS is available from the Planning Authorities;

Luas Red and Green Lines: The Luas lines recently constructed between the City Centre and Sandyford, Tallaght and Connolly Station have been included for both 2008 and 2016; and

A number of new road proposals are also proposed within the study area. For 2008, the proposed First Link Road (Spencer Dock Road) to the east of Guild Street is included. For 2016, the Second Link Road, located to the west of New Wapping Street, and the Third Link Road to the west of the Point are included. Such link roads are seen as essential to providing the required levels of access into development lands within the study area, and are included in the do-minimum scenario.

7.3.3 Existing Road Conditions

The North Quays, from Matt Talbot Bridge to the Point, represents a key approach route into the City Centre, and provides the main connection between the City Centre and Dublin Port. Similarly, Sheriff Street also provides a continuous route from East Wall Road to Amiens Street, although congestion along Amiens Street can be considerable during peak periods, and hence this is not as attractive a route for access to the City Centre. Mayor Street, on the other hand, does not presently provide a continuous route to East Wall Road. Mayor Street Lower terminates at Guild Street to the west of Spencer Dock, while Mayor Street Upper ends at New Wapping Street, some 150m to the east.

In addition, a number of north-south routes bisect the study area providing access between Sheriff Street and North Wall Quay, thereby providing an alternative to East Wall Road and Amiens Street. Existing traffic patterns through the study area can therefore be quite complex, and are as a result of a number of different requirements of road users. The key features are:

Rat-running to avoid Amiens Street:

Such traffic travels from the Five Lamps via Sheriff Street and either Commons Street or Guild Street onto Custom House Quay, where onward access to the South City is available via Matt Talbot Bridge. It appears that the majority of such traffic routes via Commons Street as opposed to Guild Street in order to bypass much of the queuing that can form on Custom House Quay, and this exacerbates queuing through the Commons Street/Mayor Street Lower junction. This activity also occurs in the reverse direction during both the AM and PM Peak periods;

As an alternative, a notable volume of traffic travels via Sheriff Street, Commons Street, and Mayor Street Lower to rejoin Amiens Street at Store Street. This is possible at present due to the retention of the left turn facility onto Amiens Street, and leads to an increase in vehicular traffic activity along Mayor Street Lower adjacent to Harbourmaster Place;

Rat-running to avoid East Wall Road:

To the east of the study area, traffic volumes are relatively light throughout the day. During peak periods however, congestion is common along East Wall Road as a result of high volumes of traffic demanding access to Alfie Byrne Road and the North City. As such, the use of New Wapping Street and Castleforbes Road is common by traffic attempting to bypass this congestion. Particularly high volumes are observed on New Wapping Street during the PM Peak;

Local Access:

At present, the main area of development in the study area is in the area to the west of Guild Street, comprising residential units, retail, commercial and general public open space. The area therefore generates a high level of travel demand, which in turn leads to the generation of local traffic activity. The main vehicular access routes into the area are via The Five Lamps, Sheriff Street and Guild/Commons Street from the North, and via Custom House Quay and Commons Street from the South. Access is also possible from the North East and South West via Alfie Byrne Road/Sheriff Street and the East Link Bridge.

As a result, local traffic is approaching on almost identical routes to those currently being used by rat-running traffic. Local traffic therefore experiences some congestion through the area, particularly at the junction of Commons Street and Mayor Street Lower as a result of this additional traffic load.

Another key feature of the study area is the traffic impacts of large events at the Point. The Point is currently characterised by car-dominated access, with extremely limited public transport provision, despite the proximity to the City Centre. Parking is provided in the Point Car Park, along adjacent residential roads, and in other private car parks. Events, particularly those that generate additional peak-hour traffic, can result in substantial congestion along East Wall Road and North Wall Quay, thereby exacerbating current traffic difficulties through this area.

7.3.4 Other Initiatives

A HGV Management Strategy has been published in draft form by Dublin City Council, the implementation of which will coincide with the opening of the Dublin Port Tunnel. The over-riding objective of the strategy is to maximise the benefits of the Port Tunnel by encouraging the maximum possible use of the Tunnel by HGV traffic. The strategy is under consultation regarding the specific objectives and means of implementation, and is scheduled for completion in 2005. It is expected that the key impact of the strategy will be a further reduction in HGV traffic along North Wall Quay, hence leading to journey time and delay savings to residual traffic in and around the Luas Line C1 study area.

7.3.5 Existing Public Transport Provision and Accessibility

At present, the provision of public transport into the North Docklands area is limited, with bus 53A providing the only scheduled local service between the City Centre and East Wall, and at a frequency of some 7 buses per day.

Route 90A has been recently introduced which connects the City Centre with Guild Street via Mayor Street, thereby improving accessibility to the westernmost extremity of the study area. Although this does provide good public transport access into the heart of the Study Area, patronage of the route 90A has been observed to be quite limited. This is likely as a result of the limited frequency of service, the long journey times relative to, for example QBC routes, and the proximity of much of the existing development to other public transport services on Amiens Street and the Luas Red Line/DART at Connolly Station.

At present Iarnród Eireann has a rail terminal within the study area, which serves part of their national freight business and is not utilised by passenger trains. Longer-term proposals, however, to introduce passenger trains to the Spencer Dock terminal could benefit future development with the study area, and proposals in this regard will be discussed later in this report.

Parking for approximately six taxis is currently provided on Mayor Street Lower immediately to the east of Commons Street.

7.3.6 Parking and Loading Activity

Existing parking and loading activity was compiled as part of a survey of existing conditions along the Luas Line C1 alignment. A summary of the survey

results along key sections of Mayor Street is provided in *Table 7.3a* below. The table indicates the number of "parking and loading events" that occur during the specified period.

Table 7.3a Parking and Loading Survey (06:00 to 19:00)

Location	Vehicles (all stopping durations)	Vehicles stopped > 3 hours	Vehicles stopped < 30 minutes	Cars stopped < 30 minutes
Mayor Street Lower between Commons & Guild	571	54	294	225
Mayor Street Lower at George's Dock	340	0	225	159
Mayor Street Upper between New Wapping & Castleforbes	121	12	67	39

Source: RPA 2004

The survey results show that significant short stay activity is taking place along the route. On Mayor Street between Commons Street and Guild Street, some 54 vehicles are stopped in excess of 3 hours. When it is taken that a total of 70 pay & display spaces are available along this section, it can be concluded that only 16 short stay parking spaces were actually available for general use for much of the day. Furthermore, some 50% of the total parking provision on Mayor Street was taken up by vehicles parked for periods in excess of six hours.

This type of activity suggests that cars are being parked for the duration of the working day. A total of 294 vehicles stopped at the kerbside for less than 30 minutes, which constitutes mainly loading or drop off activities. No parking is permitted on Mayor Street Lower at George's Dock, although loading/unloading activity does take place as noted by the surveys.

There are currently no parking restrictions in operation on Mayor Street Upper between New Wapping Street and Castleforbes Road. This area appears to be used as a long-stay parking area for local traffic and, potentially, for those with destinations on Mayor Street Lower.

7.3.7 Existing Pedestrian and Cyclist Activity

Existing pedestrian activity was also compiled using survey data. The surveys measured pedestrian movements through a number of junctions along Mayor Street, and allowed the pattern of existing activity to be built up. The results of the survey are outlined in *Table 7.3b* below.

Figure 7.3b Existing Pedestrian Activity (06:00 to 19:00)

Location	North–South	East – West	Total
Mayor Street Lower – Bridge over George's Dock	0	9248	**9248**
Commons Street / Mayor Street Lower	1668	5748	**7416**
North Wall Quay / Commons Street	145	2495	**2640**
Seville Place / Guild Place / Sheriff Street Upper	19	1143	**1162**
Mayor Street Upper / Castleforbes Road	53	106	**159**

Source: RPA 2003

The table clearly shows a dominance of east-west pedestrian flows along Mayor Street, with some significant north-south activity noted along Commons Street. The highest flows were noted on Mayor Street Lower over the bridge at George's Dock where approximately 4,500 pedestrians were recorded in each direction between 06:00 and 19:00. Over half of these pedestrians continue along Mayor Street Lower and through the junction with Common's Street. The remainder presumably end their trip at office or residential developments situated around the George's Dock area. This east-west demand is also reflected on North Wall Quay and at the junction between Seville Place / Guild Place / Sheriff Street Upper. Pedestrian activity is considerably lower at other locations closer to The Point, where the area is predominately industrial based as opposed to commercial or residential.

An assessment has also been made of existing cycling activity. The surveys again show cycling to be most predominant along Mayor Street Lower, accounting for 8% of all westbound traffic movements along Mayor Street west of Commons Street. Pedal cyclists contribute to 5% of the total vehicular activity along Mayor Street Lower east of this junction.

A summary of cycling activity is outlined in *Table 7.3c* below.

Table 7.3c Existing Cycling Activity

Location	North–South	East – West	Total
Commons Street / Mayor Street Lower	237	383	**620**
Mayor Street Lower / Guild Street	81	49	**130**
Custom House Quay / Commons Street	327	343	**670**
Seville Place / Guild Place / Sheriff Street Upr	229	49	**278**
Mayor Street Upper / Castleforbes Road	31	5	**36**

As for pedestrians, the level of cycling activity is most concentrated to the west of Spencer Dock. The volume of east-west cycle activity is as high on Mayor Street as on North Wall Quay, and implies that further increases could be expected with the introduction of a continuous cycle routing along the Luas Line C1 alignment from The Point. Also of note is the high north-south volume through the junctions, which suggests that the study area is being used as a through-route for general cycle access to the city centre. This pattern of cycle use may increase considerably following completion of the new bridge linking Georges Dock with the South Quays

7.3.8 Pedestrian, Cyclist and Vehicular Traffic and Safety

Accident statistics within the study area have been compiled and are presented in *Table 7.3d*. It is evident that the number of accidents along Mayor Street is quite low in comparison to adjacent roads, and intersecting roads such as Commons Street, New Wapping Street and Castleforbes Road. This is potentially as a result of the high levels of rat-running traffic along these intersecting roads as described earlier. Two of the three accidents recorded on Mayor Street were pedestrian related. No cycling-related accidents were recorded at any point along the proposed alignment.

Over the five-year period for which accident statistics are presented only three were recorded along Mayor Street Lower and Mayor Street Upper, all of which were classified as 'minor'. A total of four 'fatal' accidents were recorded from 1997 to 2001, on Amiens Street and East Wall Road, which carries significantly higher traffic flows. Of the total accidents recorded within the study area, 27% involved pedestrians and 15% involved cyclists.

As indicated in *Table 7.3d*, the key finding is the relatively high proportion of accidents involving pedestrians, particularly along Mayor Street. Facilities for significantly improving the pedestrian environment have therefore been incorporated into the scheme design.

Table 7.3d Personal Injury Accident Data 1997-2001

Location	Fatal	Serious	Minor	Total
Amiens St	2	5	60	**67**
Commons St	0	0	8	**8**
Sean McDermott St	0	0	1	**1**
New Wapping St	0	0	7	**7**
East Wall Rd	2	5	59	**66**
Sheriff St	0	4	11	**15**
Custom House Quay	0	2	19	**21**
Guild St 0	0	0	**0**	
Castleforbes Rd	0	0	7	**7**
Mayor St	0	0	3	**3**
Source: National Roads Authority				

The ongoing development of the study area is likely to lead to increases in pedestrian and cyclist activity. The introduction of Light Rail schemes along a potential pedestrian/cycle desire line has been shown to attract such activity away from parallel routes primarily as a result of the environmen-

tal improvements and perceived security associated with such schemes. This will allow a focusing of such activity onto Mayor Street where it can be accommodated through the various improvements proposed.

7.4 Do Nothing Scenario

7.4.1 Overview

The DTO Platform for Change outlines a definitive transport strategy for the Greater Dublin Area in the period to 2016. The Strategy addresses the potentially serious impact of congestion in future years should traffic growth be allowed to continue unmanaged in the Greater Dublin Area, and the consequential negative economic impacts on the City.

The Luas Line C1 extension reflects this position, in recognising that provision of adequate quality public transport is an imperative part of facilitating development on the scale that is currently proposed for in the North Docklands area. A reliance on car travel to facilitate this development would lead to unsustainable levels of car parking provision, and a significant increase in traffic congestion throughout the area. This is particularly evident for those areas to the east of Spencer Dock and Guild Street which are not within a reasonable walking distance of the existing public transport corridor along Amiens Street and at Connolly Station.

The proposed Line C1 scheme therefore addresses this requirement by providing a high quality, high capacity public transport corridor through the centre of an existing and future area of high-density development, and will facilitate sustainable travel habits by users from an early stage.

7.5 Proposed Infrastructure

7.5.1 Overview of System

Line C1 comprises of the installation and operation of an on-street light rail transit system between Connolly Station and The Point (East Wall Road). The route is effectively a continuation of the Luas Red Line and will follow the alignment of Mayor Street Upper and Lower. As part of the scheme, a new Luas bridge, which accommodates pedestrians, cyclists and access to the proposed National Conference Centre is to be constructed across the canal at Spencer Dock, connecting Mayor Street Upper with Mayor Street Lower.
The RPA identified a suitable method for tying the proposed Line C1 into the existing terminus at Connolly Station through a route selection process, where a total of three options were identified. The chosen option involves two-way LUAS operation from the existing Connolly Station stop, past Harbourmaster Place onto Mayor Street Lower, and continuing onto Mayor Street Upper and The Point.

The selected option allows the LRT to focus on Mayor Street as the primary corridor, along which all environmental and traffic management proposals can be concentrated. The preferred option represents the most natural alignment for extending the Luas Red Line, and makes best use of the existing platforms at Connolly Station.

There are a total of four new LRT stops proposed along Line C1. These are located at:

- Georges' Dock;
- Mayor Street;
- Spencer Dock; and
- The Point (Terminus for Line C1).

It is envisaged that services along the Luas Red Line and Line C1 will be integrated to provide a single service. The following service combinations are envisaged:

- Through running from Tallaght to The Point via the Luas Red Line, Connolly Station and Line C1;

- Through running from Tallaght to The Point via the Luas Red Line and Line C1, but omitting Connolly Station. This would be appropriate for selected services during the peak period, when dictated by passenger demands; and

- Tallaght to Connolly Station via the Luas Red Line, terminating at Connolly Station. This acknowl-

edges the potential for a reduced level of service through the docklands, particularly during the earlier years, pending full development of the study area; and

• Short running from Connolly Station to The Point (Terminus for Line C1), as dictated by passenger demand and as might facilitate special events at the Point.

In designing the scheme, provision for a public transport interchange has been made at Spencer Dock. This is in line with the Platform for Change Strategy, which envisages a through heavy rail line from north of Connolly Station to Pearse Street and Heuston via the Rail Interconnector. Spencer Dock would therefore become an important transport hub, and would potentially support significant associated activity.

The scheme has been designed on the basis of an initial 5-minute service frequency along Line C1, which will meet passenger demands up to the design year of 2016, and thereafter. Further capability for increased capacity has been incorporated into the system in the longer term.

7.5.2 Traffic Management Proposals

The development of the Line C1 scheme has required a number of traffic management proposals to ensure that expected traffic volumes can be managed effectively, to provide for road safety requirements, and to protect the Luas from the potentially severe impacts of congestion. As such, the Line C1 designs incorporate a number of specific proposals as part of the overall scheme to meet these requirements. These traffic management proposals include:

New signalised junctions along Mayor Street at Commons Street, Guild Street, New Wapping Street, and Castleforbes Road. All junctions incorporate dedicated Luas signals and pedestrian crossings;

The construction of a bridge linking Mayor Street Upper with Mayor Street Lower (Mayor Street Bridge) across Spencer Dock. The bridge will provide a route for Luas vehicles, pedestrians and cyclists between Mayor Street Upper and Mayor Street Lower. In addition, the bridge will provide vehicular access to the National Conference Centre from Guild Street. Other traffic will not be permitted to use the bridge, as this would lead to Mayor Street becoming an attractive alternative to North Wall Quay for traffic to/from the City Centre;

Closure of the road linking Mayor Street Lower with Amiens Street, with the exception of Luas vehicles, pedestrians and cyclists. Again, this ensures that Mayor Street provides for local access only, and further discourages rat-running. A decrease in traffic volumes along Mayor Street Lower and the junction with Commons Street is expected as a result.

Provision of a turning hammerhead on Harbourmaster Place for traffic, required due to the closure of the access onto Amiens Street;

Shared running of Luas and other traffic in a single lane in each direction along Mayor Street Lower between Harbourmaster Place and Commons Street. This is required due to the limited available street width, and is protected from attracting through-traffic by the closure at Harbourmaster Place;

One way eastbound for traffic on Mayor Street Lower, between Commons Street and Guild Street. The eastbound lane is provided alongside the Luas tracks, and hence no shared running is required;

No right turn from Mayor Street Upper onto New Wapping Street or Castleforbes Road. In 2008, all traffic, including Luas vehicles is required to use a single approach lane on Mayor Street to New Wapping Street and Castleforbes Road, and the introduction of a right turn restriction is necessary to ensure that Luas vehicles are not impeded by traffic waiting to turn right. In 2016, the existing lane is designated as Luas-only, with the road widened to provide an additional lane for all other

traffic. Even with this additional lane, right turning traffic would still block traffic flow, and the right turn restriction is therefore retained. Alternative access to both streets is available from Sheriff Street or North Wall Quay;

No right turn for southbound traffic from Castleforbes Road onto Mayor Street Upper, again as a result of the restricted width of Castleforbes Road, and the difficulty in providing a pocket for right-turning vehicles;

The proposed First, Second and Third Link Roads have already been discussed, and are included in the Do-Nothing and Do-Something scenarios. Such roads will be signalised at their junctions with Mayor Street Upper, and will facilitate pedestrian signals across all arms of each junction; and

Provision for westbound traffic only between Castleforbes Road and the Third Link Road.

In addition, loading bays are to be provided along Mayor Street between Commons Street and Guild Street along the northern kerb to facilitate the retail activity along this stretch of road. The loading bays would provide for deliveries to both sides of Mayor Street Lower.

7.6 Traffic and Transport Assessment

7.6.1 Construction Traffic

Likely Construction Programme

The construction of any linear project has different characteristics to that of a contained site development, which would be likely to start at a number of different locations simultaneously with many work activities running concurrently. This ensures completion of the construction works within a reasonable timeframe and minimises construction costs. Construction works in essence will incorporate:

- site preparation, utility diversion and excavation for the foundation
- Installation of ducting and drainage along and adjacent to the route
- installation of trackbed and rails
- surface finishes and installation of electrical and operating equipment

In this section, the particular impact of construction on traffic and transportation activity, and the proposed mitigation measures will be discussed.

Construction Traffic Impact

It is accepted that the traffic impact during the construction phase can be significant, primarily as a result of road closures and major decreases in junction efficiency as a result of restricted lane widths. For the current scheme, it is likely that the main impact will arise out of the requirement to temporarily occupy roadspace for construction works, resulting in partial or full closure of particular roads. This may not necessarily be the case on Mayor Street however, where significant traffic congestion resulting from reductions in junction efficiency would not be expected, due to the low volumes of traffic that currently use Mayor Street. While traffic along much of Mayor Street will significantly increase as the intensity of development grows throughout the study area, this is not likely to become an issue before 2008, when the construction work is expected to be complete.

The traffic impacts of site preparation are likely to be minimal, as no extended occupation of the public highway is required, and such works can be undertaken over a relatively short timescale. On the other hand, the traffic impact of the diversion works can be significant if not adequately managed, particularly along more restrictive areas of Mayor Street. Maintenance of a one-way running lane along Mayor Street would be sufficient to facilitate necessary access to adjacent properties and underground car parks. Facilitating one-way westbound on Mayor Street at all times, with all eastbound flows along North Wall Quay/Custom House Quay would provide a possible solution given the low levels of congestion eastbound on Custom House Quay and North Wall Quay Quay, and would take advantage of the easy access from

Amiens Street onto Custom House Quay.

Construction of the trackbed may require partial closure of certain sections of road for limited periods where restricted width is available, in order to facilitate construction of the full width as a single process. The requirement for such would be discussed with local representatives as part of the construction programme, and access to properties would be maintained at all times. Following surfacing, completed sections can be open to traffic while the installation of the power supply is taking place. This will ensure that the duration of road closures can be kept to a minimum in the most sensitive areas.

The project as proposed will also require the construction of a 'Delta Junction' in the railway at the junction of Amiens Street and Mayor Street Lower. This junction will be required to facilitate through-running of trams from the Luas Red Line to Line C1 without the requirement to enter the Connolly Station terminus. The construction of such a facility will inevitably disrupt services using the existing Luas Red Line into Connolly Station and would require trams to terminate at, for example, Abbey Street. This work will also require temporary traffic management measures to facilitate continued traffic flow along Amiens Street during the period of construction of the Delta Junction.

Mitigation Measures

In order to successfully limit the impact of the construction period, a number of key mitigating measures are proposed. These are:

- Frequent liaison and information exchanged with interested parties;
- The possibility of partial possession of roads and streets (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 procedures and fencing around trenches;
- Clear sign – posting for road traffic and pedestrians;
- Strict control of construction vehicles;
- Co-ordination by the clients' representatives of works of the utility companies and their contractors; and
- Co – ordination by the clients' representatives of works of the infrastructure contractor.

It is noted that the limited traffic activity along Mayor Street to the east of Spencer Dock, will ensure that traffic congestion issues are significantly less than would be expected in a city centre site with very high traffic flows, limited alternative routes and significant street frontage. As a consequence the construction impact will, in itself, be more limited as a result.

The requirement to maintain access to the various underground car parks on Mayor Street Lower will be an important element of the construction stage, particularly along the section of Mayor Street Lower between Commons Street and Harbourmaster Place. Two-way access to car parks will be maintained at all times during the construction period.

As part of the construction process, the selected contractor will be requested to supply a Traffic Management Plan as part of their contractual obligations for agreement with the RPA. The Traffic Management Plan would set out in detail the proposed programme of works, how appropriate access can be retained throughout the works, and how the environmental impacts of operating an urban construction site can be managed.

7.6.2 Operational Traffic Impacts

Overview

As part of the Traffic and Transport Assessment, a detailed analysis of the traffic and transportation impacts of the scheme during the operation phase was undertaken using traffic modelling software. This would ensure that the design could cater for

the future traffic flows through the area which would arise following implementation of the Line C1 scheme and the supporting traffic management measures. This section of the report outlines the assessment undertaken, the findings, and the resulting impacts. A discussion of the safety implications for pedestrians, cyclists and other vehicles will be addressed later in this section, making reference to the particular problems outlined earlier.

Within the study area, the following junctions were deemed to be most relevant for the purpose of the traffic assessment:

- Amiens Street / Mayor Street Lower;
- Harbourmaster Place / Mayor Street Lower;
- Commons Street / Mayor Street Lower;
- Guild Street / Mayor Street Lower;
- New Wapping Street / Mayor Street Upper;
- Castleforbes Road/ Mayor Street Upper;
- Commons Street / Custom House Quay / North Wall Quay; and
- First, Second and Third Link Roads at their junction with Mayor Street.

Traffic Forecasting

The traffic forecasting procedure was undertaken by the Dublin Transportation Office (DTO), and with reference to the DTO Multi-Modal Transportation Model. The traffic forecasting is outlined in full in the Traffic Forecasting report, prepared by the DTO, which outlines the assumptions, methodology and findings of the traffic forecasting. The results of the DTO work were adopted by the RPA for the purpose of the Luas Line C1 EIS.

In addition, an understanding of the impact of shared Luas/vehicle running lanes on traffic flow was required. The key issue is the bunching effect caused by Luas vehicles stopping at an upstream Luas stop, and requiring other traffic to remain behind the Luas vehicle. This can lead to large gaps in approaching lane flows, and reduce the efficiency of traffic lanes. A microsimulation model was constructed to test this effect, and demonstrated that for a single lane, lane efficiency was reduced by some 20% with shared running of Luas vehicles. This was taken into account in the assessment of junctions.

General Traffic Impacts

The construction of the proposed Line C1 and associated traffic management measures will lead to some notable changes in the pattern of traffic movement through the study area, predominantly as a result of the various road closures and turning restrictions.

In essence, the main impact on local traffic will relate to those accessing Amiens Street from Mayor Street and Harbourmaster Place. At present, all traffic exiting onto Amiens Street from Mayor Street is required to cross the river at Matt Talbot Bridge due to the compulsory left turn at Amiens Street. With the proposed closure of the link onto Amiens Street from Mayor Street, the alternative route to Matt Talbot Bridge is to travel via Commons Street and Custom House Quay. Sharing roadspace with Luas vehicles will not be expected to result in any significant additional delay, as Luas flows are quite low relative to general traffic.

The turning restrictions at Castleforbes Road and New Wapping Street, as well as the one-way westbound on Mayor Street between the Third Link Road and Castleforbes Road would not be expected to impact on existing traffic to any significant degree. The main activity through this area during the peak periods is rat-running traffic, and would be better managed by such restrictions.

On Mayor Street Lower, between Commons Street and Guild Street, a one-way eastbound is proposed. This will require some minor rerouting to access car parking along this section of Commons Street. Traffic will be required to access this section of Mayor Street Lower from Commons Street, which is for the most part a relatively minor diversion. The measure also removes traffic flow turning right from Guild Street onto Mayor Street, of which a significant amount is rat-running traffic, and reassigns it onto other North South links including Commons Street, New Wapping Street and the new

Link Roads.

There is an existing taxi bay on Mayor Street Lower immediately to the east of Commons Street. The scheme proposals require a relocation of this facility, which currently has space for approximately six vehicles. Alternative locations will be identified during the detailed design stage of the works with due regard for the requirements of taxi operations and the convenience of taxi users. Detailed proposals will be developed by Dublin City Council in discussion with the RPA, the taxi regulator, the Gardai and the Dublin Docklands Development Authority, and will lead to the identification of alternative locations. An alternative taxi facility is being proposed on Harbourmaster Place.

Access to the underground car parks along Mayor Street Lower will not be affected by the subject proposals. West of Commons Street, all traffic will share a running lane with Luas vehicles in each direction, and traffic turning right into car parks will be required to cross the opposing Luas line. This is, however, no different to crossing any conventional opposing traffic lane. Level access across the lines will be available at all such locations and hence no impact on traffic flow to/from underground car parks will therefore occur.

Traffic Flows on Links

The redistribution of vehicular traffic through the study area lead to a change in traffic volumes using most roads. In order to describe the significance or otherwise of such changes, a summary table showing link flows in 2016 is presented below in Table 7.6a. Increases deemed to be significant (ie: exceed the thresholds outlined in section 7.2.3) are highlighted.

Table 7.6a Future Year 2-Way Link Flows, 2016

Link	AM Peak No Luas	AM Peak With Luas	AM Peak % Change	PM Peak No Luas	PM Peak With Luas	PM Peak % Change
Amiens St North of Harbourmaster Pl	2250	2274	+1%	1573	1737	+10%
Mayor St Amiens St to Harbourmaster Pl	321	0	-100%	218	0	-100%
Mayor St Harbourmaster Pl. to Commons St	336	73	-78%	259	73	-72%
Commons St North of Mayor St	901	685	-24%	437	456	+4%
Commons St South of Mayor St	1072	1028	-4%	1231	723	-41%
Custom Ho. Quay West of Commons St	2268	1952	-14%	1089	1474	+35%
Custom Ho. Quay Commons St to Guild St	2387	2227	-7%	1983	1650	-17%
Mayor St Commons St to Guild St	639	470	-26%	1020	533	-48%
Guild St North of Mayor St	1171	1171	0%	937	1155	+23%
Guild St South of Mayor St	1031	1518	+47%	1899	1733	-9%
First Link Rd North of Mayor St	413	277	-33%	130	206	+58%
First Link Rd South of Mayor St	410	274	-33%	179	203	+13%
Second Link Rd North of Mayor St	77	427	+455%	170	101	-41%
Second Link Rd South of Mayor St	152	147	-3%	231	178	-23%
Mayor St Second Link Rd to New Wapping St	184	542	+195%	193	151	-22%
New Wapping St North of Mayor St	753	224	-70%	671	460	-31%
New Wapping St South of Mayor St	750	756	+1%	582	600	+3%
Mayor St New Wapping St to Castleforbes St	293	46	-84%	34	41	+21%
Castleforbes St North of Mayor St	310	337	+8%	479	391	-18%
Castleforbes St South of Mayor St	56	312	+461%	501	406	-19%
Mayor St Castleforbes St to Third Link Rd	376	12	-97%	11	13	+18%
Third Link Rd North of Mayor St	300	368	+23%	413	328	-21%
Third Link Rd South of Mayor St	346	373	+8%	409	324	-20%

The table shows a small number of significant changes to traffic flows throughout the network. Within the immediate study area, the significant increases are on:

• Guild Street, south of Mayor Street during the AM peak, where flows increase by some 47%. This is mostly as a result of the closure of Mayor Street westbound between Guild Street and Commons Street;

• The Second Link Road north of Mayor Street, and Castleforbes Street south of Mayor Street during the AM Peak. Although the percentage increases are significant, this growth is on top of very low existing flows, and the traffic flows resulting from the scheme can be easily managed;

• Mayor Street from the Second Link Road to New Wapping Street. Again, while the percentage increase is high, the actual increase is to the order of 358 vehicles during the AM Peak Hour, and can be easily managed within the road network;

• Amiens Street north of Mayor Street, which sees an increase of 10% as a result of the reassignment of traffic to other routes outside the study area;

• Custom House Quay to the west of Commons Street, where an increase of 35% is expected. This results from the restrictions on traffic movements

through the study area. The increase is to the order of 400 vehicles during the PM Peak hour. It is noted that this link sees a decrease in traffic movements during the AM Peak; and

• The First Link Road north of Mayor Street. Again, the percentage increase at 58% would suggest a significant increase. The actual increase is, however, low at 76 vehicles during the PM Peak hour.

Junction Impacts

The junction impacts have been assessed using appropriate junction modelling software. This approach allows expected queuing and delay to be assessed, and hence a conclusion to be drawn regarding the efficiency of the operation of the junction. The significant findings of the junction assessment for the Design Year (2016) are:

A significant reduction in westbound traffic along Mayor Street Lower between Commons Street and Harbourmaster Place during the Peak Periods. The reduction is to the order of some 80% to 90% of the existing traffic volumes over both peak periods;

A significant reduction in traffic volumes through the Commons Street/Mayor Street junction. During the AM Peak hour, hourly traffic reduces by over 20%, while the reduction during the PM Peak is approximately 40%. This effect arises out of a general reduction in traffic travelling northbound along Commons Street, and the removal of westbound traffic along Mayor Street Lower between Commons Street and Guild Street. The junction assessment at Commons Street/Mayor Street Lower has shown that maximum queues through the junction would be reduced by roughly 40% during the PM Peak as a result of the scheme, which would lead to notable benefits for residual traffic;

A significant improvement in traffic conditions through the junction of Mayor Street and Guild Street with the scheme. Although traffic flows through the junction do not change considerably as a result of the scheme, it is the removal of westbound traffic from Mayor Street Lower between Guild Street and Commons Street that releases much spare capacity from this junction. Queuing through this junction decreases by up to 80% during the PM Peak as a result of the proposals;

A reduction of 32% in AM Peak traffic movements through the junction of Mayor Street and the First Link Road. Traffic flows remain low through this junction and very low levels of queuing and delay are expected;

An increase of 169% in traffic movements through the junction of the Second Link Road and Mayor Street during the AM Peak. Despite this high level of increase, traffic flows remain low in comparison to nearby junctions, and no significant congestion or delay is expected through the junction. Much of this increase is as a result of the restrictions further west on Commons Street. Once again, however, traffic flows remain low through this junction and very low levels of queuing and delay are expected;

Reductions of up to 20% through the junction of New Wapping Street and Mayor Street, although flows remain low with minimal levels of queuing and delay expected;

A significant reduction in traffic through the junction of Castleforbes Road and Mayor Street during the AM Peak, where a reduction of 32% in peak hour traffic is expected. The impact of this reduction is limited, as no queuing/delay is expected through this junction without the scheme; and

Limited impact through the junction of Custom House Quay and Commons Street. Traffic flows through this junction increase by 12% during the AM Peak, but decrease by 10% during the PM Peak. Nevertheless, capacity through this junction remains an issue in future years, particularly given the requirement for a pedestrian facility through this location following the construction of the new pedestrian bridge. As a result, proposals have been made to provide additional capacity through this junction while providing for the pedestrian demand. The proposals reduce queuing by up to

85% during the AM Peak hour, with a corresponding reduction of some 50% in queuing during the PM Peak hour. This will be addressed later in this section.

In summary, the scheme appears to generally reduce east-west movements through the study area, displacing this traffic onto the surrounding road network. The closure at Amiens Street has a strong impact in reducing traffic along Mayor Street Upper, and leads to significant reductions in traffic through the junction with Commons Street.

Although not specifically as a result of the Luas proposal, the junction of Guild Street/Mayor Street is expected to come under significant pressure in future years as a result of the National Conference Centre. As part of the assessment, it has been assumed that traffic exiting the Conference Centre will be allowed to turn left onto Guild Street only.

Pedestrian, Cyclist and Vehicular Safety Impacts

The issue of traffic safety is also relevant to the EIS, and the implications of Luas operation on a shared road environment require to be addressed. Existing safety records have been presented earlier in this report, and highlight the key issues as:

Pedestrian safety along Mayor Street; and

General traffic and pedestrian safety along intersecting roads;

With the expected pace of development of the area over the coming years, one would expect a general increase in risk to users as a result of the increase in associated traffic and pedestrian activity. As such, a number of features have been incorporated into the scheme design to address existing and potential safety issues.

The key impacts on safety as a result of the safety features can be outlined as follows:

An area–wide improvement to provision for pedestrians. All proposed signal junctions on Mayor Street Upper and Lower would have pedestrian facilities, activated by push – button. This allows a continuous pedestrian route along Mayor Street from Connolly Station to The Point Square, with full provision of pedestrian crossings;

Dedicated Luas signals at all junctions where separate Luas and traffic lanes are provided. The Luas signal would be activated by approaching Luas vehicles and would stop all conflicting movements to facilitate Luas vehicles. This approach will minimise the safety risk through the junction arising out of lack of familiarity of drivers with Luas vehicles;

Provision of appropriate vehicle signage on side-road approaches to Mayor Street to warn drivers of Luas activity. This will improve overall awareness of drivers and will prove most beneficial during the initial years of the scheme;

General pedestrian and cyclist safety benefits as a result of the closure of road access onto Amiens Street, and the consequential reduction in traffic activity along Mayor Street. This will be particularly evident during the peak periods when heavy congestion occurs on Amiens Street leading to rat running.

The design therefore addresses the existing problems of pedestrian safety along Mayor Street with the provision of improved crossings. The proposals also remedy some of the traffic safety concerns on the intersecting routes, by better managing traffic through the junctions with Mayor Street.

For cyclists, the scheme will lead to a greatly improved environment as a result of the environmental improvements along Mayor Street. The risk of injury to cyclists is, however, relevant, and can occur as a result of bicycle wheels running into tramlines, or as a result of skidding on wet rails. The safety of cyclists in the vicinity of the tramway will therefore be reinforced through the provision of dedicated cycle lanes such as is proposed along Mayor Street Upper between Castleforbes Street

and new Wapping Street, and at other locations where space permits. Elsewhere, adequate width between the track rail and kerb will be provided to ensure sufficient space exists for cyclists without encroachment into the tracked area. At crossing points, appropriate signage and positive direction will be provided to cyclists to minimise the potential for oblique crossing of tracks. These and other proposals will be developed in conjunction with Dublin City Council, interest groups and local stakeholders during the detailed design of the scheme. Following construction, cyclist safety will continue to be dealt with through an awareness campaign, as is the normal approach in other countries.

Other Traffic and Transport Impacts

Mention has been made of traffic congestion that currently results from events at the Point. Line C1 will greatly improve accessibility to The Point by Public Transport, and will facilitate high quality access from all railway stations throughout the Greater Dublin Area and beyond via either Heuston or Connolly Stations. This will, in itself, introduce public transport as a realistic alternative to travel by car for events at The Point, and will allow a reassessment of parking management at the venue.

The reduction in car traffic that will result from the scheme will extend far beyond the immediate Study Area. The provision of end-to-end accessibility is an important feature in providing for public transport use, and will facilitate the long-term reduction in car use throughout the Greater Dublin Area. The wider impact of such a scheme can therefore be significant, in that as well as providing an attractive alternative to car travel, the corresponding reduction in car use will improve journey times for residual traffic on the road network.

Other Mitigation Measures

The assessment of impacts at junctions outlined potential for queuing and congestion at the junction of Custom House Quay and Commons Street. Although not on the alignment of the proposed scheme, congestion at this junction has the potential to impact on the road network and Luas operation within the study area. A scheme has therefore been considered which can improve the overall efficiency of the junction, achieved by a redesign of the traffic signals to provide a dedicated right turn lane into Commons Street. The proposed measures greatly improve the operation of the junction and mitigate queuing and delay which would otherwise be expected during peak periods.

It is also likely that a notable volume of pedestrian activity will result from the proposed environmental improvements along Custom House Quay and North Wall Quay, and as a result of the construction of the pedestrian bridge linking the South Quays. As a result, the redesign of the junction of Commons Street/North Wall Quay has included a facility for pedestrian crossings to cater for such demand.

7.6.3 Conclusions

General

In this section, the particular construction and operational impacts of the scheme on traffic and transportation have been outlined, along with a number of mitigation measures to overcome related issues.

Construction Impacts

While the construction of the Luas Line C1 can lead to notable traffic and environmental impact, it is noted that much of the alignment of Line C1 is through undeveloped areas with low traffic flows, particularly so for the section of Mayor Street east of Guild Street. As such, the local impact will be lower than that normally expected for an urban site and hence a shorter construction programme can be achieved.

For the section of Mayor Street Lower between Guild Street and Amiens Street, and for the works on Amiens Street, a carefully programmed traffic management scheme will be implemented in consultation with the Garda Siochána, the local

authority and local stakeholders. The Traffic Management Plan will be submitted by the contractors and will outline the key environmental and traffic management mitigation measures, including the maintenance of access to properties while facilitating a rapid construction programme.

Operational Impacts

The scheme notably affects traffic patterns through the study area, with the main effect being a reduction in traffic along Mayor Street Lower and Commons Street as a result of the closure at Harbourmaster Place. The discussion has outlined that the various junctions along the route will operate efficiently, and no significant congestion is to be expected. This was concluded following a detailed modelling of the operation of individual junctions using appropriate modelling software. The net impact of the scheme is a reduction in traffic activity within the study area, most noticeable in the area to the west of Spencer Dock.

The scheme greatly improves safety for vehicles, pedestrians and cyclists through the Study Area by providing an excellent network of pedestrian crossings, and managing vehicular conflicts through the area by means of proposed traffic signals along Mayor Street. Impacts on accessibility to The Point have also been noted, with a potential dramatic improvement to the current situation of car-dependency for access to this site.

The traffic and transportation impacts, which have been outlined, have therefore been fully addressed within the design of the scheme, and by the supporting mitigation measures as proposed.

Finally, additional measures have been proposed to improve the overall traffic and pedestrian environment based on the results of the Transport Assessment. The key proposal involves a reworking of the existing signalised junction at North Wall Quay/Commons Street to provide additional junction capacity, and to provide a pedestrian link through this junction to link with the South Quays via the new pedestrian bridge.

7.7 Public Transport

7.7.1 Impact of Proposed Scheme

As expected, the key public transport related impact of the proposed Line C1 would be a significant increase in the share of public transport through the study area. A number of key effects are expected:

Those who currently walk from residential areas through the North Docklands into the City Centre for work, or transfer to bus and rail services would switch to Luas for their connecting trip. With the introduction of integrated ticketing, it is likely that such activity would further increase as the attraction of multi-leg journeys improves;

Business-related trips throughout the day to the growing commercial district in the study area. Although such activity would be currently private car-based, a shift onto Luas from private car-based trips would be expected given the current and future restrictions on car parking throughout the city centre; and

The system will make best use of the 2-way carrying capacity with the development of a successfully mixed pattern of land use. The provision of mixed land uses ensures that the peak flow is well balanced in both directions along the line.

The preliminary transport modelling undertaken by the RPA has allowed expected patronage levels on the proposed extension to be established for 2016 with proposed traffic management measures in place, and expected levels of development throughout the study area. The results are outlined in *Table 7.7a* below.

Table 7.7a Luas hourly passenger flows, AM Peak 2016

Link	AM Peak (2-way)
Connolly – Georges Dock	3209
Georges Dock – Mayor Square	3139
Mayor Square – Spencer Dock	2400
Spencer Dock – The Point	604

The assessment demonstrates that for the AM Peak, considerable passenger flows are expected, at up to 3209 passengers/hour. At a tram frequency of 5 minutes in each direction, this leads to an average tram loading of 120 persons. This confirms that the catchment of the proposed scheme is significant, and reflective of the intensity of development proposed for the locality.

In addition, the expected loading of the system in 2016 ensures an element of spare capacity for the additional passenger trips which would result from the construction of the proposed Irish Rail Spencer Dock terminus, the Interconnector Tunnel linking Spencer Dock with Heuston Station, or any future Luas links from Spencer Dock to Barrow Street as outlined in '*A Platform for Change*'.

Looking at the broader picture, while the exact impact has not been determined, the provision of Line C1 would lead to network-wide increases in Public Transport patronage as end-to-end accessibility is improved. This is in line with local and national policy for provision of transport accessibility in urban areas, and will build on the corresponding effects of Luas Red and Green Lines, as well as Quality Bus Corridors and potential future metro links to form an overall integrated transport network for the Greater Dublin Area.

7.7.2 Consideration of Other Schemes

The proposed Luas Line C1 forms part of an overall strategy to improve access to the Docklands as part of the development of the area. The various other transport schemes proposed to support this are outlined in the Dublin City Development Plan and the DTO 'A Platform for Change', and in addition to the Luas Line C1 include:

- The Irish Rail terminus at Spencer Dock
- The Interconnector Tunnel from Spencer Dock to Heuston Station; and
- A Luas connection from Spencer Dock to Barrow Street and the South City.

The above schemes focus on Spencer Dock as an important transport node in the Docklands area. The proposed Line C1 will therefore provide an important feeder route between Spencer Dock and the City Centre, and hence sufficient spare capacity has been incorporated into the design proposals to facilitate future patronage which will arise out of the schemes outlined above. In addition, provision for a transport interchange at Spencer Dock has been made as part of the design proposals.

7.7.3 Conclusions

The proposed scheme has been shown to result in the generation of a significant additional number of public transport trips through the North Docklands area, as well as knock-on benefits throughout the entire network as a result of improved overall transport accessibility. Furthermore, the importance of the development of an appropriate mix of land uses along the proposed corridor has also shown to be crucial in achieving a balanced flow during the peak periods and hence maximum utilisation of the new infrastructure. The Line C1 scheme will provide the first passenger rail connection into the Docklands area and has been developed to successfully integrate with and compliment future railway schemes for the area, and the development of a transport interchange at Spencer Dock

7.8 Predicted Residual Impacts of Proposed Development

7.8.1 Overview

The EIS has identified all relevant impacts of the proposed scheme on the Study Area and beyond, outlined the extent of such impacts, and described the mitigation measures proposed to manage such impacts. Nevertheless, the scheme will lead to traffic impacts, both positive and negative, throughout and after the construction period. These impacts are summarised below:

7.8.2 Traffic Impacts

In essence, the main impact on local traffic will relate to those accessing Amiens Street from Mayor Street and Harbourmaster Place. At present, all traffic exiting onto Amiens Street from Mayor Street is required to cross the river at Matt Talbot Bridge due to the compulsory left turn at Amiens Street. With the proposed closure of the link onto Amiens Street from Mayor Street, the alternative route to Matt Talbot Bridge is to travel via Commons Street and Custom House Quay. This is a negative impact, although the level of impact is not deemed significant.

On Mayor Street, between Commons Street and Guild Street, a one-way eastbound is proposed, and will require some minor rerouting to access car parking along this section of Commons Street. Traffic will be required to access this section of Mayor Street Lower from Commons Street, is a relatively minor diversion. The measure removes traffic flow turning right from Guild Street onto Commons Street, of which a significant amount is rat-running traffic, and reassigns it onto other North South links including Commons Street, New Wapping Street and the new Link Roads. This impact is negative, although potentially insignificant due to the low length of the diversion.

A scheme has been considered for the junction of North Wall Quay/Commons Street to address pedestrian and traffic demands for the period to 2016. A redesign of the signals and incorporation of pedestrian facilities has been proposed to support the expected draw of pedestrian traffic from the North Quays, and address an unrelated traffic congestion issue. The operation of this junction will improve as a result of the proposed improvements, and will lead to a net increase in junction efficiency as compared to the do-minimum. The net impact at this location is therefore positive, despite an increase in traffic flow.

Finally, a net reduction in traffic activity through the study area is expected, which will lead to notable improvements in the operation of a number of junctions, with significant reductions in queuing and delay through Commons Street, Castleforbes Road and on Mayor Street to the west of Commons Street. This is a significant positive local impact, which will address a number of issues including traffic safety, delay and the general environment.

The net impact on traffic flow is therefore positive, with the negative impacts of closures and turn restrictions offset by the general reduction in traffic through the study area and the associated improvements to traffic management.

7.8.3 Pedestrian Impacts

The overall quality for pedestrians will improve significantly, with the provision of new pedestrian crossing facilities along the length of Mayor Street Upper and Lower, and from Commons Street onto North Wall Quay. The general environment will also improve as a result of the environmental improvements associated with the scheme. The net pedestrian impact will therefore be positive in the short and long term.

7.8.4 Safety Impacts

The proposals will notably improve safety throughout the area, through the provision of pedestrian crossings along Mayor Street, the signalisation of existing junctions, and the use of dedicated Luas traffic signals. This will manage all potential conflicts between pedestrians, vehicles and Luas vehicles along Mayor Street. Safety issues previously outlined on Commons Street, New Wapping Street

and Castleforbes Road will also be addressed with the introduction of traffic signals through the junctions of Mayor Street. The net impact on traffic safety will therefore be strongly positive.

7.8.5 Public Transport Impacts

The scheme will improve public transport patronage levels through the study area and, to a lesser extent, throughout the Greater Dublin Area. Given that the success of public transport is dependent on attracting adequate patronage, the expected passenger demand will serve to support the feasibility and success of the public transport system in general. The net impact is therefore positive.

7.8.6 Construction Impacts

The construction stage of the proposed scheme will lead to some level of disruption throughout the study area, most relevant to the west of Guild Street where the highest volumes of existing activity occur. A number of mitigating measures have been proposed to address the impacts of the construction stage, and which will minimise hindrance to general activity in the area, while allowing the construction period to be progressed as fast as is feasible. Appropriate safety measures will be put in place to mitigate any safety risk to the general public. A scheme of traffic management measures will be adopted to manage traffic impacts. The net impact of the construction stage is therefore of a short - term negative nature on traffic impact grounds.

7.9 Summary and Conclusions

7.9.1 Summary

This section of the EIS has been prepared to focus specifically on traffic and transportation issues associated with the proposed Luas Line C1 extension from Connolly Station to The Point on East Wall Road. The proposed alignment runs along Mayor Street Upper and Mayor Street Lower, connected at midpoint by a new Luas bridge across the existing railway yard (Spencer Dock Bridge). Luas Line C1 will support the proposed development along this corridor, providing fast and direct access to public transport nodes at Connolly Station, O'Connell Street and Heuston Station.

Following the undertaking of an Options Study for integrating Line C1 into the Connolly Station terminus, Option A was selected as the preferred approach to constructing Line C1 and together with the other options was taken through Public Consultation. Option A represents the most natural alignment for extending the Luas Red Line, and makes best use of existing platforms at Connolly Station.

A number of traffic management proposals are to be implemented as part of the proposed Luas Line C1, comprising mainly turning restrictions and some one-way operation as necessary to protect the Luas alignment. A number of new link roads are also proposed to connect Mayor Street with North Wall Quay and which will provide improved access to potential development lands within the study area. The development of such infill areas would further strengthen the position of the Luas and improve the finances of operation.

Mayor Street currently supports a considerable volume of pedestrian and cycling activity, in particular along Mayor Street Lower. The design caters for such activity and envisages an increase in pedestrian and cycling volumes both as a result of the Luas Line C1 scheme and of continuing development throughout the study area.

The impacts of construction activity have been examined as part of the traffic and transportation assessment. For the current scheme, it is likely that the main impact will arise out of the requirement to temporarily occupy roadspace for construction works, resulting in partial or full closure of particular roads. This may not necessarily be the case on Mayor Street however, where significant traffic congestion resulting from reductions in junction efficiency would not be expected, due to the low volumes of traffic that currently use Mayor Street. While traffic along much of Mayor Street will significantly increase as the intensity of development grows throughout the study area, this is not likely to become an issue before 2008, when the construction work is expected to be complete. The

details of traffic management during construction would be outlined in a Traffic Management Plan, to be submitted by the contractor as part of their contractual obligations, reviewed by the RPA and discussed in detail with An Garda Siochána, Dublin City Council and local representatives.

An assessment has also been undertaken to determine the impact of the scheme on queuing and delay during the operational stage. The assessment demonstrated a net improvement to traffic conditions through the study area as a result of the general decrease in traffic volumes, and consequential improvements to the operation of the junctions along Mayor Street.

The impacts on public transport will be significant and immediate, opening up access from the docklands area to the key transport interchanges along the North Quays, and at Heuston Station. With Line C1 in place, commuter travel by rail will be possible from areas as far as Kildare or Drogheda to The Point with good interchange at Heuston Station and/or Connolly Station. This improved accessibility would be expected to lead to network wide increases in public transport patronage as end-to-end accessibility improves. This would be further strengthened by the introduction of the Integrated Ticketing, also a short-term city objective, which would reduce the financial penalty of interchange trips that currently exists.

7.9.2 Conclusions

In addition, the traffic and transportation assessment has concluded that:

The North Docklands area is developing at a rapid pace, with development currently focused on the western end of the study area. The provision of Luas will facilitate an eastwards extension of this development, and is required to run through the core of the development (Mayor Street) to achieve the highest catchment population;

That the existing study area with the exception of the area in the vicinity of Harbourmaster Place supports very limited development, and hence limited local traffic movements. At present, key traffic demand is currently along the boundaries of the study area on the main routes to and from the City Centre, and the scheme has been designed bearing in mind the risk of reassignment of much of this traffic onto Mayor Street, should an additional east-west route be created. This has required the closure of Mayor Street at Harbourmaster Place, and provision of the Spencer Dock Bridge for Luas-only running and access;

A considerable increase in cycling and pedestrian activity would be expected to result through the area, both along the Luas Line C1 alignment as a result of the continued development along the Mayor Street corridor, and along perpendicular roads as a result of the new pedestrian bridge at Georges Dock. Provision for pedestrians and cyclists has therefore formed a key element of the design proposals, and will be further elaborated during the detailed design stage; and

That the scheme as proposed can be successfully accommodated within the existing road network. There are a number of positive impacts resulting from the scheme which centre around improvements to traffic conditions within the study area, improved transport accessibility, and improved road safety; particularly for pedestrians. The only significant negative impacts relate to increases in traffic flow on surrounding distributor roads (Amiens Street and Custom House Quay), and result from the removal of rat-running traffic from the study area. Such surrounding roads are, in any case, more suited to catering for such traffic movements, and the relocation of such traffic further improves road safety within the study area where the majority of pedestrian movements occur.

Chapter 8

8 ECOLOGICAL RESOURCES

8.1 Introduction

This section of the EIS assesses the impacts of Luas Line C1 on ecological resources along the route.

The scope of the study of potential impacts on ecological resources is defined as including the following key issues:

- biodiversity of flora including habitats and critical ecosystem functions that may be impacted by the project (e.g. drainage, changes in hydrology and potential pollutants);
- fauna: habitats, breeding/feeding/roosting information (as appropriate), resident or visiting mammals/birds/insects, including vulnerability to disturbance, and any existing management; and
- statutory designated areas within 500m of Luas Line C1.

Impacts upon water resources and water quality are not covered in this section, although it is acknowledged that they have a strong interaction with ecological impacts. These are dealt with in *Chapter 10, Water Resources.*

8.2 Methodology

8.2.1 Overview

In order to assess the impact of Luas Line C1 on ecological resources and develop appropriate mitigation measures, the following tasks were carried out:

- collection of data sources through desk top review, consultations and a site walkover;
- assessment of the significance of ecological impacts based on the assessment criteria described in *Section 8.2.4*;
- provision of mitigation measures in order to minimise any ecological impacts;
- identification of any residual impacts; and

provision of an appropriate management and monitoring regime.

8.2.2 Survey Methodology

Information on ecological resources was collected from a range of sources, with the level of detail being dependant upon the importance of the ecological resource and the extent of likely impact. Ecological data of relevance to the Line C1 alignment were collected in the following manner:

Desktop Study

The desk-based assessment focused on the proposed development site (and those areas directly or indirectly effected by the consequences or requirements of the development) and its broad ecological context.

Site Walkover

A Site Walkover was undertaken by the Study Team in mid-August 2003 to identify species and habitats that existed along the proposed Luas Line C1 route. Habitats were identified according to the Heritage Council's *Guide to Habitat Classification* (Heritage Council, 2000).

Consultations

Baseline data on designated areas and the presence of rare and sensitive species (flora, fauna and avifauna) were collected during consultations with various conservation agencies and groups, namely the National Parks and Wildlife Service (formerly Dúchas), the Bat Conservation Ireland (BCI) and Dublin City Council.

8.2.3 Principal Sources

The principal sources of information that were referred to during the desktop review are outlined below.

a review of the National Parks and Wildlife Service database in order to identify any statutory and non-statutory designated sites within 500m of the

proposed route; and

a review of existing published ecological information[1]

As indicated in *Section 8.2.2* above, additional information was gathered during consultations with various conservation agencies and groups.

8.2.4 Assessment Criteria

The significance of ecological impacts has been evaluated taking into account the following:

the vulnerability of the habitat or species to the change caused by the development;

its ability to recover; and

the rarity/value in nature conservation and ecological terms, of affected species, populations, communities, habitats and ecosystems.

High value receptors are habitats/species considered being vulnerable or rare, or having a low ability to recover; low value receptors are habitats/species that are considered to be common, less vulnerable and have a strong resilience to change.

Significance impacts are defined as high where large effects on receptors of high value are identified; low significance impacts are defined as smaller effects on receptors of low value.

8.2.5 Limitations

There has been no ranger from the National Parks and Wildlife Service (formerly Dúchas) operating in the Docklands area within the last 3 years. Consequently information provided by the National Parks and Wildlife Service was limited.

The area through which Luas Line C1 passes is under active redevelopment. As a consequence, the ecological resources are subject to significant alteration. The information presented in this section represents the ecological status of the study area in summer 2003

8.3 Description of Receiving Environment

The proposed route of Luas Line C1 traverses largely artificial urban habitats including built features, walls, pavement, waste ground and derelict sites and transport infrastructure such as roads. A bridge will be constructed at Spencer Dock to enable the trams to cross over the Royal Canal.

8.3.1Habitat Description

Habitats identified were primarily urban in nature. In line with the Heritage Council's Guide to Habitat Classification[2]; these may be broadly classified as:

- *BL3: Buildings and artificial surfaces; and*
- *ED 2: Spoil and bare ground*

A summary of the habitat classifications recorded along the route is provided in *Box 8.3a*.

Box 6.3a Summary of Urban Habitats

Buildings and Artificial Surfaces (BL3): This classification includes all buildings (domestic, agricultural, industrial and community) other then derelict stone buildings and ruins (BL1). It also includes areas of land that are covered with artificial surfaces of tarmac, cement, paving stones, bricks, blocks or Astroturf (e.g. roads, car parks, pavements, runways, yards, and some tracks, paths, driveways and sports grounds).

Spoil and bare ground (ED2): Includes heaps of spoil and rubble, and other areas of bare ground that are either transient in nature, or persist for longer periods of time because of ongoing disturbance or maintenance. Spoil is generally associated with the excavation or construction of roads and buildings, or with drainage and dredging activity. Once the disturbance ends spoil is readily colonised by plants.

[1] *C.Moriarty, Exploring Dublin Wildlife, Parks and Waterways, 1997 and S. Reynolds, Flora of County Dublin, 1998*

[2] *J. Fosset, 2000*

8.3.2 Flora

Vegetation is largely confined to the margins of a timber yard on Mayor Street Upper (at the junction of Castleforbes Road) and to the unused land within the CIE yard as the route approaches Spencer Dock. Flora in both areas is typical of derelict sites and includes thistles (*Cirsium spp*), nettles (*Urtricaceae*), Brambles *(Rubus fruticosus)* and the Butterfly bush (*Buddleia,)*.

In addition, a number of open amenity areas exist along the route. For example, a number of Oak trees (*Quercus spp*) have been planted at Custom House Square, whilst Field Maples (*Acer campestre*) have been planted at The Point. Immature lime trees (*Tilia spp*) are found along Mayor Street Lower in the IFSC region; these latter specimens are illustrated in *Figure 8.3a* below.

In addition there are narrow areas of landscaping around a number of the recent developments within the Georges Dock and Mayor Street area. For example species such as Privet (*Ligustrum vulgare*), Beech (*Fagus sylvatica)*, Fuschia (*Fuschia magellanica*) and a range of annuals (including *Allium spp*) have been planted around number 3 Georges Dock. These pockets and corridors of vegetation are likely to support a narrow range of typical invertebrate species.

Figure 8.3a Planted Lime Trees (Tilia spp) in IFSC area

A number of studies (including Reynolds, 1996) have noted that Dublin Port and Docklands have provided an entry point for many of Dublin's alien species. For example, the exotic Pineappleweed (*Matricaria discoidea*) was first recorded in the Docklands area in 1894. Although a number of non-indigenous floral species were identified (including, for example, *Buddleia*), these are common and widely distributed in Ireland and no unusual or rare alien/exotic species were identified during the site walkover.

8.3.3 Fauna

Due to the limitation of habitats along the route and the urban location of the proposed Luas Line C1, the sites support a species-poor fauna assemblage.

A desktop review, supplemented by consultation with the National Parks and Wildlife Service, has indicated that there have been no large mammal sightings at the site of the proposed development. Although spraints of the European Otter (*Lutra lutra*) have been recorded along inland sections of the Royal Canal, due to the industrial /urban location of the section of the Royal Canal within the footprint of the Luas Line C1 route, it is unlikely that this species is present in the vicinity of Luas Line C1.

A number of avifauna species typical of urban settings are present in the general area of the proposed extension. These include Starlings (*Strunus vulgaris*), Peregrine Falcons (*Falco peregrinus*), Gulls (*Larus sp*), Wood Pigeons (*Columba palumbus*), Pied Wagtails (*Motacilla alba*) and Moorhens (*Gallinula chloropus*).

Consultations with the National Parks and Wildlife Service indicated that Mute Swan (*Cygnus olor*), Mallard (*Anas platyrhynchos*) and Coot (*Fulica atra*) are also likely to occur within the vicinity of the route. In addition, a Kingfisher (*Alcedo atthis*) was

sighted above the creek at Spencer Dock on the Royal Canal in 1994[1] and Great Black-backed Gull (*Larus marinus*) has occasionally been sighted at Dublin Port.

The National Parks and Wildlife Service has also indicated that there is a possibility that bat species (in particular, Leisler's Bat (*Nyctalus leisleri)* and possibly Daubenton's Bat (*Myotis daubentonii*)) might be present in old, derelict buildings in the vicinity of the route. Whilst documented evidence for the presence of bats is lacking, a number of bat species are known to roost in derelict buildings in urban areas. The potential of these structures to provide habitats for bats (and other faunal species) is supported by the EIS of Development Proposals contained in the Planning Scheme for Docklands North Lotts, wherein it was noted that underused and derelict sites and structures act as "important sanctuaries for a variety of wildlife not usually found within cities"[2].

8.3.4 Designated Sites

Consultation with the National Parks and Wildlife Service revealed that there are no designated Special Areas of Conservation (SACs) or Special Protection Areas (SPAs) in the vicinity (within a 500m radius) of the proposed development.

However, the Royal Canal is a proposed Natural Heritage Area (Site code 2103) under the provisions of the Wildlife Amendment Act 2000. This designation ensures that the site is protected from damaging activities arising since the date of its proposed designation. In addition, the Flora Protection Order 1987 identifies the Royal Canal as having a variety of different habitats found within the canal boundaries including hedgerows, calcareous grasslands, reed fringe, open water, scrub and woodland. It should be noted, however, that the section of the canal to be affected by the proposed development is an industrial area and does not contain the habitats described in the Flora Protection Order.

8.4 Do Nothing Scenario

Under a do nothing scenario no significant impacts arise with respect to ecological resources.

8.5 Potential Impacts of the Proposed Development

8.5.1 Construction Impacts

Due to the lack of significant ecological resources in the vicinity of the proposed works, impacts from the construction phase on terrestrial ecological resources are expected to be minimal.

The Luas Line C1 construction phase has the potential to cause impacts on aquatic ecology at the Royal Canal near Spencer Dock during construction of the bridge and during widening works at Mayor Street Bridge. Impacts to flora and water quality may arise from run-off or spillages. The proposed bridge development also has the potential to affect breeding birds and aquatic fauna on the Royal Canal.

Although the potential exists for derelict buildings along the route alignment to contain bat roosts, it should be noted that the provisions contained in the development plans for the North Lotts Area provide for the demolition of these structures. Luas Line C1 will not materially affect the current planning intention with regard to these structures.

8.5.2 Operation Impacts

The operational phase of Luas Line C1 does not have the potential to cause any likely or significant adverse impacts on flora.

No significant impact on fauna is expected during the operation of Luas Line C1. Avifauna will be accustomed to the urban environment therefore likely impacts on birds during the operation of Luas Line C1 are not anticipated.

(1) *C. Moriarty, 1997*
(2) *DDDA, 2001*

8.6 Mitigation Measures

The following mitigation measures are required in order to protect the overall quality of ecological resources:

Best practice site management will be implemented throughout the construction of Luas Line C1 to reduce the risk of spillages into the Royal Canal. The RPA must also adhere to the objectives outlined in the Royal Canal Corridor Study 1995 and notify appropriate environmental bodies should a spillage occur.

The replacement of any trees or shrubs lost during construction.

8.7 Predicted Residual Impacts of the Proposed Development

There is a potential for residual impacts at the Royal Canal. However adherence to the mitigation measures outlined above should prohibit any adverse residual impacts to the flora/fauna of the Royal Canal.

8.8 Conclusions

No likely and significant adverse impacts are predicted on ecological resources once the mitigation and monitoring requirements outlined above are adhered to.

However, particular care is to be taken during construction works at the Royal Canal. Further details are provided in *Chapter 17 Environmental and Monitoring Programme*.

Chapter 9

9 GEOLOGY AND SOIL

9.1 Introduction

This chapter of the EIS describes the existing soils, subsoils and geology along the length Luas Line C1 from Connolly Station to The Point and the potential impacts during both the construction and operational phases.

9.2 Methodology

9.2.1 General Approach

The assessment has been prepared in accordance with good practice, as described in guidance produced by the Environmental Protection Agency [(1)]. Publicly available baseline data (geology and soils contained within the study area) was obtained during the route selection study when ERM completed a desktop assessment of the area.

The sources of data used in this assessment were as follows:

- subsoil and drift maps 6" sheets 18,19,22 & 23 for the Dublin area from the Quaternary Section of the Geological Survey of Ireland (GSI);
- 1:1000,000 series Bedrock Geological Map (Kildare - Wicklow), Sheet 16.
- IGSL Geotechnical Report (December 2002) prepared on behalf of South Midland Construction for the Luas Light Rail C-Line;
- EIS of Development Proposals contained in the Draft Planning Scheme for the Extended Custom House Docks; and
- data on contaminated land from Dublin Docklands Development Authority (DDDA) reports.

The baseline data allowed technical specialists to identify any areas of sensitivity that may exist along the route of Luas Line C1. Areas of sensitivity included the following:

- outcrops of bedrock;
- areas of Karst or other types of highly permeable geology; and
- soil potentially contaminated (physically or chemically) by historical or current activities.

The desktop assessment assisted in the scoping of issues that would require further examination during the EIA process. The principal issue that arose from this exercise was the potential for soil contamination to have occurred mainly as a result of historical activity (use of warehouses, Connolly Station and the former site of the North Wall Container Depot), which could be exposed, or disturbed during construction of the line or associated developments. This issue therefore, formed the focus of the assessment in the EIA.

9.2.2 Assessment Criteria

Construction works that disturb contaminated land, in the absence of mitigation measures, present a risk of remobilising contaminants and causing additional contamination through drainage (i.e. surface waters and groundwater) and to the air. In addition, exposure to contaminated material can potentially present a risk to human, animal and environmental receptors nearby.

In order to evaluate the significance of these potential impacts of the proposed development upon the receiving environment, relevant criteria were developed. These comprise:

nature and level of contamination;

land use and presence of susceptible targets;

mobility and solubility of the contaminants; and

level of exposure likely to result from development.

9.2.3 Limitations

The data presented and assessed in this chapter are based on a desktop review of available and other published data at the time of reporting. Although no specific site investigations were carried out as part of this assessment, ERM did undertake a review of available data from a slit trenching report commissioned as part of the geotechnical investigations for the scheme.

(1) *EPA, Guidelines on the Information to be contained in Environmental impact Statements, 2002*

Data relating to contaminated land is often confidential to the property owner and is not always available for review as part of a separate EIA process. Confidential data could not always be accessed as part of this desktop review and where it was possible to access data, precise details could not always be referenced.

Nevertheless, the data that was collected is regarded as being sufficient and accurate enough to be able to accurately predict the impacts of the proposed development on the environment.

9.3 Description of Receiving Environment

9.3.1 Geological and Soil Overview

Published geological data indicates that the entire study area is on land reclaimed in the eighteenth century from the inter-tidal estuary of the River Liffey. Available geotechnical intrusive information for the area indicates that the shallow geological sequence comprises made ground/fill deposits underlain by alluvial deposits including interbedded silts, sands and gravels. The alluvial deposits are in turn underlain by glacial deposits (upper till) with sands and gravels over a Calp Limestone bedrock of Chadian - Brigantian age.

Based on gathered historical information and given the age of the surrounding area and its industrial heritage, it is considered likely that the made ground/fill materials will comprise reworked alluvial 'gravelly' clay deposits with fragments of glass, clay, brick, plastics, metal, timber, ash and ceramics, amongst others. The fill materials are reported to be proven to a depth of 5 metres below ground level (mbgl). However, the thickness of the fill deposits may vary across the length of the route.

A summary, based on the IGSL geotechnical report, of the spatial variation in fill material along the length of the proposed route is provided in *Table 9.3a* below.

Table 9.3a Nature of Ground Encountered in Slit Trenches cut along the Route of Line C1

Location	Made Ground and Fill	Natural Subsoils	Slit trench data
La Touche House	Tarmac/slabs, 804 material (gravel).	Made ground consisting of dense brown sand and gravel with brick fragments.	ST13: plastic ST 14: No data
Georges Dock	Slabs and bedding concrete. 804 material.	Medium/dense clayey sandy fine –coarse angular gravel with occasional cobbles and roots.	ST 11: No data. ST 12: Concrete and red brick
Station in Georges Dock	Blacktop/slabs, 804 material.	Dense brown very sandy clayey gravel with cobbles.	ST 10: No data
Junction at Common's Street	Slabs and bedding concrete, 804 material.	Medium dense brown slightly clayey sandy fine to coarse gravel with some cobbles.and shells.	ST 6 and 7: Red brick tar ST 8: Plastic. ST 15: No data.
Approach to station at Custom House Square	Made ground consisting of pavement and fill material.	Medium dense grey brown, very sandy angular gravel with occasional cobbles and pockets of plastics brick ends and wood and light brown medium sand.	ST 16: concrete and red brick ST 17: pockets of light brown medium sand.

continued

Table 9.3a (continued)

Location	Made Ground and Fill	Natural Subsoils	Slit trench data
Custom House Square	Made ground consisting of concrete and fill material.	Dense black clayey sandy angular gravel with occasional cobbles.	St 18 No data/ ST 19: plastic
Commerzbank area at junction of Guild Street	Made ground consisting of concrete and fill material.	Dense black clayey slightly gravely medium sand with occasional cobbles.	ST 20 and 22: Shells. ST 21: No data.
Houses as Line C1 approaches CIE yard	Concrete.	Made ground with cobbles	ST 23: Not surveyed
Junction of New Wapping Street and Mayor Street Lower	Made ground consisting of concrete and fill material.	Brown/black speckled white sandy gravely clay with occasional cobbles.	ST 24 and 26: Concrete and red brick. ST 25: No data
Timber Yards Lower Mayor Street	Made ground consisting of concrete and fill material.	Sandy gravely clay with occasional cobbles.	ST 27: No data. ST 28: Red brick and shells.
Junction of Mayor Street and Castleforbes Rd	Made ground consisting of concrete and fill material.	Black/grey clayey slightly gravely medium sand with occasional cobbles.	ST 29: Concrete, Brick fragments. ST 30: No data. ST 31: Red brick. ST 32: No data.
Lower Mayor Street, towards Univar Ltd	Made ground consisting of concrete and fill.	Dense black very clayey slightly gravely medium sand with occasional cobbles	ST 33: No data. ST 34: Shells.

Note: the code 804 (used in the IGSL reports) is British Standard for a pebbly material.

9.3.2 Historical and Current Land Uses

Luas Line C1 will run through a classified 'brown-field' area of vacant land from Spencer Dock to East Wall Road. Within this route alignment several potential areas of environmental concern (PAECs) have been identified as a consequence of both current (builders yards, timber/oil storage yards, vacant brownfield sites, North Wall Container Depot and railway sidings) and historical activities.

9.3.3 Contaminated Sites

Access was granted by the Dublin Docklands Development Authority (DDDA) to documentation relating to site investigations within the Dublin Dockland Development Area. Three reports relating to the currently undeveloped area of the Spencer Docks were reviewed (URS 2003). This is the area within which Mayor Street Upper is to be re-instated. These reports cover the western half of the Spencer Dock area; there are no currently available reports for the eastern part of this area.

The physical stratification below the Spencer Dock Development site was reported to generally consist of 2-4m of made ground and fill materials, overlying 4-20m of naturally deposited glacial sediments, in turn overlying limestone bedrock generally occurring at depths greater than 20m below ground level. The reports indicate that where contamination occurs it is generally confined to the upper fill layers which overly the natural geological

deposits. The underlying natural soils are generally considered clean. The main type of contamination comes from polycyclic aromatic hydrocarbons (pahs), diesel range organic compounds (dro) and heavy metals (copper, lead, zinc and arsenic). The groundwater quality below the site investigated was found to be generally good. In some groundwater samples, cadmium levels were found to be slightly elevated but there was no organic contamination identified.

The site investigation reports state that up to 50% of the fill material falls above the EPA inert waste guidelines (reported in the URS site investigation Spencer Dock reports). However, contamination of a "hazardous" nature was only recorded in isolated "hotspots". There is some evidence to show that this contamination occurs at a deeper level towards the south of the site. The solubility of the hazardous contamination in the hotspots, and hence its ability to move within the soil profile was investigated and found to be low. The hazardous contamination in the hotspots is reported to consist of lead, benz(a)pyrene and benz(b)flouranthene. At least one of these isolated hot spots is close to Luas Line C1.

The remediation proposed in the reports for this site includes the excavation of up to 150,000 m^3 of soil and fill materials. Some of which will be reused on the site as part of the proposed development, and the remainder will be disposed of in accordance with the relevant waste management legislation.

A number of voids/chambers occurring 2-3m bgl were reported in the made ground in the general vicinity of Luas Line C1. Lubrication oil and hydrocarbon staining was recorded in some of the voids; others were noted as being partially filled with sands.

9.4 Do-Nothing Scenario

Under the do-nothing scenario, no significant implications are foreseen in relation to soils and geology unless future development in the area requires soil excavation or remediation. In the area currently occupied by Mayor Street Lower there is unlikely to be any excavation of soil due to the lack of opportunity to develop this area any further. However, the proposed developments at Spencer Dock and the eastern area of the North Lotts Planning Scheme are more likely to involve soil excavation. This soil would be treated appropriately and would lead to remediation of any contaminated areas. Therefore in this respect, regardless of the Luas Line C1 scheme, there is likely to be removal of contaminated fill material in the area around Spencer Dock and the North Wall Container Depot.

9.5 Potential Impacts of the Proposed Development

9.5.1 Construction Impacts

The potential impacts to the soils and geology during the construction phase are likely to be minimal. A substation will be located underground at Spencer Dock Stop; the overall space requirements for the substation are in the order of 450m^2. The construction of a new bridge over the Grand Canal at Spencer Dock and the widening of Mayor Street Bridge will have no permanent impact on soil. Potential impacts will arise from the removal and disposal of excavated spoil.

The potential negative impacts on the soil and geology during construction work will be from possible spills and waste from other construction-type activities. As no large quantities of potentially contaminating substances are anticipated during the construction phase, and with the application of best practice in site management, it is likely that no significant impacts will occur.

A number of hot spots of hazardous contamination have been identified in the Spencer Dock reports and based on historical landuse activities there is the potential for limited areas of soil contamination to be encountered. The contaminated areas identified in the Spencer Dock reports will be remediated by Spencer Dock Development Company prior to Luas Line C1 construction work and as such

are unlikely to impact on the construction phase of the Luas.

9.5.2 Operation Impacts

There are no potential impacts to the soils and geology during the operational phase of the development. There may be emissions of dust from the vehicle braking systems, but these will be in imperceptible quantities.

9.6 Mitigation Measures

In areas where existing soil contamination is possible due to historical land uses, but which has not yet been identified, contamination will be addressed if and when it is encountered. Construction workers will be obliged to adopt appropriate health and safety management procedures. The removal and disposal of excavated soil will be carried out in line with best practice procedures. Appropriate arrangements will be made in accordance with the Waste Management Act 1996 to 2005 for the disposal of any contaminated spoil material, which is excavated during the construction of the Luas Line C1, associated bridge at Spencer Dock and substation.

Standard guidance for construction work is provided in CIRIA's Environmental Handbook for building and Civil engineering projects, part 2: Construction [(1)].

The excavation of foundations of the bridge may require the disposal of a small amount of existing soils from the bed and banks of the Royal Canal. Testing of these soils will be undertaken during construction to determine the degree of contamination, if any, and the material will be disposed of in accordance with the Waste Management Act 1996.

Appropriate site investigation (intrusive or non-intrusive) will be carried out prior to the construction of the Luas to identify any potential voids directly below the proposed route.

9.7 Predicted Residual Impacts of The Proposed Development

With the application of the mitigation measures described above, no significant residual impacts will occur from the construction and operation of Luas Line C1.

9.8 Conclusion

The potential impacts to the soils and geology from the construction of Luas Line C1 are not significant. Such identified impacts will be adequately mitigated through contractual agreements and the application of best practice in site management.

(1) *CIRIA, 1998*

Chapter 10

10 WATER RESOURCES

10.1 Introduction

This chapter describes the existing water and drainage systems along the length Luas Line C1 from Connolly Station to The Point. It also describes the potential impacts of the scheme on water resources during both the construction and operational phases.

10.2 Methodology

10.2.1 Overview

ERM's approach to assessing the impacts of Luas Line C1 on surface and sub-surface water resources is in accordance with the Guidelines on Information to be contained in Environmental Impact Statements published by the Environmental Protection Agency.

Firstly, the collection of baseline data involved a comprehensive review of available data made known and available to the consultants. These data sources comprised:

- Ordnance Survey Discovery Series Map (Sheet 50, scale 1:50,000);
- Ordnance Survey Dublin City and District Street Guide; 3rd Edition (scale 1:15,000);
- Dublin City Council water services, drainage and utility maps (various);
- proposed RPA Luas Drainage Plans;
- River quality data held online by the Environmental Protection Agency (EPA);
- *Water Quality in Ireland 1998-2000*, (EPA 2000); and
- Site Investigation Report for the Spencer Dock Developments.

The review of baseline data took place during the environmental desktop review that was undertaken during the route selection process. This review allowed the key water resources to be identified for further investigation in the EIA process. The key issues comprised:

- potential contamination of groundwater;
- risk of flooding; and
- surface water drainage.

10.2.2 Assessment Criteria

In order to evaluate the significance of potential impacts of Luas Line C1 on surface water resources, assessment criteria were developed which describe the following:

- sensitivity of aquifer (if present);
- flood risk;
- land use; and
- sensitivity of surface water bodies.

10.2.3 Limitations

The findings presented in this chapter are based on a desktop review of available and published data at the time of reporting. The data that was collected are regarded as being sufficient and accurate enough to be able to accurately predict the impacts of the proposed development on the environment. There is no published EPA or local authority data for the Royal Canal in the vicinity of the Docklands and proposed route of the Luas Line C1.

There are no drainage details provided for the area around Spencer Dock and North Wall Quay.

10.3 Description of the Receiving Environment

10.3.1 Surface Water

The nearest surface watercourses to the Luas Line C1 alignment are:

- River Liffey located 180m to the south of the alignment;
- George's Dock, which is linked to Inner Dock to the north and the River Liffey to the south; and
- Spencer Dock, which links to the Royal Canal.

The route along Mayor Street (Upper and Lower) is parallel to the River Liffey. In the vicinity of the area through which Luas Line C1 will pass, the River Liffey is tidal and has a width of approximately

120m. At the western end of the line, the route crosses over a canal joining the Inner Dock to Georges Dock, which is in turn connected to the River Liffey. Georges Dock has recently been subject to redevelopment; the southern dock has been filled and the basin level has been raised. The Royal Canal enters the River Liffey from the north immediately to the east of Guild Street; this area is called Spencer Dock. Luas Line C1 will cross the Royal Canal approximately 200 metres upstream of the River Liffey.

In 2002, the Environmental Protection Agency published surface water quality data for the Liffey estuary ( ). Water quality in the bay remains high in terms of oxygen availability, organic matter, nutrient and chlorophyll levels. This reflects the moderate impact from the discharges of organic effluent at Ringsend Sewage Treatment Works.

Published information available from the EPA's online Water Quality Maps indicates that surface water quality in the area ranges between 'serious' and 'moderate' pollution levels. Limited information is available on the surface water quality of both Spencer Dock and George's Dock. It is likely that both docks are of poorer water quality than the River Liffey in this area, and may be susceptible to contamination from surface water runoff and groundwater ingress from the surrounding area.

10.3.2 Groundwater

Hydrogeological information is based upon available information that was gathered for the soils assessment. It is noted that at present no published Groundwater Protection Scheme for County Dublin has been produced by the Geological Survey of Ireland (GSI).

Groundwater quality was investigated as part of studies for proposed developments in the Spencer Dock area (between Guild Street and New Wapping Street) and was reported in the Site Investigation Reports for this proposed development [(1)]. The following data is derived from these reports:

The groundwater table -approximately 2-3 meters below ground level, fluctuates to some extent with tidal variations.

The water quality was also found to be generally 'good'. Cadmium levels were slightly elevated in some samples, but no organic contamination identified.

From the limited non-site specific geological information, groundwater vulnerability for the general area is classified as being 'high' as it overlies the limestone bedrock aquifer. The general area has therefore been assigned a tentative Resource Protection Code of Ll/H, which represents an area of local importance where the shallow groundwater unit is highly vulnerable to contamination.

It is reported that shallow groundwater is encountered at depths ranging between 2.5m bgl and 3.6m bgl. No specific information is available on the direction of groundwater flow, although it is anticipated that shallow groundwater is likely to flow towards the River and Dublin Bay to the south-south east. No information was available on depth to groundwater within the bedrock deposits.

10.3.3 Potable Water Supply

The potable water supply in the area of the proposed development is provided via a mains supply provided by Dublin City Council. This water originates from reservoirs in the Wicklow Mountains and is treated at the Ballymore Eustace, Roundwood and Bohernabreena Treatment Works. Treated water is stored at the Stillorgan Reservoirs prior to being piped to the user (Dublin City Council, 2003).

According to data from the GSI, there are no known private supply wells of potable water in the area.

10.3.4 Foul Drainage

The drainage details for the route are:

- a surface water sewer running along Harbourmaster Place, La Touche House, Mayor Street Lower, and then draining into the River

Liffey;
• a combined sewer runs along Sheriff Street, Mayor Street Lower, the intersection of Guild Street, Mayor Street Upper terminating before The Point, and
• a surface water sewer runs from Georges Dock along Mayor Street Lower.
Source: Dublin City Council.

All existing drainage patterns in the area under the North Lotts Planning Scheme (eastern section of the proposed route) follow the existing street pattern (i.e. in a grid structure). The main foul sewers run along the northern boundary of the streets and the water is distributed along the southern boundary.

10.3.5 Flood Risk Assessment Details
The highest water level ever recorded in this area of the city was in the IFSC area (east of Amiens St to Guild Street, and extending from Sherriff Street Lower to the Custom House Quays) on the 1st February 2003, when water levels reached 2.95m OD. The Draft Greater Dublin Water Supply Strategic Study expects levels to rise by 450mm in 2080 and by 1m in 2200 [2]. The minimum flood risk level is considered to be 3.9m OD for the IFSC area. The vertical alignment of Luas Line C1 has accommodated a 4m level around the Spencer Dock area and will descend to approximately 2.2m at the Mayor Street/Wapping Street Junction. Adequate provision is therefore provided for the Spencer Dock area in relation to the minimum flood risk level of 3.9m OD for the IFSC area.

10.4 Do-Nothing Scenario
Under the do-nothing scenario there will be no significant changes to water resources.

10.5 Potential Impacts of the Proposed Development

10.5.1 Construction Impacts
The principal potential impact that may arise due to the construction of Luas Line C1 will be a threat of contamination of the shallow groundwater due to spillages of hazardous liquids or discharges of potentially contaminating substances.

An additional, though minimal, potential impact would be from reduced runoff and increased filtration of rainfall as it falls on absorbent, open, excavated areas.

There is potential for impacts on water quality during the construction of the Bridge over the Royal Canal at Spencer Dock. A short-term reduction in water quality may occur due to a release of pollutants or canal bed disturbance.

10.5.2 Operation Impacts
There are no foreseen potentially significant impacts to water resources during the operational phase of the development. There may be a minor increase in surface water run-off due to the increase in impermeable surface area in the area of the North Wall Container Depot, to the east of Spencer Dock in the currently undeveloped area.

10.6 Mitigation Measures
Adequate protection will be provided for stormwater runoff and sewer openings and containment measures and procedures will be put in place during construction work where potentially contaminating substances are being used or handled or where silt from open cuttings may enter the local drainage systems.

Particular care and protection of the canal is recommended during the construction of the Bridge over the Royal Canal at Spencer Dock.

No mitigation measures are required during the operational phase of the Luas scheme.

10.7 Predicted Residual Impacts of the Proposed Development
With the effective implementation of the mitigation measures described above, no significant residual impacts will occur from the construction and operation of Luas Line C1.

10.8 Conclusions

The potential impacts to water resources from the construction and operation of Luas Line C1 are expected to be minimal and temporary, and those highlighted here will be adequately mitigated through legal requirements and implementation of best practice in site management.

The effects will be minimised by the shallow depth of excavation and the relatively small amount of additional hardstanding area that will be created.

The area will be subject to other impacts on water resources as a result of parallel developments at Spencer Dock and in the rest of the North Lotts Planning Scheme. However, these impacts will be mitigated by the measures proposed for those respective schemes.

Chapter 11

11 NOISE AND VIBRATION

11.1 Introduction

This section discusses the potential airborne noise and vibration impacts that might arise from the construction and operation of Luas Line C1.

11.2 Noise Methodology

11.2.1 Noise Assessment Criteria

Construction

The noise criteria specified in the draft National Roads Authority noise guidance have been adopted for this assessment in the absence of an accepted national guidance on construction noise. Noise generated by the construction phase will be of a temporary nature and is expected to be intermittent, depending on the nature of the construction activity.

Table 11.1 provides noise criteria for construction noise levels.

Table 11.1 Construction Noise Assessment Criteria – 1 Hour L_{Aeq}, 0700 – 1900 hrs

Noise Level	Rating
Less than or equal to 70 dB(A)	Negligible
Greater than 70 dBA	Significant

Operation

Noise from a development is often assessed in using noise thresholds/standards. By comparing the levels of noise that are expected to be generated against an absolute noise standard, such as those that indicate likely annoyance or disturbance with an activity (a passing tram for example).

The assessment standards (shown in *Table 11.2*) are based on the guidance offered in the UK's Planning Policy Guidance (PPG) 24 and the statutory provisions of the Noise Insulation (Railways and other Guided Transport Systems) Regulations 1996. The following standards for absolute (free-field) noise levels can be drawn from them. As these are UK guidance only, they are not legal constraints in the Irish context and hence may be considered as a general guide only.

Table 11.2 Noise assessment criteria (L_{Aeq})

	Day (0700 – 2300)	Night (2300 – 0700)
No impact	< 55 dB	< 45 dB
Above threshold of impact	55 – 66 dB	45 – 61 dB
Unacceptable impact	> 66 dB	> 61 dB

It should be noted that the threshold levels are not specifically relevant to new rail development and there are no statutory/legal requirements to achieve them. However, the criteria do provide an acceptable assessment methodology to assess the potential impact arising from a rail development.

Noise from the development will thus fall into one of three categories as follows.

1. Tram noise below threshold criteria (below 55 dB [day]/ 45 dB [night]) – *no impact*.

2. Tram noise between threshold and unacceptable criteria (between 55 and 66 dB [day]/ between 45 – 61 dB [night]) – *impacts dependant upon actual change in noise level*.

3. Tram noise above unacceptable criteria (above 66 dB [day]/ 61 dB [night]) – *unacceptable noise impact*.

Regarding the second category, a further sub-division of the assessment criteria is required. This is because there is potentially a large range of noise levels covered under the second category.

To further sub-divide the assessment criteria for these noise levels, significance rating criteria given in the *Institute of Acoustics and the Institute of Environmental Assessment and Management's*

draft guidance on the Assessment of Environmental Noise [1] is used. This criterion is based on the absolute increase in noise level over the baseline noise level, as noted in *Table 11.3*.

Table 11.3 IoA/IEMA draft noise assessment criteria

Change from *baseline* level	Assessment
< 1 dB	No impact
1 to 3 dB	Slight impact
3 to 5 dB	Moderate impact
5 to 10 dB	Substantial impact
>10 dB	Severe impact

This additional assessment criteria is only applied (in the case of this project) when assessing noise levels which are between the minimum noise impact threshold (55 dB for the day and 45 dB for the night) and the unacceptable noise threshold (66 dB for the day and 61 dB for the night).

The additional criteria are not applied below the minimum noise impact threshold as below this no impact will be noticed (especially in a city centre location, as is the case of Luas Line C1).

They are not applied above the unacceptable noise threshold as any noise above this level is generally considered as unacceptable (hence there is no need for further division of this impact classification). Instead a 1 dB increase in the baseline noise levels is the key criteria and will trigger the need to consider mitigation. Thus, in this case, the resulting noise level will be classified as unacceptable if it is: a) greater than 66 dB (day) and b) results in more than a 1dB increase over the baseline noise level.

If the noise level is greater than 66dB (day), but there is a less than 1 dB increase over the baseline level (i.e. the baseline noise environment is high), then the impact is not classed as unacceptable, as the noise from the tram will not increase the baseline noise levels significantly.

Maximum pass-by noise levels (L_{Amax}, the instantaneous 'peak' as the tram passes) are assessed against the PPG24 82 dB free-field noise standard for sleep disturbance.

11.2.2 Prediction Methodology

Construction

The predictions of construction noise have been carried out using the methodology stipulated in BS 5228. The predictions have been based on noise from a range of assumed activities; the assumptions have been derived from the RPA study team's experience of typical construction activities.

Operation

The established methodology for predicting noise from railways is the Calculation of Railway Noise (CRN) [2], produced by the UK Department of Transport in 1995. CRN is an empirical method developed for wider application to railways in the UK, and it advocates the use of noise measurements wherever possible.

The noise predictions have been carried out using a spreadsheet noise model implementing calculation routines based on the CRN procedure. The source noise levels were based on measurements taken on equivalent reference light railways, including the UK Croydon Light Rail system. In addition, measurements of the Luas trams that are now running on the system have been made in 2004 [3] and they confirmed that the noise levels predicted in the Luas Red Line EIA using the CRN prediction method and based on data that was similar to that gained for the Croydon system showed reasonable agreement with the measured noise levels.

[1] *Institute of Environmental management and Assessment and Institute of Acoustics (April 2002) Guidelines for Noise Impact Assessment, consutation draft.*

[2] *UK Department of Transport (1995) Calculation of Railway Noise (CRN), DoT, 1995*

[3] *Noise Levels Due to Tram Passbys at EIS Locations Line A and Noise Levels Due to tram Passbys at EIS Locations Line C, Eanna O'Kelly & Associates, 2004*

Positional information relating to receiver buildings, reflective structures, terrain and the rail tracks were extracted from 1:1000 Ordnance Survey mapping, engineering drawings and site inspections.

The frequency of the proposed service is another important factor in determining noise levels. For the purposes of this assessment, the following future tram service has been assumed from the period Monday to Friday in order to determine worst-case scenario:

- Service starts 0530 hours;
- Service finishes 0030 hours;
- Trams every 5 minutes in each direction between 0700 -10.00 and 1600 -1900);
- Trams every 10 minutes in each direction in each direction between 0530 and 0700;
- Trams every 7.5 minutes in each direction 1000 - 1600 and 1900 - 2230; and
- Trams every 15 minutes in each direction 2230 - 0030.

Thus the figures for the day and night are shown below in *Table 11.4.*

Table 11.4 Number of Tram Movements

	Day (0700 to 2300)	Night (2300 to 0700)	Day (0530 to 0000)	Night (000 to 0530)
Single Track	150	18	160	8
Double Track	300	36	320	16

Limitations

It is acknowledged that certain information, such as the types of construction equipment is not available at this stage in the development process. However, wherever possible, data that will allow the most significant environmental impacts to be identified have been used.

11.2.3 Baseline Noise Survey

One consideration in assessing the noise impact of the scheme is the change in baseline noise levels. Accordingly, baseline noise surveys have been carried out close to potentially affected noise sensitive receptors to determine the existing noise levels.

Twelve noise level measurements were made at six different representative locations along the route. The same locations were chosen for day-time and night-time recordings. These representative noise sensitive receptors are illustrated in *Figure 11.1a*. (page 111) These noise sensitive receptors have been identified on the basis of mapping and site visits.

Noise Sensitive Receptors

There are two areas along the route of Luas Line C1:

Area 1 which consists of landuse along Upper Mayor Street close to The Point - mostly industrial and timber warehouses, with pockets of residential houses; and in contrast

Area 2 nearer to Connolly Station and along Harbourmaster Place, Sheriff Street Lower and Commons Street (more commonly referred to the IFSC area) - land use largely comprises of apartments, offices, retail and financial services.

Representative noise sensitive receptors that may potentially be subject to noise impacts as a result of the operation of the scheme are shown in *Table 11.5*. These have been identified on the basis of mapping, aerial photographs and site visits.

Table 11.5 Noise Sensitive Receptors

Location	Approx. horizontal distance to works (m)	Approx no of properties within 25m	Nearest Building Usage(s)
Area 1: Industrial Zone with Planned Mixed Use Development			
N1 – Houses next to Unilever	7	6	Residential
N2 – No.1 Upper Mayor Street	7	8	Residential
Area 2: Zone under Development			
Area includes new Spencer Dock offices to the North of and facing Mayor Street. Residential apartments are located to the north of these offices and may not have a clear view of the Luas Line depending on building heights. The Spencer Dock development will have been given planning permission assuming Luas Line C1 would run along Mayor Street. Therefore, it has been assumed that planning controls will have been used to ensure that building layout and glazing systems will have been designed so that internal noise levels will be appropriate with Luas Line C1 in place and these receptors have not been considered further in this assessment.			
Area 2: IFSC (Financial Centre)			
N3 – National College of Ireland	7	3	Educational
N4 – Apartments (Custom House Square)	40	4	Apartments
N5 – Harbour Master Bar	12	2	Restaurant / Bar
N6 – Offices/Retail/Apartments	7	2	Offices

Other potential noise sensitive buildings include a hotel (The Clarion) but this is located further from the route than the National College of Ireland and no noise impact is expected at this location.

Night-time weather conditions were dry and cold with a light breeze and stronger occasional gusts. The conditions were locally sheltered at measurement locations. The measured noise levels are considered valid as they exceeded readings due to wind gusts by at least 10 dB(A). Daytime weather conditions were calm, dry and hot.

11.3 Baseline Noise Environment

Table 11.6 Summary of Baseline Noise Levels (Free-field dB)

Measurement Location	L_{Aeq} Daytime (0700-2300)	L_{Aeq} Night-time (0600-0700 & 2300 to midnight) [1]
N1 – Houses next to Unilever	66.4 [2]	46.2 [2]
N2 – 1 Upper Mayor Street	70.4	61.2
N3 – National College of Ireland	68.1 [2]	58.8
N4 – Apartments and Open amenity area	61.0 [2]	55.6
N5 – Harbourmasters Bar	66.6 [2]	56.6
N6 – Offices/Retail/Apartments	65.3	57.9

Note 1) Night-time noise levels based on measurements between 2300 and 0030 hours.
Note 2) Affected by construction noise.

Although these baseline data are considered adequate for the EIS, at the detailed design stage, further surveys will be undertaken to support the design process.

Ambient noise conditions along the route are discussed below:

Noise levels in area 2 at locations N1 and N2 were generally dominated by industrial noise. Noise from construction works affected N1 and noise from buses that were turning and parking was also noted. Road traffic noise from Wapping Road and on North Wall Road was noted during the day and the night at N2. The railway adjacent to N2 also gave rise to a noticeable squealing noise.

At N3 to N5 the daytime noise levels were affected by traffic noise and noise from construction activities. The daytime noise levels were therefore not representative of baseline noise conditions. During the night the noise from construction had finished and the traffic noise and local noise sources, such as music and ventilation fans, were audible. These sources were typical of the baseline environment in the area.

At location N6 traffic dominated the baseline noise levels during the day and the night.

11.4 Do Nothing Scenario

If the proposal does not proceed it is likely that noise impacts from vehicle traffic would increase due to the on-going development of the area. Thus the future baseline noise environment is likely to increase.

11.5 Potential Impacts of the Proposed Development

11.5.1 Construction Impacts

The likely impacts from the construction phase of the Luas Line C1 are expected to be higher than the operational phase. However, they are likely to be limited to a total period of 20 months, and this period covers construction along the approximately 1,500 m construction route. In reality, construction will only be concentrated on a specific point along the route for a much shorter period of time.

It is anticipated that construction will be undertaken within normal working hours: 0800 to 1800 Monday to Friday and 0900 to 1600 on Saturdays.

However, it is likely that some work on specific junctions and in the IFSC will also take place on Saturday and Sunday outside of these normal construction hours. Such working hours and traffic management arrangements will be agreed with the local authority where required. The planning of such works will also take consideration of the residents. Night work, if required, would normally cease at 2300 hours unless the area is non-residential.

The principal work site and laying out area is likely to be restricted to The Point area, which is less sensitive to noise than the IFSC area, where there are apartment blocks, open amenity areas and the National College of Ireland.

The predicted construction noise levels for the construction phase of Luas Line C1 are shown in *Table 11.7.*

The upper range of noise predictions presented here are based on enabling works (ground breaking etc.) while the lower range of values represent stop construction and track laying. Noise from sheet piling and bridge construction activities has been assessed separately, as this is an activity to take place at a specific location (see below) rather than along the whole alignment.

The distances used in the predictions are 10m from the location of construction works for N1, N2, N3, and N6, 40m from N4, and 12m from N5. It is expected that the construction programme will be approximately 20 months in duration. Yet, this covers the whole Luas Line C1 route; in reality, construction will only be outside a specific location for a much shorter period of time, ensuring that all construction-related noise impacts are of a temporary nature.

For noise due to ground breaking, the results are significant, but it must be noted that such works will be very limited in duration, in comparison to the rest of the construction activities.

Noise impacts from other construction activities (stop construction and track laying for example) will be lower, as indicated by the lower set of values in *table 11.7*. Although the significance threshold is exceeded (apart from receptor N4 where the threshold is not exceeded and thus insignificant), the predicted noise levels are closer to the 70dB threshold.

Sheet Piling and Bridge Works

For this assessment, a typical location for sheet piling, bored piling and bridge works was assumed – across Spencer Dock. Modelling indicates that noise levels of up to 80 dB may arise at the closest of the six receptors in table 11.6 (N3: the National College of Ireland), during driven sheet piling. This falls to 75 dB for new apartments (the Locks, receptor N4) in the Spencer Dock development and is expected to be below 70 dB threshold for other receptors. This is a significant impact, if one that is

Table 11.7 Predicted Day-time Construction Noise Levels - dB 1 hour L_{Aeq}, 0700 – 1900 hrs (Façade)

Location	Predicted Noise Level dB(A)	Impact Assessment Criterion (Day-time)	Significance of Impact
N1 – Houses next to Unilever	78 – 88	70	Significant
N2 – 1 Upper Mayor Street	78 – 88	70	Significant
N3 – National College of Ireland	78 – 88	70	Significant
N4 – Apartments and Open amenity area	66 - 76	70	Significant
N5 – Harbourmasters Bar	76 – 86	70	Significant
N6 – Offices or Retail/Apartments	78 – 88	70	Significant

also temporary and limited in duration.

Predicted noise levels during bridge works and bored piling are not above the criterion of 70 dB and significant noise impacts are not predicted during these phases.

11.5.2 Operational Impacts

Tram Noise

Table 11.8 summarises the predictions of noise from the operation of trams along the alignment. The first column of noise levels gives the predicted daytime noise level. The second column gives the increase in baseline noise caused by the operation of Luas Line C1.

The results show that there is predicted to be adverse impacts of slight significance for all receptors along the Luas Line C1 route, apart for receptor N1 at night, where a severe impact is predicted.

Potential Impacts due to Changes in Road Traffic

Traffic data for the scheme is derived from modelling of traffic conditions around Mayor Street Upper, Mayor Street Lower, Commons Street and Harbourmaster Place, as well as access roads and junctions that are affected by the proposed scheme.

The effect of noise from road traffic within the Spencer Dock development has not been quantified since new developments adjacent to this road will have been designed with the noise from the road traffic taken into account. The key noise sensitive receptors that have been considered in this study are along Mayor Street Upper and Mayor Street Lower. A conservative assumption has been made that noise sensitive buildings may be located close to all existing roads.

Changes in traffic noise of less than 3 dB(A) are generally assumed to be insignificant since changes of around 3 dB(A) are generally the smallest noise changes that might be noticeable under normal conditions. It would be necessary to double or halve the flow along a road to experience noise changes of this order (*Guidelines for the Treatment of Noise and Vibration in National Road Schemes, NRA, 2004*).

In 2008 changes in the AADT (Annual Average Daily Traffic) flows from the Luas Line C1 in the area close to the new infrastructure are predicted along Mayor Street from minus 32% to plus 70%. Traffic flow increases on all links are less than 100% of the total flow which are unlikely to result in significant noise changes. The only link where flows change by more than 100% in the Northern Section of New Wapping Street where flow changes are 147%. This is approximately a 4dB increase which may be noticeable but is not expected to result in a major noise impact.

In 2008, the operational Luas Line C1 results in some changes in vehicular traffic throughout the rest of the study area. Where there are increases in flow, these are less than 25% of the total flow which is unlikely to result in significant noise changes.

In 2016 reductions in the AADT flows from the Luas Line C1 in the area close to the new infrastructure are predicted along Mayor Street, ranging from 11% to 68% which equate to an insignificant reduction in noise levels. The scheme appears to generally reduce vehicular traffic activity throughout the rest of the study area, and where there are increases in flow these are less than 25% of the total flow which are unlikely to result in significant noise changes.

The baseline noise levels outlined in *Table 11.6 A1.1a* in Annex A are likely to increase because of natural increases in traffic flow. As a result it is expected that the noise from Luas Line C1 will result in smaller changes in baseline noise and its effect will therefore be reduced.

Table 11.8 Assessment of Operational Noise Impacts

Receptor	Day (0700 to 2300 hours)				Night (2300 to 0700 hours)			
	Predicted noise level	**Baseline noise levels**	**Increase in baseline L_{Aeq}**	**Significance of impact**	**Predicted noise level**	**Baseline noise levels**	**Increase in baseline L_{Aeq}**	**Significance of impact**
N1 – Houses next to Unilever	64	66.4	2	Slight impact	57	46.2	11	Severe impact
N2 – 1 Upper Mayor Street	64	70.4	1	Slight impact	57	61.2	1	Slight impact
N3 – National College of Ireland	64	68.1	1	Slight impact	57	58.8	2	Slight impact
N4 – Apartments and Open amenity area	54	61.0	1	Slight impact	48	55.6	1	Slight impact
N5 – Harbourmasters Bar	63	66.6	2	Slight impact	57	56.6	3	Slight impact
N6 – Offices/Retail/Apartments	61	65.3	1	Slight impact	55	57.9	2	Slight impact

Note that the *Threshold* values described in Table 11.2 are exceeded in all cases above, but noise levels are below the Unacceptable Criteria.

11.5.3 Mitigation Measures

There are a variety of mitigation measures, which may be used to reduce the exposure to noise nuisance and vibration. Noise can be attenuated (reduced) by screening the source or receptor, by increasing the distance between source and receptor or by changing the operational nature of the source. The following mitigation measures will be implemented:

Construction Noise

all construction equipment will be required to meet the EC Directive on noise emission from construction plant and equipment (including compressors, welding generators, hand held concrete breakers and picks, excavators, dozers, loaders and excavator loaders);

Dublin City Council and any other relevant authorities will be consulted on aspects of the construction programme;

the appointed contractor will agree working hours with the local authority in advance of the works;

equipment will be located as far from noise sensitive receptors as possible during the construction phase.

Operation Noise

the existing trams have been required to incorporate noise control measures in the design to comply with noise performance specifications and track and tram wheels will be maintained in good order;

to reduce the risk of additional noise when light rail vehicles are moving around tight curves, anti wear and anti squeal measures will be applied to the rails;

as far as is practicable, operation activities will be kept to hours which will minimise the potential for noise impact, e.g. keep night-time maintenance noise to a minimum in residential areas; and

careful design of the tram stops and their audible announcement systems. The detailed design stage will minimise noise impacts from PA speakers.

11.5.4 Residual Impacts

Construction phase

Daytime enabling works for track work phase will result in temporary noise impacts when the works are at the closest point to receptors. Such construction activities (e.g. ground breaking) are likely to be limited and focused in duration.

The impacts are also likely to be significant during the track laying and stop construction phase at locations N1, N2, N3, N5 & N6 and the closest new buildings in Spencer Dock, although the predicted noise levels are closer to the 70 dB threshold in comparison to other construction activities.

Construction is anticipated to last for a period of 20 months, although the periods for which noise impacts will result on a receptor-by-receptor basis are expected to be much less than this, in the order of days and weeks.

A typical location for sheet piling and bridge piling was assumed – across Spencer Dock. Modelling indicates that noise levels of up to 80 dB may arise at the closest receptors (the National College of Ireland, new Spencer Dock Offices facing Mayor Street and the proposed National Conference Centre). This falls to 75 dB for new apartments (the Locks) in the Spencer Dock development and is expected to be below 70 dB threshold for other receptors. This is a significant impact, although it is also temporary and limited in duration.

Operational phase

In assessing the predicted noise levels in relation to the criteria set out in the PPG 24 UK planning policy guidance threshold levels are exceeded, but no unacceptable levels are exceeded, during either daytime or night-time periods at any noise sensitive receptor.

Potentially slight adverse noise impacts have been predicted for the six noise sensitive receptors in both area 1 and area 2 during both day and night.

The impact is slight due to the generally high baseline noise levels. In all daytime cases, the predicted noise levels are less than the current baseline noise levels recorded. The baseline noise levels will be rechecked during detailed design.

The noise from the tram will result in a severe adverse noise impact in night-time noise impacts at receptor N1 (houses next to Unilever) where the noise increase is expected to be approximately 11 dB compared to the current baseline noise. However, the noise level is expected to be 6 dB below the criterion for an unacceptable impact, which is 61 dB.

During night-time periods, the predicted L_{Amax} noise levels at residential properties represented by N1 and N2 range from 78dB to 81dB and are just below the assessment criterion for sleep disturbance of L_{Amax} 82dB.

Noise insulation mitigation measures will be considered by the RPA on a case-by-case basis for each of these properties, although there is no statutory/legal requirement to provide them.

11.6 Vibration Impacts

11.6.1 Introduction

This section describes the potential effects of ground vibration from the Line C1 extension.

11.6.2 Vibration Methodology

Ground Vibration Assessment Methodology

Vibration Dose Value (VDV) is a measure of the accumulated level of ground vibration over a period and, through the application of BS 6472 [(1)], is the standard measurement system for predicting the likelihood of adverse comments from effected building occupants. The standard gives the following VDV levels at or below which the probability of adverse comments is low:

Day (0700-2300 hours) 0.4 $m/s^{1.75}$; and
Night (2300-0700 hours) 0.1 $m/s^{1.75}$.

Vibration Prediction Methodology

Construction

Vibration levels due to construction works have been predicted at receptors along the proposed alignment, based on measurements of typical construction plant.

Operation

Estimates of levels of ground vibration from the operation of Luas Line C1 have been made based on levels measured adjacent to comparable tram systems.

11.6.3 Limitations

It is acknowledged that certain information, such as the types of construction equipment is not available at this stage in the development process. However, wherever possible, data that will allow the most significant environmental impacts to be identified have been used.

11.6.4 Do Nothing Scenario

Under a do nothing scenario, no significant implications are foreseen in relation to vibration.

11.6.5 Construction Vibration Impacts

Vibration levels due to construction works have been predicted at receptors along the proposed alignment. The final choice of construction method will be determined by the contractor and the work process will be designed to minimise the

(1) *British Standard BS 6472 (1984) Guide to the evaluation of human exposure to vibration in buildings (1 Hz to 80Hz).*

effects of vibration on surrounding structures.

Ground vibration is likely to be perceptible at all receptors during the construction of Luas Line C1 at times. However, VDV levels of ground vibration are not expected to exceed the 0.4 $m/s^{1.75}$ daytime assessment criterion due to the temporary nature and short duration of the construction activity. As a result, vibration from construction work is not expected to give rise to adverse comment and impacts are not expected to occur.

Vibration from construction activity is extremely unlikely to cause any structural damage to properties along the proposed alignment. However, vibration monitoring should be considered at any listed buildings within 4m of the compaction work phase, in order to ensure compliance. This may occur along Mayor Street near N4 where there is a listed building.

11.6.6 Operational Vibration Impacts

Estimates of levels of ground vibration have been made based on levels measured adjacent to comparable systems, including a detailed investigation into vibration levels from Phase 1 of the Manchester Metro in 1996. This data set is robust and has been widely used on other planning applications and noise assessments.

The results are summarised below in *Table 11.9.*

Table 11.9 Measured Vibration Levels from the Manchester Metrolink – Street Running Sections at Full Speed

Distance to nearest rail (m)	Peak particle velocity (mm/s)	Weighted acceleration (m/s^2)	Estimated VDV_{day} ($m/s^{1.75}$)(1)
1 to 3	1.5 to < 2.0	0.06 to < 0.1	0.5 to < 1.0
3 to 5	1.0 to 1.2	0.03 to 0.06	0.2 to 0.5
5 to 10	0.6 to 1.0	0.01 to 0.03	0.08 to 0.2
10 to 15	0.3 to 0.6	0.005 to 0.01	0.03 to 0.08
15 to 20	0.15 to 0.3	0.003 to 0.005	0.015 to 0.03

(1) Vibration Dose Value

The levels tabulated above are considered to provide a reasonable estimate of the ground vibration levels that can be expected provided that the detailed design stage considers local conditions and uses a high-quality rail design where it is shown to be required.

Ground vibration will be perceptible at receptors within approximately 20 m of the alignment (depending on final design details). However, the estimated VDV levels of ground vibration are not expected to exceed the 0.4 $m/s^{1.75}$ daytime assessment criterion beyond approximately 4 m from the tracks. Existing receptors are further from the tracks than this. Hence, whilst vibration may be perceptible in some areas, due to its transient nature and low levels it is not expected to give rise to adverse comment and impacts are not expected to occur.

The expected levels of ground vibration are below criteria which relate to the structural integrity of buildings. Consequently, no impacts on vibration sensitive buildings located adjacent to the scheme are expected to occur.

11.6.7 Mitigation Measures

Although there no statutory requirements to provide mitigation measures for vibration, there are a variety of mitigation measures, which may be used

to further reduce the exposure to vibration. Vibration can be attenuated (reduced) by screening the source or receptor, by increasing the distance between source and receptor or by changing the operational nature of the source. The following mitigation measures are recommended:

Construction Vibration

Control duration of working hours; and

the appointed contractor will undertake all reasonable efforts during construction to minimise ground vibration with the intention that vibration levels do not exceed 5mm/sec peak particulate velocity, when measured near the foundation of house and apartments, and 3mm/sec peak particulate velocity when measured at listed buildings and other sensitive buildings.

Operational Vibration

To reduce groundborne vibration the need for resilient trackform (typically continuously welded rails mounted in lined rail trenches) will be reviewed at the detailed design stage for all receptors; and

if any new receptors are built within 4 m of the track alignment before the Luas tramway Railway Order is granted, further vibration isolation techniques will be considered.

11.6.8 Summary of Residual Impacts

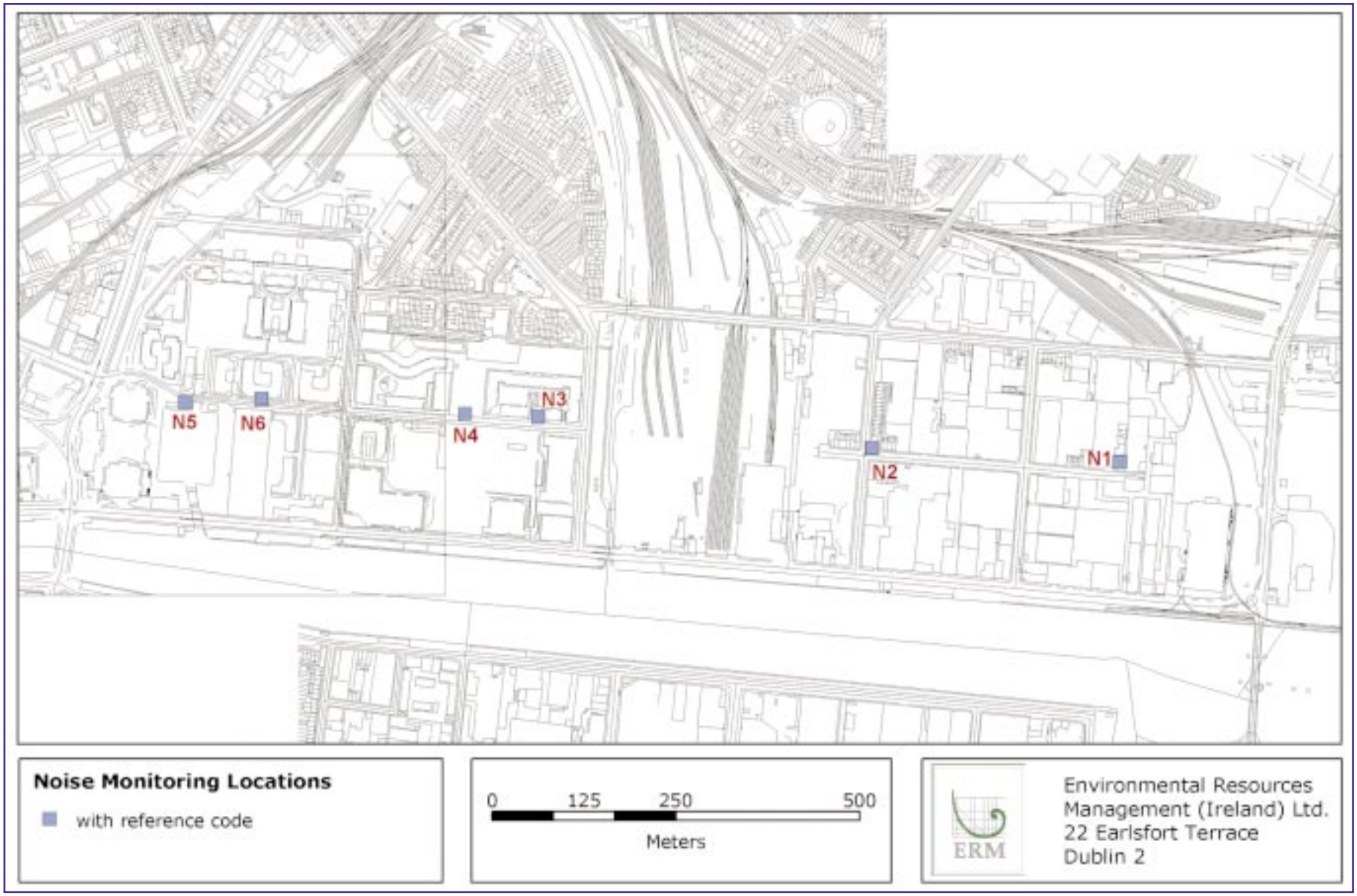
Construction Vibration

Although vibration may be perceptible in buildings when works are being carried out directly outside the receptors that are closest to the line, it is expected that the contractor will be able to control vibrations so that no significant construction vibration impacts are expected at any of the receptors described in this report.

Operational Vibration

Ground vibration is expected to be perceptible at some receptors but not at levels that are likely to give rise to adverse comment or structural damage, provided a high quality track design is used. The assessment of impacts associated with vibration will also be subject to further investigation during the detailed design phase.

Figure 11.1a Noise monitoring locations



Chapter 12

12 ELECTROMAGNETIC ASPECTS

12.1 Introduction

This section examines the potential for electromagnetic interference on existing receptors and the potential impacts from stray currents arising from the construction and operation of Luas Line C1.

12.2 Methodology

This assessment involves the identification of potentially sensitive receptors along the alignment and a desktop review of the most up-to-date research relating to the effects and mitigation of electromagnetic radiation.

12.3 Description of Receiving Environment

In terms of electromagnetic radiation, the study area does not contain any significant existing sources of electromagnetic radiation. One particular source of electromagnetic radiation is the telecommunication masts situated on the north side of Sherriff Street Lower, and it is understood that there are plans to remove these during the redevelopment of this area. There is also an ESB substation located on Sherriff Street Lower, at the top of Harbourmaster Place.

Electromagnetic radiation also has the potential to interfere with electronic equipment. This is particularly important as the route passes in close proximity to offices within the IFSC area that are heavily dependant upon telecommunications and have a significant telecommunications network.

12.4 Do Nothing Scenario

In the absence of the development, electromagnetic radiation levels are likely to remain at current levels, which do not appear to affect local telecommunications.

12.5 Potential Impacts of the Proposed Development

12.5.1 Construction Impacts

Sensitivity to the electromagnetic fields produced by the Overhead Conductor System (OCS) will be influenced by the precise alignment of the OCS lines with respect to potential sensitive receivers. The most sensitive receptors are located within the buildings fronting Mayor Street Lower and Harbourmaster Place.

Further areas where receptors may be sensitive to the effects of electromagnetic radiation include offices at the eastern end of Mayor Street Lower, developments proposed within the Spencer Dock Scheme and the terraced houses on Mayor Street Upper.

Electromagnetic radiation is a potential issue for projects using overhead power transmission cables. Light rail schemes powered by overhead cables, will generally give rise to two types of electromagnetic radiation: power frequency fields and high frequency fields. However, at receptor locations adjacent to Luas Line C1, magnetic and electric field strengths from operational use are both considerably less than a person would normally experience from natural sources of radiation and radiation emitted from household appliances such as microwave ovens, PC monitors and televisions.

The provision of a new substation underground at the Spencer Dock Stop will be a new source of electromagnetic radiation. This substation will convert existing ESB alternating current into a direct current power supply for the trams. The main depot for the Luas system is sited at the Red Cow Depot and will include the operational base and radio/video communications centres for the whole network. This was approved and constructed as part of the Luas Red Line. The LRO process and further details on the depot may be found in chapter four of the "*Environmental Impact Statement Line A Tallaght to Abbey Street, Volume 1, July 1998*".

12.5.2 Construction Impacts

There are no potential electromagnetic impacts arising from the construction phase as the construc-

tion works programmes involve principally civil works and utilities diversion.

12.5.3 Operation Impacts

The trams operate on 750 volts direct current (d.c.). Electricity to the trams is supplied via overhead power lines, at a minimum height of 6.0m above the ground in areas where road traffic can run directly on the alignment, supported by poles positioned either alongside or between tracks, or by cables fixed to building facades. Power will be supplied to the OHLE via multi-tubular cable ducts that form one edge of the track bed foundation; on the other side of the track bed there will be a parallel set of ducts carrying communications and signalling cables (this is dependant on the utility companies).

One new substation will be required to service Luas Line C1. Substations are required to house the necessary equipment to transform and rectify a supply at 10kv from the national electricity grid and output to the tram traction system at 750v d.c. It is proposed that this substation will be located underground at the Spencer Dock Stop; the overall space requirements for the substation are in the order of 450m^2. This substation will provide the additional power supply required and will be connected to the contact wire at intervals. Thus the weight of the contact wire is minimised and there is no need for a mass of overhead wiring. Synthetic cables, which have good insulating properties, will be used to support overhead wiring and this reduces the number of insulators required.

Concerns regarding electromagnetic effects are sometimes raised with regard to electrically-powered railways, both in terms of potential effects on the population from exposure to electro-magnetic radiation and electro-magnetic interference with electrical equipment. The UK National Radiological Protection Board has concluded that there is no clear evidence that electromagnetic fields emanating from a.c. and d.c. currents to which people are exposed during everyday activities give rise to adverse health effects such as cancer[1]. The report concluded:

"Laboratory experiments have provided no good evidence that extremely low frequency electromagnetic fields are capable of producing cancer, nor do human epidemiological studies suggest that they cause cancer in general".

The magnetic and electric field strengths from railway operations are both considerably less than a person would normally experience from natural sources of radiation and radiation emitted from household appliances such as microwave ovens, PC monitors and televisions. With regard to some types of sensitive electric appliances, whilst some magnetic fields are very difficult to screen effectively, relocation of the affected appliance (even a short distance from a railway boundary) where possible, is usually enough to solve interference from electromagnetic radiation.

In most d.c. systems, any stray currents (electrical currents through a path other than the intended pathway) will return to the substation via a parallel path provided by the ground itself and by any other metallic objects such as pipes and cable sheaths. This has the potential to cause current erosion and put structures at risk if the corrosion is concentrated over a small area such as on a pipe. Although stray current cannot be fully eliminated in electrical systems, it can be controlled and minimised by reducing the magnitude of the traction supply current in the rails and by providing a suitable return path to direct the stray current back to the sub-station.

12.6 Mitigation Measures

Luas Line C1 will be constructed to meet the requirements of the EU Directive on Electromagnetic Compatibility (89/336/EEC).

With regard to some types of sensitive electric appliances, whilst some magnetic fields are very

(1) *National Radiological Protection Board (2001) ELF Electromagnetic Fields and the Risk of Cancer: Report of an Advisory Group on Non-Ionising Radiation. NRPB Vol 12:1*

difficult to screen effectively, relocation of the affected appliance (even a short distance from a railway boundary) where possible, is usually enough to solve interference from electromagnetic radiation.

Measures to minimise stray current have been incorporated into the design specifications and will be implemented during the construction and operation of the scheme. These measures may include the use of a stray current collector system, together with other design measures such as resilient insulating polymer around the rails.

12.7 Predicted Residual Impacts of The Proposed Development

With the effective implementation of the mitigation measures described above, no significant residual impacts will occur from the construction and operation of Luas Line C1.

12.8 Conclusions

Providing the detailed mitigation and monitoring measures are implemented, there are no anticipated negative impacts of Luas Line C1 on electromagnetic radiation.

Chapter 13

13 CLIMATE AND AIR QUALITY

13.1 Introduction

The scope of the assessment of impacts upon air quality and climate comprises the following environmental aspects:

Impacts on pollutant concentrations at sensitive receptors as a result of operation of the proposed scheme (including impacts from construction dust).

Impacts on emissions of carbon dioxide, a gas with the potential for global warming.

13.2 Methodology

13.2.1 Overview

The methods used to identify and predict the impacts of the proposed development upon air quality and climate are as follows:

Reference to existing air monitoring data has been used to extrapolate the baseline air quality for the site of the proposed development.

Potential sources of air emissions during the operation of the proposed development have been identified in consultation with the design team.

The Design Manual for Roads and Bridges (DMRB) *(Volume 11, Section 3, Part 1, Highways Agency, February 2003)* has been used to estimate the impact of the proposed scheme to air quality and greenhouse gas emissions.

Evaluation of the significance of these impacts has been undertaken by comparing them to air quality standards, where appropriate.

Mitigation measures have been suggested in consultation with the project design team.

13.2.2 Primary and Secondary Sources

Traffic data predictions for scenarios with and without the proposed scheme were derived from the traffic and transportation assessment (see *Chapter 7*), undertaken by Faber Maunsell. Baseline air quality data were taken from reports published by Dublin's Air Quality Monitoring and Noise Control Unit.

13.2.3 Limitations

Due to the ongoing development within the Spencer Dock development, the distances from potential receptors to affected roads were estimated from the Spencer Dock Development plans.

13.3 Description of Receiving Environment

Baseline data on air quality within the Dublin region were obtained from the following reports produced by the EPA and by Dublin City Council.

- *Air Quality Annual Report 1999, EPA*
- Air Quality Monitoring and Noise Control Unit:
- Annual Report 2001-2002, Dublin City Council.
- Air Quality Monitoring and Noise Control Unit:
- Annual Report 2002-2003, Dublin City Council.

The recommended target values for the different air pollutant commonly found in the urban environment are based on European Union Air Quality Objectives and are depicted in *Table 13.3a.*

Table 13.3a Air Quality Target Values for the Dublin Region

Pollutant	Averaging Period	Target Value Dublin City Council	EU Limit Values	EC Limit Values
Sulphur Dioxide	10 minute mean	500 µg/m^3		
	1 hour mean (1) 3	50 µg/m^3		
	24 hour mean (2)	125 µg/m^3	100-150µg/m^3	
	Winter (median of daily values)			180mµg/m^3 if smoke is <60µg/m^3 130µg/m^3 if smoke is > 60µg/m^3
	Annual (median of daily values)			120µ g/m^3 if smoke is<40µ/m^3 80µg/m^3 if smoke is >40 µ g/m^3
Nitrogen Dioxide	1 hour mean (3)	200 µg/m^3		
	Annual mean	40 µg/m^3		
Black Smoke	24 hour mean	150 µg/m^3		
	Annual mean	60 µg/m^3	40-60 µg/m^3	80µg/m^3
	Winter			130µg/m^3
Particulate (PM_{10})	24 hour mean (4)	50 µg/m^3		50
	Annual mean	40 µg/m^3		40
Benzene	Annual mean	5 µg/m^3		
Carbon Monoxide	8 hour mean (5)	10 µg/m^3		
Ozone	8 hour mean (6)	120 µg/m^3		
Lead	Annual mean	0.5 µg/m^3		

Target values are based on European Union Air Quality Directive (including 80/779/EEC), as follows:

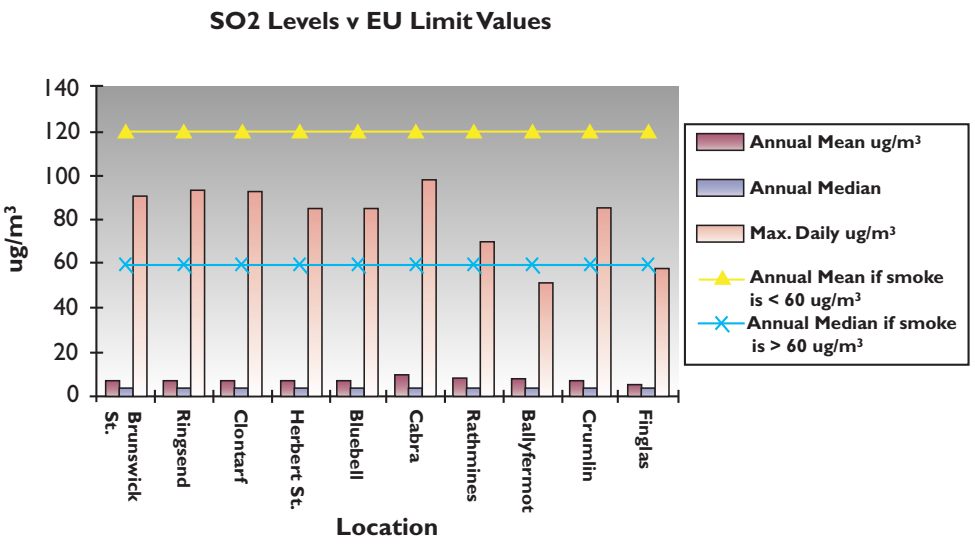
1. 350(µg m^{-3}) hourly mean not to be exceeded more than 24 times per year
2. 125 (µg m^{-3}) hourly mean not to be exceeded more than 3 times per year
3. 200 (µg m^{-3}) hourly mean not to be exceeded more than 18 times per year
4. 50 (µg m^{-3}) hourly mean not to be exceeded more than 25 times per year
5. 10 (µg m^{-3}) as a running 8 hour mean
6. 120 (mg m^{-3}) as the highest running 8-hour mean within one day not to be exceeded on more than 20 days per year.

(Source: Dublin Regional Air Quality Management)

13.3.1 Baseline Air Quality

Figure 13.3a reveals that the highest daily SO_2 level of 98 µg m^{-3} was recorded at Cabra. All measurements were in compliance with EU values.

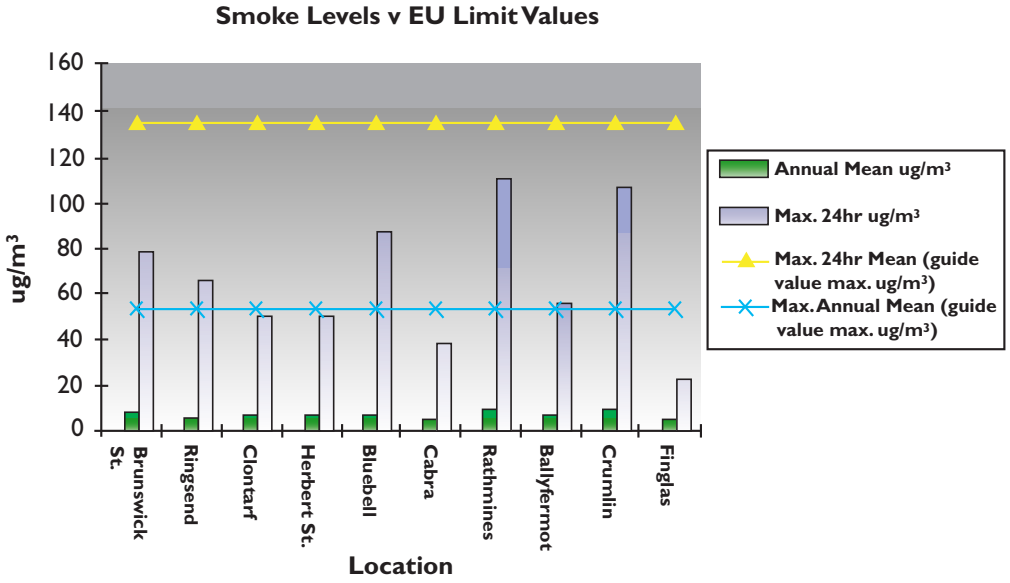
Figure 13.3a Sulphur dioxide



(Source: *Air Quality Monitoring and Noise Control Unit: Annual Report 2001-2002*)

Figure 13.3b presents smoke levels recorded at sites around Dublin in 2001-2002.

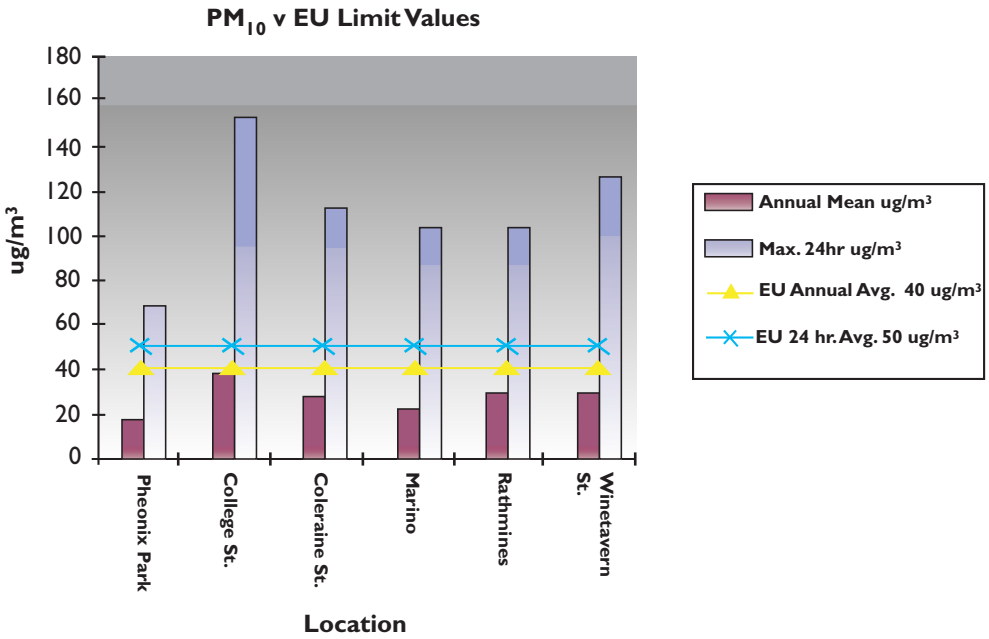
Figure 13.3b Smoke



(Source: *Air Quality Monitoring and Noise Control Unit: Annual Report 2001-2002*)

Monitoring of particulate matter was carried out from January to December 2002. The summary of the monitored concentrations is reproduced below. *Figure 13.3c* demonstrates that the 5 sites that comply with EU siting criteria are all in compliance with EU limit values for PM_{10}

Figure 13.3c Particulate Matter (PM_{10})



(Source: *Air Quality Monitoring and Noise Control Unit: Annual Report 2001-2002*)

Table 13.3b Summary of PM_{10} Concentrations Recorded from Jan- Dec 2002

Site Location	Annual Mean ($\mu g\ m^{-3}$)	Total Number of Days > 50$\mu g\ m^{-3}$
Phoenix Park	15	8
College Street (1)	37	66
Coleraine Street	21	10
Marino	24	12
Rathmines	19	12
Winetavern Street	23	14
Assessment Criteria	*40*	*35*

(1) It is important to note that the site at College Street does not conform to criteria set down by the European Union in terms of site selection and particularly in terms of proximity to traffic. However the site is maintained to allow trends to be examined.

(Source: *Air Quality Monitoring and Noise Control Unit: Annual Report 2002-2003*)

Nitrogen dioxide concentrations were monitored at two sites: Winetavern Street and Coleraine Street, both within the city centre with significant traffic volumes in their vicinity[(1)]. The 2002 annual mean concentration was recorded to be 35 $\mu g\ m^{-3}$ at Winetavern Street and 38 $\mu g\ m^{-3}$ at Coleraine Street.

(1) Air Quality Monitoring and Noise Control Unit: Annual Report 2001-2002, Dublin City Council.

Existing Urban Pollutants

The Dublin City Council Report, *Air Quality Monitoring and Noise Control Unit: Annual Report 2001-2002* and *Air Quality Monitoring and Noise Control Unit: Annual Report 2002-2003*, reported that

• Atmospheric lead levels are currently well within the annual mean national limit value. In 2001 the monitoring site on Branch Road within the Dublin Docklands area has recorded concentrations of 0.53 µg m^{-3}; this has since reduced to concentrations of 0.12 µg m^{-3} recorded in 2002.

• An additional survey of the diurnal variation in nitrogen dioxide levels revealed that there is typically a marked increase in levels of nitrogen dioxide from early morning peaking in mid morning. This is followed by a sharp decline through mid afternoon followed by a smaller increase through the evening and night. It is believed that traffic is the most significant factor contributing to these trends.

• The annual mean value of benzene recorded in 2001 at Winetavern St was 4.9 µg m^{-3}, by 2002 this had reduced to 3.75 µg m^{-3}.

• Monitoring results for carbon monoxide are well within national limit value of 10mg m^{-3}. The 2002 annual 8hour rolling mean recorded at Winetavern Street was 1.2 mg m^{-3} and 0.6 mg m^{-3} at Coleraine Street.

Dust Deposition

The determination of the baseline with regards to dust is frequently done by undertaking a dust-deposition monitoring programme. It is recommended that a dust deposition survey (to *B.S. 1747*) would be undertaken by the contractor immediately prior to, and at stages during construction of the proposed development. The location of the monitoring locations will reflect the potential sources of dust and the location of sensitive receptors. Sensitive receptors in the vicinity of the proposed Luas Line C1 may include residents in the various apartments or staff from the various financial services and commercial developments along the route. Impacts from dust are discussed in more detail further on in this chapter.

13.3.2 Climate

Rainfall and temperature

The existing microclimate can be described using the most relevant meteorological data and by describing key influences over the microclimate at the site.

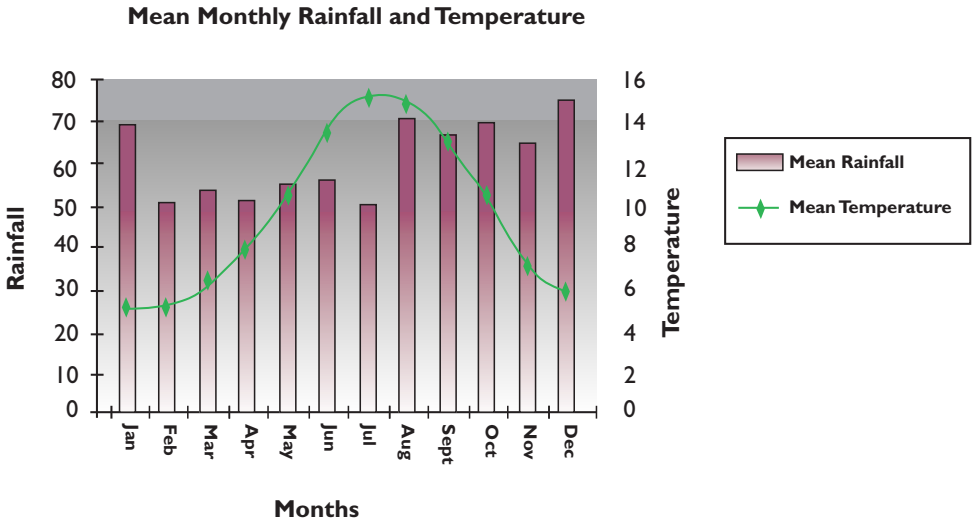
Long-term (30 year) data were collected from Met Éireann. Data included:

• mean monthly rainfall (Dublin Airport) *Figure 13.3d;*
• temperature (Dublin Airport) *Figure 13.3d, and*
• wind speed and direction (recorded at Dublin Airport).

Precipitation and Temperature

The data indicates a climate that is described as "maritime" as it is primarily influenced by the sea. This is reflected by the lack of extreme temperatures (range from 6°C to 15°c). Average annual rainfall at Dublin Airport is 732.7mm. *Figure 13.3d* depicts mean rainfall and temperature recorded at Dublin airport.

Figure 13.3d Mean monthly rainfall and temperature, Dublin Airport 1961-1990



Wind

The prevailing winds recorded at Dublin Airport, are from the west, with southerly winds recorded quite rarely due to the sheltering effects of the Dublin and Wicklow mountains.

In terms of wind speed, the mean wind speed is 9.9 knots, with maximum wind speeds in December (11.8 knots) and January (12.2 knots). Max gusts were recorded at 75 knots and the mean number of days with gales is 8.2.

There are no major obstructions or natural barriers (e.g. mountains) surrounding the proposed site. This means that the wind pattern recorded at Dublin Airport is likely to be similar to that experienced along the proposed route, although local wind patterns will be significantly influenced by the mass and form of the surrounding built environment.

Greenhouse Gas Emissions

In Ireland, the principal greenhouse gas is carbon dioxide (CO_2), mainly arising from the burning of fossil fuels in the transport, heating and electricity generation sectors. It is estimated that private vehicles contribute 60% of all transport sector greenhouse gas emissions and freight vehicles contribute 35%. In 1990, the transport sector contributed approximately 15.7% of Ireland's CO_2 emissions and 9.5% of base year greenhouse gas emissions. However, transport sector greenhouse gas emissions are forecast to increase by almost 180% in the period from 1990 to 2010.

A significant proportion of this increase is expected to occur in the Dublin region as over a quarter of the population live and commute throughout Dublin City and the Greater Dublin Area (National Climate Change Strategy, 2000).

13.4 Emissions of Greenhouse Gases

13.4.1 Do Nothing Scenario

Emissions of carbon dioxide from traffic along affected routes in the Do Nothing scenario have been estimated using the DMRB, version 1.02(c). In the Do Nothing scenario, annual CO_2 emissions release approximately 2,793 tonnes a year.

13.4.2 Potential Impacts of the Proposed Development on Greenhouse Gas Emissions

Construction Impacts

Greenhouse gas emissions associated with the construction of Line C1 are limited to those associated with emissions from construction vehicles and machinery. However, these emissions will be temporary in nature and are not considered to be significant.

13.4.3 Predicted Residual Impacts of The Proposed Development

While the Luas Line C1 will generate CO_2 emissions (due to the consumption of energy) this calculation takes no account of CO_2 'savings' made by passengers using Luas Line C1. If the Luas was not available, these (and, most importantly, future residents and workers of the Docklands area) people would use other transport means to get to work. A large proportion of these journeys would be undertaken by cars, resulting in CO_2 emissions. Thus the residual impact of the Luas extension is the reduction in CO_2 emissions in comparison to the Do-Nothing Scenario, contributing to the Government's intention of reducing Greenhouse gas emissions.

13.4.4 Conclusions

Luas line C1 will reduce CO_2 emissions, in comparison to the Do-Nothing Scenario, through encouraging a modal shift in mode of transport, away from car-based travel.

13.5 Air Quality

In this section, concentrations of pollutants are predicted at sensitive receptors within the study area that are within 200m of roads with significant changes in traffic as a result of the introduction of Luas. Sensitive receptors are defined as locations where members of the public are regularly present such as residential dwellings, schools, hospitals and churches. The main pollutants of concern in terms of traffic are nitrogen dioxide and particulate matter as measured concentrations of these substances in Dublin are currently close to exceeding objectives. Benzene has also been included in this assessment as concentrations close to the 2010 objective have been recorded at Winetavern Street in 2001, although they have since been reduced. The baseline concentrations included in the assessment are based on the monitoring results reported in the *Air Quality Monitoring and Noise Control Unit: Annual Report 2002-2003.* These measured 2002 concentrations have been used for the 2008 assessment and represent a worst case, as it is almost certain that background concentrations in 2008 will be lower than those measured in 2002.

The predicted changes in traffic on 26 streets are presented in *Annex C, Table 1.3*.
Changes in traffic of less than 10% can usually be scoped out, as they are unlikely to have an impact on air quality[(1)]. Of the 26 routes above, 5 have increases in traffic greater than 10% and 3 have decreases in traffic greater than 10%.

13.5.1 Do Nothing Scenario

Do Nothing pollutant concentrations at sensitive receptors have been calculated using the DMRB version 1.02(c) spreadsheet. Background concentrations of NO_2 and PM_{10} have been estimated from the baseline data presented in *Air Quality Monitoring and Noise Control Unit: Annual Report 2002-2003.* Predicted concentrations of nitrogen dioxide, particulate matter and benzene in 2008 without the proposed development have been estimated and the results are presented in Annex B, *Table 1.4*.

[(1)] *TAG Unit 3.3.3 Local Air Quality Sub-objective, UK Department of Transport, February 2004*

There are no predicted exceedances of the NO_2, PM_{10} and benzene annual mean concentrations at the above receptors in 2008 without the Luas development. The 24-hour particulate matter objective is not exceeded at any of the receptors.

13.5.2 Potential Impacts of the Proposed Development

Construction Impacts

The impact to traffic in the construction phase may occur due to road closures and decreases in junction efficiency (as described in *Section 7.6*). Emissions from plant and equipment are predicted to be insignificant as are any emissions of black smoke from tarmac laying. Fugitive emissions from plant and equipment will be minimised by the application of the mitigation measures. The remainder of this section investigates the impact from construction traffic and dust.

Dust emissions are exacerbated by dry weather and high wind speeds. The impact of dust also depends on the wind direction and the relative location of the dust source and receptor.

Dust becomes airborne due to the action of winds on material stockpiles and other dusty surfaces or when thrown up by mechanical action, for example the movement of tyres on a dusty road or activities such as sanding or drilling. The quantity of dust released during construction depends on a number of factors, including:

the type of construction activities occurring (e.g. crushing and grinding);

- volume of material being moved;
- the moisture and silt content of the materials;
- the distance travelled on unpaved roads;
- the mitigation measures employed; and
- the area of exposed materials.

There are many types of particulate matter that are included in the definition of dust.

A 1980 study[1] from the UK indicated that at least half the people living within 50 m of the site boundary of a construction scheme were seriously bothered by construction nuisance due to noise, vibration, dust or loss of amenity due to the presence of heavy construction traffic, but that beyond 100 m less than 20% of the people were seriously bothered.

Residential receptors front onto the proposed alignment along much of its length and are located within 10 m of construction works. This includes properties along Mayor Street Upper. There are also commercial properties within 10 m of the alignment, particularly along Harbourmaster Place and Mayor Street Lower.

Construction dust is likely to cause a minor impact at sensitive receptors within 100 m of the source of the dust generated. However, this impact can be minimised by the application of appropriate mitigation measures (see *Section 13.5.3* below).

The impact of dust, as a nuisance, is partially dependent on existing deposition rates. The increase is more noticeable in an area with low background deposition. In this case, there is nothing to suggest that existing local dust deposition rates are unusually high or low for an essentially urban area.

Operation Impacts

Pollutant concentrations at the sensitive receptors assessed above are shown in *Annex B, Table 1.5*, and are compared to the Do Nothing concentrations. Baseline concentrations have been taken from the *Air Quality Monitoring and Noise Control Unit: Annual Report 2002-2003* and are the same as those used in the assessment of the Do Nothing scenario.

[1] *Baughan CJ (1980) Nuisance from road construction: a study at the A31 Poulner Lane Diversion, Ringwood (Dorset, UK): TRRL Supplementary Report 562. From Design Manual for Roads and Bridges, 1994*

Operational impacts of the tram have been estimated using baseline concentrations from the Air Quality and Monitoring and Noise Control Unit: Annual Report 2002-2003. The introduction of Luas in 2008 has been compared against the results of the Do Nothing scenario.

Of the eight receptors assessed, two are predicted to experience a marginal increase in NO_2 and PM_{10} concentrations, one is predicted to experience a marginal increase in just NO_2 concentrations, five are predicted to experience a marginal decrease in NO_2 and PM_{10} concentrations and one is predicted to experience a marginal decrease in just PM_{10} concentrations. Benzene concentrations remain the same at six receptors, and decreases marginally at two receptors.

Even with the changes in traffic from the Luas scheme, the annual mean NO_2 objective is not exceeded at any of the receptors assessed.

The largest impact is predicted to occur at Number 5 Upper Mayor Street. NO_2 concentrations are predicted to increase by 0.21 µg m^{-3}, PM_{10} concentrations are predicted to increase by 0.08 µg m^{-3}. However, these increased concentrations are still marginal.

Five of the eight receptors assessed will experience direct benefits in respect of improvements in local air quality with the largest benefit being predicted to occur at the roadside along the link that is expected to join up with Spencer Dock, known as the North First Link Road. Roadside concentrations of NO_2 are predicted to decrease by 0.14 µgm^{-3}, PM_{10} concentrations are predicted to decrease by 0.01µg m^{-3} and concentrations of benzene are predicted to stay the same.

13.5.3 Mitigation Measures

Construction Dust

The mitigation of construction impacts is discussed in this section. The main focus is on the impacts from construction dust.

It is not possible to eliminate emissions of dust from construction activities completely. In order to minimise the impacts of construction, best site management practices will be implemented to reduce the likelihood of dust impacts. Typical measures include water-based dust suppressors, especially for dust 'intensive' construction activities such as block/pavement cutting and ground breaking. Any lose material will be covered to prevent wind dispersal.

UK DTi Guidance on Control of Dust from Construction and Demolition Activities

As there are no specific Irish dust guidelines, the construction industry in Ireland typically references appropriate UK-based guidance. The DTi and several industrial partners have funded a four-year project to produce guidance on the control of dust from construction and demolition activities. This guidance will be adhered to, as general best practice, during the construction of the Luas Line C1.

13.5.4 Predicted Residual Impacts

There are no predicted residual impacts from the construction of the Luas Line C1. Impacts from construction dust, likely to be most significant along Mayor Street Upper and Lower, and Harbourmaster Place will only last for the duration of the construction period, therefore there are no predicted residual impacts from construction dust. A dust monitoring programme during construction is recommended to be undertaken.

Changes in traffic flows as a result of the operation of Luas Line C1 are predicted to cause marginal changes in pollutant concentrations at nearby sensitive receptors.

13.5.5 Conclusions

Construction dust is predicted to have an impact on frontage properties along the following routes: Mayor Street Upper, Harbourmaster Place and

Mayor Street Lower. This will be a short-term impact and one that is amenable to mitigation through the implementation and maintenance of appropriate best practice measures.

The operation of Luas is predicted to cause negligible impacts to air quality at sensitive receptors. Although there are marginal increases in pollutant concentrations at two of the eight receptors there are no predicted exceedances of the target air quality values as a result of Luas Line C1. The overall contribution of the new Luas line to the local air quality will be positive with reductions in pollutant concentrations predicted at five of the eight receptor locations.

Former Excise Bar

Chapter 14

14 TOWNSCAPE AND VISUAL IMPACTS

14.1 INTRODUCTION

This chapter presents the impacts on townscape and visual amenity of the proposed Luas Line C1. Mitigation measures are described to reduce these impacts and a description of the residual impacts (predicted townscape and visual impacts with mitigation measures in place) is presented. This chapter is supported by *Annex A, Landscape Insertion Plans.*

14.2 METHODOLOGY

The methodology used is in accordance with that presented in the reference entitled *Guidelines for Landscape and Visual Impact Assessment,* The Landscape Institute and Institute of Environmental Management and Assessment, 2002.

Following a description of the receiving environment or townscape, an assessment of impacts is presented for both the construction and operation phases of Luas Line C1. Impacts on both townscape character (townscape impacts) and visual amenity (visual impacts) are described.

Townscape impacts relate to the effect of the proposed development on the physical elements or fabric that comprises townscape and townscape character. Impacts can range from physical removal of townscape elements to qualitative change in character caused by the proposals.

Visual impacts relate to the extent to which the proposals will cause a change in the existing view gained by individuals who will be able to see the proposed development.

The sensitivity of a receptor relates to both townscape elements and individuals who are predicted to experience a change in view caused by the proposals; sensitivity is further defined in *Table 14.2a* below.

Table 14.2a Definitions of Receptor Sensitivity

Sensitivity	Receptor	Definition
Low	Townscape	A townscape that is not valued for its senic quality and is tolerant to change.
	Visual	Viewers with a passing interest in their surroundings e.g. motorists or workers in industrial premises.
Moderate	Townscape	A moderately valued townscape, perhaps a locally important townscape, tolerant of some change.
	Visual	Viewers with a moderate interest in their environment such as users of recreational facilities.
High	Townscape	A townscape of particularly distinctive character or one that is highly valued for its scenic quality.
	Visual	Viewers with proprietary interest and prolonged viewing opportunities, such as residential receptors.

The magnitude of change caused by the development proposals is defined in *Table 14.2b* below.

Table 14.2b Definitions of Impact Magnitude

Magnitude of change	Receptor	Definition
Low	Townscape	A virtually imperceptible change in components of the townscape.
	Visual	Few viewers affected by minor changes in views.
Moderate	Townscape	Moderate changes in townscape components.
	Visual	A moderate number of viewers affected by moderate changes in views.
High	Townscape	A notable change in townscape characteristics over an extensive area.
	Visual	A large number of viewers affected by major changes in view.

Evaluation of Impact Significance

The level of impact is arrived at by synthesising *receptor sensitivity* with *magnitude of change* caused by the development as illustrated in the table 14.2c below. Impacts are graded as nil, slight, moderate and substantial and can be either positive (beneficial to townscape or visual amenity) or negative (detrimental to townscape or visual amenity)

Table 14.2c Definition of Levels of Impact Significance

	High Magnitude of Townscape or Visual Change	**Moderate Magnitude of Townscape Visual Change**	**Low Magnitude of Townscape or Visual Change**
High Townscape or Viewer Sensitivity	Substantial	Moderate / Substantial	Slight / Moderate
Moderate Townscape or Viewer Sensitivity	Moderate / Substantial	Moderate	Slight
Low Townscape or Viewer Sensitivity	Slight / Moderate	Slight	No significant impact

14.2.2 Principal Sources

Baseline information on the landscape of the area was collected through a desktop study of maps, plans and documents, followed by field surveys in August 2003 and January 2005. Information was also provided by consultation with relevant parties.

14.2.3 Limitations

The area between Royal Canal and The Point is currently undergoing large-scale redevelopment and the proposed Luas Line C1 passes through the centre of this area. As a result of this redevelopment, new large scale built elements will block or change some of the viewpoints presented in *Tables 14.4a* to *14.4c*.

14.3 Description of the Receiving Townscape

14.3.1 Townscape Character

The study area, bounded by Sheriff Street on the North and the North wall Quay on the south, runs between Connolly Stop and The Point. The area is composed of landfill claimed from the Liffey Estuary in the 18th Century and land use includes commercial, residential, light industry, warehousing and distribution. Recent developments have brought a large increase in commercial, retail and residential land uses. There are also a number of listed buildings throughout the study area, which are associated with the historic uses of the docklands when this was the main point of contact for trading and immigration to and from Dublin.

A landscape assessment along the proposed extension to the Luas Red Line was carried out. This identified three distinct townscape character zones

(referred to as CZs). Definitive boundaries to these zones are illustrated on *Figure 14.2a (page 147)* and described below.

Character Zone 1: Dublin Docks Commercial Zone

This area runs from Connolly Stop in the west to Guild Street in the east and is dominated by extensive commercial and residential development.

This zone features a range of recently constructed office blocks and hotels; cafes, bars and restaurants line the streets at ground level. The National College of Ireland has relocated next to a newly developed public square, which has become a popular meeting and resting space. A contemporary look to the area has been achieved using different materials such as brick, glass, wood and steel which strongly contrasts with historic features and buildings which have been retained and reinstated, (notably at Georges Dock and Customs House) and the use of swan neck lampposts. The area has been planted with avenues of trees.

The townscape quality of Dublin Dock Commercial Zone is moderate and its sensitivity to change is also moderate.

Character Zone 2: Spencer Dock

This area stretches from Guild Street to the western end of Mayor Street Upper. The area was formerly used as a maintenance yard for trains and there are rail links from this area to Connolly Stop. Two red-brick buildings, formerly owned by Iarnród Éireann remain in this area as part of the Spencer Dock redevelopment as listed structures.

The site is currently being developed and is therefore not accessible to the public. The development will include commercial and residential uses and will include a linear park centred on the Grand Canal. This proposal is expected to bring the area up to a similar standard of land use and character as the Dublin Docks Commercial Zone.

The townscape quality of this construction site is low and the sensitivity to change is also low.

Character Zone 3: Dublin Docks Industrial Zone

This area stretches from the western end of Mayor Street Upper in the west to East Wall Road in the East. The area is characterised by warehouses that are constructed from a range of modern and historic building materials (including Victorian red brick) with many low quality buildings being used to house light industry and distribution plants. There are also a number of terraced residential premises, usually two storeys high, which line parts of one side of certain streets. There are a number of protected structures in the area which all line North Wall Quay to the south of the area. The most notable of these buildings is The Point, which has been refurbished to create a popular theatre and indoor concert space.

There are some construction activities in the area with site clearance and demolition work to the south of Sheriff Street Upper, however the majority of the structures and land uses within the area are proposed to remain as they are today. This conflicting mix of small-scale residential premises against larger scale, often poorly maintained warehouses create a fragmented townscape character, which is further amplified by the patches of derelict land and rubbish tips. As a result this area is of low townscape quality and the sensitivity to change is also low also.

14.4 Assessment of Impacts

14.4.1 Do Nothing Scenario

If the Luas line C1, or indeed any other form of public transport is not implemented, negative townscape and visual impacts will result from traffic congestion in this area thereby causing an overall deterioration in environmental quality.

14.4.2 Potential Townscape Impacts

The impact of the proposals on townscape elements, fabric and associated character is outlined in respect of both the construction phase and operating phase of the development.

Sensitive Townscape Receptors

Townscape receptors (existing townscape elements) are identified throughout the site and their sensitivity is graded according to the methodology and is outlined in *Table 14.3a* below.

Table 14.3a Sensitivity Rating for Townscape Receptors.

Character Zone	Townscape Element	Sensitivity
CZ1 Dublin Docks Commercial Zone	Avenue of standard trees on mayor Street Lower	High
	High quality stone cobbled paving on Custom House Square and Guild Street	High
	The inner dock area as an amenity to adjacent residents	High
	Traditional street lighting which currently occupies the main east west street axis.	Moderate
	Public square on Mayor Street Lower	Moderate
Spencer Dock	Royal Canal and linear park	High
Dublin Docks Industrial Zone	Original cobbled paving on Castleforbes Road	High
	Semi mature tree planting adjacent to The Point	Moderate

Construction Impacts

Short-term townscape impacts will result from temporary alterations to the townscape during the construction period. Such activities include temporary traffic management (both vehicular and pedestrian), movement of construction machinery, excavations and earthworks, storage of construction materials, site compounds, lighting and dust.

The construction activities are predicted to have a negative impact on the townscape in all character zones. These impacts will be temporary and thus their significance is not regarded to be as great as

the long term impacts.

Operational Impacts

The construction of the scheme will introduce the following into the existing townscape.

Trams of up to 40m length will travel at 5 minute intervals during peak periods and at 10 to 15 minute intervals during off peak periods, introducing new movement into the townscape, especially in pedestrianised areas.

Overhead cables together with supporting pole structures will be installed representing additional elements which will not benefit the existing townscape.

Pairs of rails to facilitate two-way traffic will be countersunk into existing paving finishes. Additional track facilities for maintenance will be accommodated at The Point.

Four tram stops will be located along the line extension in this area and will include shelters, information display, lighting, vending machines, Smart card validators and advertising drums; CCTV cameras and speakers will be maintained on poles at stops.

The proposed bridge crossing over the Grand Canal is a modern, slender curvaceous design and utilises modern materials, namely glass and steel. The design is expected to be visible at short range and to make a contribution to the modern townscape that has recently evolved in this area.

The magnitude of the change in the physical environment is judged to be moderate overall, however at each particular location the magnitude of change will vary, being higher in locations where stops are proposed or where significant new infrastructure is required and lower in locations where change is limited to the introduction of wires, tracks and passing trams into the existing townscape.

In addition to the general changes along the length of the scheme the following specific impacts upon townscape resources or character were identified.

Character Zone 1: Dublin Dock Commercial Zone

The removal of existing street trees on Mayor Street Lower in order to accommodate trams will result in a *substantial negative impact.*

Disruption of public open space defined by Custom House square will result because of the tram lines, proposed stop and passing thereby generating a *moderate negative impact*.

Loss of original cobbled setts along a section of Mayor Street Upper between Commons Street and Guild Street *resulting in moderate negative impact.*

New bridge crossing over the canal between Georges dock and Inner Dock resulting in slight negative impact

Character Zone 2: Spencer Dock

Introduction of new access through this site (currently not accessible) that will have a substantial positive impact.

Introduction of tram movements into an area that is currently inaccessible to the public that will result in a substantial positive impact.

New bridge over Royal Canal gaining access to the western side of the site, the design of which will generate a substantial positive impact.

Character Zone 3: Dublin Docks Industrial Zone

*Luas infrastructure that will bring improvements in the existing streetscape and lighting of the area and may introduce street planting in an area where none exists (*substantial positive impact*).*

*Loss of a free standing concrete gable end wall to provide access for the Luas Line C1 to the proposed end terminal at The Point (*slight positive impact*).*

Introduction of an end terminal and associated infrastructure, at The Point, that could have a substantial negative impact *on local residents, through noise levels and loss of privacy.*

Loss of a small area of original cobble setts where the Luas Line C1 line crosses Castleforbes Street. Slight negative impact, *which will be offset by the*

overall improvements that the Luas line will bring to the streetscape of the area.

14.4.3 Potential Visual Impacts

Construction Impacts

The construction activities will have negative impacts on the viewing experience of all the visual receptors identified in *Figure 14.3 (page 148)*. Residents, as the most sensitive receptors, will experience the most significant impacts.

Of particular note are the following visual receptors that will experience significant negative visual impacts during construction:

• the many recreational users and office workers in the commercial zone where construction activities will detract from the moderate quality townscape along Mayor Street Lower;
• many residents of the new apartment blocks on Mayor Street Lower, all of which front onto roads which will be largely reconstructed, widened or dug up to divert services especially the residents near the proposed stop at the public square along the street who will have elevated views of the construction site;
• residents of New Wapping Street and Castleforbes Road who will have acute views of construction works at crossroads.

It should be noted that these works will only be temporary and thus their significance is not regarded to be as great as the long-term impacts.

Operational Impacts

Visual impacts are recorded in respect of selected fixed points (viewpoints) throughout the site. These are identified, together with a description of the existing receiving visual environment and predicted impacts in *Tables 14.4a, 14.4b and 14.4c.*

Substantial negative visual impacts are recorded in respect of visual receivers associated with two viewpoint locations. These are located at the square on Mayor Street Lower (Viewpoint 7), and the T junction at Mayor Street Lower and Guild Street (Viewpoint 9). A moderate to substantial negative visual impact is recorded in respect of Viewpoint 4 (Mayor Street lower – Opposite JP Morgan). Moderate negative visual impacts are recorded in respect of three viewpoints, V1 at Harbourmaster place, V2 at Georges Dock and V8 at the Clarion Hotel.

In terms of positive visual impacts, these are recorded in two viewpoint locations and are graded as moderate to substantial, the locations are viewpoint 17 (crossroads of New Wapping Street and Mayor Street Upper) and viewpoint 22 (Eastern end of Mayor Street Upper)

14.4.4 Mitigation Measures

The following mitigation measures will be achieved throughout the construction phase to minimise townscape and visual disruption in accordance with the Construction Method Statement to be further developed by the Contractor. Please also see *Section 14.9* and *Chapter 17, Environmental Management and Monitoring Programme*:

• all site compounds, offices and major works sites will be fenced off;
materials and machinery will be stored tidily during the works;
• portable machinery will be stored behind hoarding in compounds when not in use;
• roads providing access to site compounds and works areas will be maintained free of dust and mud;
• lighting of compounds and works sites will be restricted to agreed working hours and that which is necessary for security;
• temporary hoarding, barriers, traffic management and signage will be removed when no longer required;
• contractor's compounds will be located away from residential areas wherever possible;
• all existing trees to be retained where possible and will be protected prior to the commencement of construction in accordance with BS 5837: 1991 *Guide for Trees in Relation to Construction*; and
• on completion of construction, all remaining spoil

and construction materials will be removed.

Once complete, the proposed Luas Line C1will pass through a number of areas that could benefit from environmental improvements. The whole area is undergoing redevelopment currently and there may be opportunities for landscape planting upon completion of the redevelopment works.

The following mitigation measure can be carried out to reduce residual impacts to minimise townscape and visual disruption of the proposed development. Specific mitigation measures are detailed below:

Street tree planting to enhance the setting of the scheme, anchor it comfortably into the new townscape (DDDA masterplan 2003) and improve the environment of the areas through which Line C1 runs.

Street tree planting to filter longer distance views of the scheme down side streets from route alignment. Planting in streets like Castleforbes Road, New Wapping Street, Guild Street and Commons Street will have the added advantage of introducing vegetation to an area where there is currently very little or none. The DDDA and private developers will co-ordinate masterplan objectives including street tree planting for the Docklands Area

Protection of specific trees and other landscape resources of importance for example the walls of George Dock and Royal Canal. Where features cannot be retained in situ they will be relocated (for example the original cobble setts along Mayor Street Upper and at the cross roads at Guild Street and Castleforbes Street).

Mayor Street Bridge Widening: care will be taken not to disrupt the historic walls and these will be protected during construction and fully retained. The historic lighting posts on the four concrete pillars will be stored during this widening phase and returned to the plinths post-construction. Care will be taken to integrate the surface drains with the surrounding materials and high quality detailing will be provided. Additional infrastructure associated with the bridge widening will be integrated at the time of construction and a piecemeal approach to signage, which could be visually intrusive, will be avoided.

Spencer Dock Bridge Construction: A design has been developed for the bridge crossing which is contemporary in style and will be seen to coordinate with the urban renewal of the Spencer Dock Area. The bridge is consciously designed as a landmark feature and with the use of modern high quality materials, namely steel and glass, is expected to have a beneficial visual impact in this area.

A distinctive, characteristic and high quality visual 'language' will be used for all Luas-related infrastructure including the trams, stops, signs, the poles and fixings, the overhead lines, lighting, the sub stops and equipment boxes and all associated paving, kerbing and street furniture. This will be modern, yet in keeping with the historic elements of Dublin, and in context to the Docklands area.

Careful location of signage and stops to retain important sight lines and vistas, and to avoid unnecessary intrusion into views from housing, for example, signs and lighting will be located where they do not reflect or shine into residents' windows.

Cables will be attached to buildings thereby minimising the need for supporting poles which adversely affect townscape character.

Luas rails will be countersunk with the adjacent paving.

Any barriers (railings, fences or walls) that are required for safety, screening or noise reduction will be designed to fit into and enhance the environment. Unsightly obstructions will be avoided. It is not anticipated that there will be any earth mounding or bunding associated with the scheme, with the exception of temporary bunding associated with on site storage of fuel.

14.4.5 Predicted Residual Visual Impacts

Moderate to substantial negative visual impacts are recorded in respect of viewpoint 7 (located on Mayor Street Square) and viewpoint 9 (T junction between Mayor Street Lower and Guild Street). A moderate negative visual impact is recorded in respect of viewpoint 4 (located on Mayor Street

Lower). A moderate to substantial positive visual impact is recorded in respect of viewpoint 17 (crossroads of New Wapping Street and Mayor Street Upper) and a moderate positive visual impact is recorded in respect of viewpoint 10 (north end of Guild Street).

14.5 Conclusions

Construction activities will generally have a negative impact on the townscape character and visual amenity of all three character areas, however the nature of these works is temporary and is not deemed to be critical. Impacts at the operating stage are long term and are therefore more critical. These however are restricted, in townscape terms, to the loss of tree planting. In terms of the removal of high quality paving material, these are expected to be reinstated and indeed, the countersunk finish of the rails outlined in the mitigation measures will result in a very low overall impact on townscape character. The rail related street furniture at the four stops locations will detract from the local townscape in these areas, however, the overall impact on townscape and townscape character is beneficial owing to the reduction and removal of traffic congestion, noise and dust as a result of Luas Line C1.

In terms of visual impact, this is expected to be greatest for residents, workers and visitors located on or fronting onto the main streetscape through which the Luas will pass. Substantial negative visual impacts are recorded for two locations only and indeed positive visual impacts are recorded for at least two locations. Mitigation measures will ensure the reinstatement of the high quality new townscape works. This together with the mitigating design features associated with the Luas and the reduction in traffic volumes will result in an overall beneficial landscape and visual impact.

Visual Amenity

A range of 24 viewpoints were selected for the purposes of the visual assessment. The viewpoint locations are illustrated in *Figure 14.3 (page 148)*
A key to visual receptor types is presented below.

Key to Visual Receptor Types:

H - Residents	S - Shoppers	O - Office Workers
L - Leisure/hotels	I - Industrial Workers	T - Tourists
V - Vehicle users	R - Recreational	E - Educational

(H) – Residents with acute viewing angles

Table 14.4a Existing Visual Amenity

ID	Receptor Location	Type of Receptor	Sensitivity to Change	Distance from tram	Description of Existing view
CZ1: Dublin Dock Commercial Zone					
V1	2 Harbour -master Place near Connolly Stop	O V	Moderate	Track-side	Enclosed views from pavement looking east down tarmac road. 7(+) storey stone and glass modern office developments to each side with smaller red brick retail developments visible before road curvesto west. Avenue street planting down roadsides.
V2	Georges Dock (northern entrance)	R O V	Moderate	0 > 25m	Views from seating area at dockside looking west towards bridge with reinstated historic features (lighting, stonework etc). Smaller red brick developments in foreground with 7(+) storey modern office developments behind with urban street planting at bases. Gap in offices reveals Connolly Stop works, temporary hoarding and cranes in distance.
V3	Georges Dock (southern entrance)	V	Low	100m (+)	Distant views of V2 over site work in Georges Dock. Greater surrounding built context visible from this vantage point and largely composed of (+) 7 storey office developments.
V4	Opposite JP Morgan on Mayor Street Lower	O V	Moderate	Track-side	Views looking east down central spine of Dublin Docks Commercial Area. 6 storey red brick offices with urban planting at base on the west and a Listed building now refurbished as CHQ, Custom House Quarter, a new retail centre on the east featuring Victorian lampposts.

Table 14.4a (continued)

ID	Receptor Location	Type of Receptor	Sensitivity to Change	Distance from tram	Description of Existing view
CZ1: Dublin Dock Commercial Zone continued					
V5	Inner Dock	H	Moderate	50m (+)	Glimpsed enclosed views looking down antique sett access track with 6 (+) storey office developments to either side. Semi mature tree and shrub planting on eastern side and young urban planting on west. Focus of view a 4 storey red brick modern office development.
V6	North end of Commons Street	V (H)	Low	100m (+)	Distant views down tarmac road enclosed by high stonewall with safety fencing on top to the west (residences visible over top). Smaller residential apartments with avenue of young trees at roadside to the east.
V7	Square (northern side) on Mayor Street Lower	H R O S E	High	0 > 25m	Views from seating in civic square enclosed by tall developments (5 storeys +) with retail outlets at ground level. Hard landscaping features use granite, steel grills and stainless steel bollards with sculptural elements (painted cows). Oak trees used as feature planting.
V8	Clarion Hotel on North Wall Quay	H L V	Moderate	100m (+)	Distant, glimpsed views down tapering pedestrian link (granite flags) towards square on Mayor Street Lower. Enclosed by 8-storey residential development on west and similar height hotel (The Clarion) on east. Large modern steel lampposts (3 storeys high) line eastern side of newly developed pedestrian link.
V9	T-junction at Mayor Street Lower and Guild Street	V H O	High	Track-side	Enclosed views looking west down road (with reclaimed setts) with red brick 5 storey residential development to north side of street and similar height grey reconstituted stone finish office development to south side of Mayor Street. Young avenue of trees line both sides of street (struggling to establish and diseased).
V10	North end of Guild St	H	Moderate	100m (+)	Views down wide cobble sett streets enclosed by 6 storey residential development to west and stone wall with advertisements for proposed Spencer Dock residential development to the east. Glimpsed views of Victorian red brick warehouses on the south side of the Liffey and the Dublin Mountains in the distance.

Table 14.4a (continued)

ID	Receptor Location	Type of Receptor	Sensitivity to Change	Distance from tram	Description of Existing view
CZ2: Spencer Dock					
V11	Guild Street and North Wall Quay corner of works yard	I	Low	75m (+)	Open views over Royal Canal towards derelict site with rubble and pioneer species plant growth. Listed train stop brick warehouses to the east and tall office development enclosing western boundary of the site. Stone arch bridge visible on northern side of site with cranes in the distance piercing the skyline.
V12	Showroom apartment at Spencer Dock	S	Low	75m (+)	Elevated views of V11 with showroom car park and temporary hoarding in foreground.
V13	Stone arch bridge on Sheriff Street	V	Low	100m (+)	Elevated open views over works site towards Listed warehouses and steel fixing rig with rubble, skips, scrub and lengths of rusty track visible in foreground. Site enclosed by new office buildings fronting onto Guild Street with cranes and Dublin Mountains in the distance.
V14	Site entrance to train works yard (North Quay)	V I	Low	100m (+)	Glimpsed views through iron gate over derelict works yard site with associated machinery Wall including a large steel fixing rig mounted on tracks in foreground. Modern residential development (Spencer Dock) under construction to the west of the entry gate. Church and spire over the site to the west with rooftops of East Wall visible to the east in the distance.
CZ3: Dublin Docklands Industrial Area					
V15	Industrial yard off Wapping Street	I	Low	50m (+)	Views over newly laid tarmac access road over industrial ground with high viewing tower, waste tips of rubble in centre and low-level brick storehouses in a state of dereliction in the foreground. Industrial buildings in distance with church steeple visible to the west. Site is enclosed by stonewalls with a palisade gate.
V16	South end of New Wapping Street	V I	Low	100m (+)	Glimpsed views down tarmac street with no higher than 3-storey timber processing and storage plant to east (mortar finish) and temporary hording advertising Spencer Dock residential development to the west with elegant Victorian red brick building owned by Irish Rail in the background. Glimpse of the rooftops and vegetation of East Wall estate in distance.
V17	Crossroads at New Wapping Street and Mayor Street upper	H V	High	Track-side	Enclosed views down cul-de-sac end of Mayor street with typical 2 storey houses along north western side of crossroads. 2 storey houses with boundary wall on north eastern side of crossroads. Church tower visible in background punctuates the sky.

Table 14.4a (continued)

ID	Receptor Location	Type of Receptor	Sensitivity to Change	Distance from tram	Description of Existing view
CZ3: Dublin Docklands Industrial Area continued					
V18	North end of New Wapping Street	V (H)	Low	100m (+)	Views along tarmac road with red brick 2 and 3 storey residential premises lining the east side of street (industrial warehouses further down) and site fencing to Treatment Facilities and Systems Co. on the west. Views over Liffey blocked by red brick warehouse on northern side on North Wall Quay, however this is currently under demolition. Cranes and the Dublin Mountains in the distance visible over the top.
V19	Middle of Mayor Street Upper between New Wapping Street and Castleforbes Road.	I V	Low	Track-side	Enclosed views down concrete road with high (2+ storeys) breeze block walls and mortar finish / concrete warehouses on either side of the street. Upper halves of new residential and office developments in Dublin Docklands Commercial Zone visible in the distance.
V20	Castleforbes Road opposite Alexander Terrace	V I (H)	Low	50m (+)	Views down cobble sett street with temporary hoarding to west and new flats under construction to east. Some residential properties at north end of street. South shore of Liffey and existing development visible with crane and Dublin Mountains in the distance. Pylons, lampposts and electricity wires clutter the sky in the foreground.
V21	Southern end of Castleforbes Road	V R	Low	100m (+)	Enclosed views between 3+ storey high red brick warehouses down cobble set road with smaller developments and storage yard boundary walls behind. More industrial buildings in the distance. This view also represents views from the southern shores of the Liffey.
V22	Eastern end of Mayor Street Upper	H I V	High	Track-side	Looking east down tarmac road with corrugated iron warehouses (Crosbie Transport) to the east of the view and new flats under construction to the west. Some rough scrub outside the warehouse to the east and some vegetation in the front gardens of the residential properties. View ends with the gable wall (now freestanding) of a part-demolished warehouse.
V23	Eastern end of Sheriff St	V	Low	100m (+)	Views through palisade fencing over site works towards corrugated iron warehouses. Enclosed to the west by stone warehouses and to the east by Irish Rail yard enclosed by concrete wall.
V24	The Point car park	R V	Low	50m (+)	Open views over car park with The Point to west, with semi-mature maples outside. View enclosed in foreground by freestanding wall that was once part of a warehouse. Petrol stop to east.

Table 14.4b Predicted Visual Impact at operating stage

ID	Receptor Location	Sensitivity to Change	Change of View During Operation (no mitigation)	Magnitude of Change	Significance of Impact
CZ1: Dublin Dock Commercial Zone					
V1	2 Harbour-master Place near Connolly Stop	Moderate	Close up views of trams and immediate infrastructure, with some support poles and overhead cables seen against the sky. Harbourmaster Place will be reinstated with tarmac.	Moderate	Moderate (negative)
V2	Georges Dock (northern entrance)	Moderate	Views of trams and infrastructure in the wider context revealing staggered spacing between support poles, which are seen against the sky in places. Streetscape improvements in the immediate vicinity also visible.	Moderate	Moderate (negative)
V3	Georges Dock (southern entrance)	Low	Glimpsed views of sections of trams and infrastructure between smaller developments on southern side of Mayor Street Lower. Support poles visible over the top and to a greater extent between smaller developments and set against the context of existing modern developments.	Low	No Significant Impact
V4	Opposite JP Morgan on Mayor Street Lower	Moderate	Luas stop proposed for this area, which includes platforms, shelters, signage, advertising drums, ticket machines and increased lighting that could dominate this enclosed view. Acute viewing angle will cause greater clutter by tall structures the further into the distance they are viewed.	High	Moderate / Substantial (negative)
V5	Inner Dock	Moderate	Views of a short section of trams and infrastructure seen against the existing office development.	Low	Slight (negative)
V6	North end of Commons Street	Low	Glimpsed views of a small section of trams and infrastructure that will slowly filter out as existing planting matures (from acute viewing angle of residential apartments). Trams will increasingly dominate views with proximity.	Low	No Significant Impact
V7	Square (northern side) on Mayor Street Lower	Moderate	Luas stop proposed for this area, which will include platforms, shelters, increased lighting, ticket machines and advertising. This will alter the character of this area segregating it into two. The RPA will be reinstating all areas of displaced setts and street furniture to accommodate Luas works and maintain functionality of the pedestrian area. Possible glimpse views in the distance of the parapets of the proposed canal bridge crossing. These views will be obscured as development continues in the Spencer Dock area.	Moderate	Slight (negative)

Table 14.4b (continued)

ID	Receptor Location	Sensitivity to Change	Change of View During Operation (no mitigation)	Magnitude	Significance of Impact
CZ1: Dublin Dock Commercial Zone continued					
V8	Clarion Hotel on North Wall Quay	Moderate	Part of proposed Luas stop will be visible seen as a plan view from hotel and residential balconies. This will be seen in the context as part of the square from this vantage point and will be set against the existing office developments.	Moderate	Moderate (negative)
V9	T-junction at Mayor Street Lower and Guild Street	High	Close up views of trams and infrastructure, which will be filtered (from ground level not from higher residential and office views) as street planting matures. Reclaimed setts will be replaced by modern setts in this area. Canal bridge crossing will be almost fully in view at street level and will be partly viewed from upper levels of buildings. Windows fronting onto Guild Street will gain maximum views of the bridge.	High	Substantial (negative)
V10	North end of Guild Street	Moderate	Views of a short section of trams and infrastructure that will run through wall into proposed residential development at Spencer Dock, which will enclose the view further, once completed. Overhead cables and support poles will be set against the Dublin Mountains. The bridge crossing will be barely perceptible, filtered through vegetation associated with the proposed canalside linear park.	Low	Slight (positive)
CZ 2: Spencer Dock					
V11	Guild Street and North Wall Quay corner of works yard	Low	A new bridge and route through the site will need to be constructed to accommodate the trams and associated infrastructure. This however will not be visible once the Spencer Docks residential development has been completed. A part of the long section or elevation of the canal bridge parapet will be exposed to view as building work continues. Ultimately the views will be filtered by vegetation associated with the linear park.	High	Slight / Moderate (positive)
V12	Showroom apartment at Spencer Dock	Low	Support poles and cables will be seen against the existing backdrop of residential housing in the distance, however all views will be blocked once Spencer Docks development is completed.	High	Slight / Moderate (positive)

Table 14.4b (continued)

ID	Receptor Location	Sensitivity to Change	Change of View During Operation (no mitigation)	Magnitude	Significance of Impact
CZ 2: Spencer Dock continued					
V13	Stone arch bridge on Sheriff Street	Low	Central new access route will split the site into two and bring extensive upgrading works to the area. Rubble, scrub and dereliction will be cleared and replaced by trams and infrastructure and modern streetscape. (No views after residential development complete). The proposed canal bridge crossing will be partly exposed to view, in particular the long section view of the parapet.	High	Slight / Moderate (positive)
V14	Site entrance to train works yard (North wall Quay)	Low	New access bridge over Royal Canal will enter site at the western foot of modern residential development and dissect the site. Trams and infrastructure will be visible with some of the support poles and cables set against the sky in the east. (No views after residential development complete).	High	Slight / Moderate (positive)
CZ3: Dublin Docklands Industrial Area					
V15	Industrial yard off Wapping Street	Low	Views of new trams stop and associated improvements in lighting and street surfacing. Low-level storehouses and rubble will be cleared to make way for Luas line to link with Mayor Street Upper (outwith the site). (No views after site redevelopment).	High	Slight / Moderate (positive)
V16	South end of New Wapping Street	Low	Distant views of short section of trams and infrastructure, with support poles and cables set against the sky. Will be absorbed by to a great extent by existing lampposts and development.	Low	No Significant Impact
V17	Crossroads at New Wapping Street and Mayor Street Upper	Moderate	Views of new Luas stop. Site wall will be demolished to open up central spine for Luas line through Dublin Docklands. Improved streetscape will be visible. Albeit Mayor Street is straight and leads the eye directly to the proposed bridge crossing, views of the bridge may be slight and partially gained.	High	Moderate / Substantial (positive)
V18	North end of New Wapping Street	Low	Glimpsed distant views of trams and infrastructure with support poles and cables set against the Dublin Mountains. Viewing angle from existing residential premises very acute, therefore reducing the impact.	Low	No Significant Impact

Table 14.4b (continued)

ID	Receptor Location	Sensitivity to Change	Change of View During Operation (no mitigation)	Magnitude	Significance of Impact
CZ3: Dublin Docklands Industrial Area continued					
V19	Middle of Mayor Street Upper between New Wapping Street and Castleforbes Road	Low	Views of trams and infrastructure with trams stop in the distance (just past end of dead end street). Luas line will open up a central corridor making it possible to see at street level as far as the existing commercial area. Improved streetscape as part of overall regeneration will be visible.	High	Slight / Moderate (positive)
V20	Castleforbes Road opposite Alexander Terrace	Low	Glimpsed Views of trams and infrastructure at crossroads on street. Streetscape improvement and street planting will also be apparent however support poles and cables will not be visible over the hoarding once this site is developed. The DDDA and private developers will co-ordinate responses to the Docklands Masterplan objectives regarding tree planting as well as other broad masterplan objectives.	Moderate	Slight (positive)
V21	Southern end of Castleforbes Road	Low	Glimpsed view of a short section of trams and infrastructure. Support poles and cables will be seen against the sky however the existing clutter of overhead wires will absorb them.	Low	No Significant Impact
V22	Eastern end of Mayor Street Upper	Moderate	Views of proposed end terminal at eastern end of docks with tram and associated Luas stop infrastructure. Gable wall to be removed which will open up view to Dublin ferry port. Extensive upgrading of streetscapes part of the regeneration.	High	Moderate / Substantial (positive)
V23	Eastern end of Sheriff Street	Low	Support poles and cables of Luas infrastructure will be visible over the top of the fencing, set against the Dublin Mountains and the skyline. Filtered views of trams and lower parts of infrastructure partially visible through the fencing. (No view after site redeveloped).	Low	No Significant Impact
V24	The Point car park	Low	Views of Luas terminus proposed for this area. Freestanding wall will be removed to open views of a central spine through the docks. Support poles and cables and overhead wires will be seen against the sky.	High	Slight / Moderate (positive)

Table Table 14.4c Predicted Residual Visual Impact (with Mitigation Measures)

ID	Receptor Location	Sensitivity to Change	Change of View During Operation (with mitigation)	Magnitude of Change	Significance of Impact
CZ1: Dublin Dock Commercial Zone					
V1	2 Harbour-master Place near Connolly Stop	Moderate	Close up views of tram and immediate infrastructure with streetscape upgrading. Street trees will filter views of cables attached to buildings.	Low	No significant impact
V2	Georges Dock (northern entrance)	Moderate	Cables visible against the sky with new street tree planting to either side of bridge. The DDDA and private developers will co-ordinate masterplan objectives including street tree planting for the Docklands Area. Original features of George Dock retained.	Low	No significant impact
V3	Gorges Dock (southern entrance)	Low	Filtered, glimpsed views of sections of trams and infrastructure between smaller developments on southern side of Mayor Street Lower. Cables visible over the top of smaller developments and set against the context of existing modern developments.	Low	No Significant Impact
V4	Opposite JP Morgan on Mayor Street Lower	Moderate	Luas stop proposed for this area. Swan neck lights retained and used to support cables. Stop furniture thoughtfully placed to minimise clutter and promote safe pedestrian movement in this narrow space. Planting and material selected to define the area and give it a unique character.	Moderate	Moderate (negative)
V5	Inner Dock	Moderate	Cables seen against existing buildings and screened by street trees down access roads. Small section of streetscape upgrading also visible.	Low	Slight (negative)
V6	North end of Commons Street	Low	Cables obscured by increased street planting down Commons Street.	Moderate	Slight (positive)

Table Table 14.4c (continued)

ID	Receptor Location	Sensitivity to Change	Change of View During Operation (with mitigation)	Magnitude of Change	Significance of Impact
CZ1: Dublin Dock Commercial Zone continued					
V7	Square (northern side) on Mayor Street Lower	High	Luas stop proposed for this area, which will include a slightly platform, shelters, increased lighting, ticket machines and advertising. Stop furniture placed to retain singular character of the square and lighting placed on north side of road to reduce glare to residents. Original setts used to pave Commons Street to offset loss. Any glimpse views of the bridge structure that will be gained will be seen as having a positive visual impact. These views are likely to be lost as Spencer Dock develops fully.	Moderate	Moderate / Substantial (negative)
V8	Clarion Hotel on North Wall Quay	Moderate	Views obscured by street planting down tapering pedestrian access route.	Low	Slight (positive)
V9	T-junction at Mayor Street Lower and Guild Street	High	Existing street planting increased upon and cables attached to building to reduce linear clutter, which would be amplified from this viewing angle. Views of the bridge structure that will be gained at short range will be seen as having a positive visual impact owing to its presence as a carefully designed landmark feature.	Moderate	Moderate / Substantial (negative)
V10	North end of Guild Street	Moderate	Views obscured by street planting. Any glimpse views of the bridge structure that will be gained will be seen as having a positive visual impact.	Moderate	Moderate (positive)
CZ2: Spencer Dock					
V12	Showroom apartment at Spencer Dock	Low	Views of the trams, infrastructure, streetscape improvements and new street trees. All views will be blocked once Spencer Docks development is completed.	High	Slight / Moderate (positive)
V13	Stone arch bridge on Sheriff Street	Low	Views of the trams, infrastructure, streetscape improvements and new street trees. All views will be blocked once Spencer Docks development is completed. Any partial views to be gained of the canal bridge crossing will be considered to have a beneficial visual impact.	High	Slight / Moderate (positive)

Table Table 14.4c (continued)

ID	Receptor Location	Sensitivity to Change	Change of View During Operation (with mitigation)	Magnitude of Change	Significance of Impact
V14	Site entrance to train works yard (North wall Quay)	Low	Views of the trams, infrastructure, streetscape improvements and new street trees. All views will be blocked once Spencer Docks development is completed.	High	Slight / Moderate (positive)
CZ3: Dublin Docklands Industrial Area					
V15	Industrial yard off Wapping Street	Low	Views of new stop and associated improvements in lighting, street surfacing and street trees. (No views after site redevelopment).	High	Slight / Moderate (positive)
V16	South end of New Wapping Street	Low	Views obscured by new street planting.	Moderate	Slight (positive)
V17	Crossroads at New Wapping Street and Mayor Street Upper	Moderate	Views of new Luas stop. Site wall will be demolished to open up central spine for *Luas* Line through Dublin Docklands. Improved streetscape and extensive planting as part of overall regeneration will be visible. Any part of the proposed canal bridge crossing will be screened by avenues of trees proposed as mitigation.	High	Moderate / Substantial (positive)
V18	North end of New Wapping Street	Low	Views obscured by new street planting.	Moderate	Slight (positive)
V19	Middle of Mayor Street upper between New Wapping Street and Castleforbes Road	Low	Views of trams and infrastructure with stop in the distance (just past end of dead end street). Alignment will open up a central corridor; however, street planting will absorb the full extent of the development and cables will be secured to the new developments, such that support poles will only stretch to New Wapping Street.	High	Slight / Moderate (positive)
V20	Castleforbes Road opposite Alexander Terrace	Low	Glimpsed Views of trams and infrastructure at crossroads on street partially filtered by street planting. Displaced original cobbles can be used to repair southern end of Castleforbes Street.	Moderate	Slight (positive)

Table ***Table 14.4c (continued)***

ID	Receptor Location	Sensitivity to Change	Change of View During Operation (with mitigation)	Magnitude of Change	Significance of Impact
V21	Southern end of Castleforbes Road	Low	Views obscured by street planting.	Low	No Significant Impact
V22	Eastern end of Mayor Street Upper	Moderate	Views of proposed end terminal at eastern end of docks with trams and associated stop infrastructure. Gable wall to be removed which will open up view to Dublin ferry port. Materials and planting will give the terminal its own unique character and furniture will be carefully placed to reduce clutter so the terminal can enhance the area further.	High	Moderate / Substantial (positive)
V23	Eastern end of Sheriff Street	Low	Support poles of Luas infrastructure will be visible over the top of the fencing, set against the Dublin Mountains and the skyline. Filtered views of trams and lower parts of infrastructure partially visible through the fencing and street trees. (No view after site redeveloped).	Low	No Significant Impact
V24	The Point car park	Low	Views of Luas terminus proposed for this area. Freestanding wall will be removed to open views of a central spine through the docks. Opportunity to use extensive planting and hard landscaping to mirror the existing character of the regenerated The Point.	High	Slight / Moderate (positive)

Figure 14.2a Landscape character zones

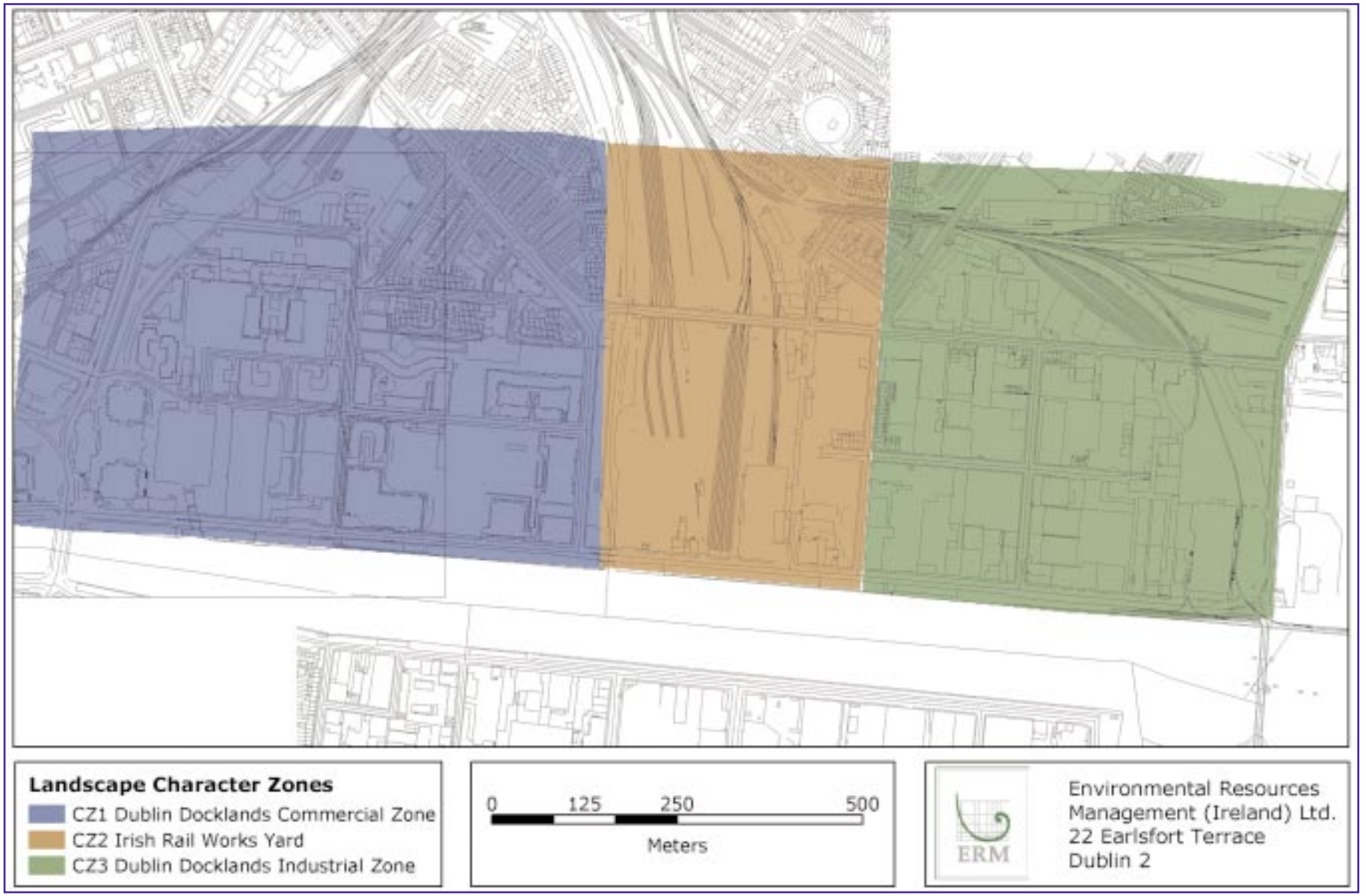
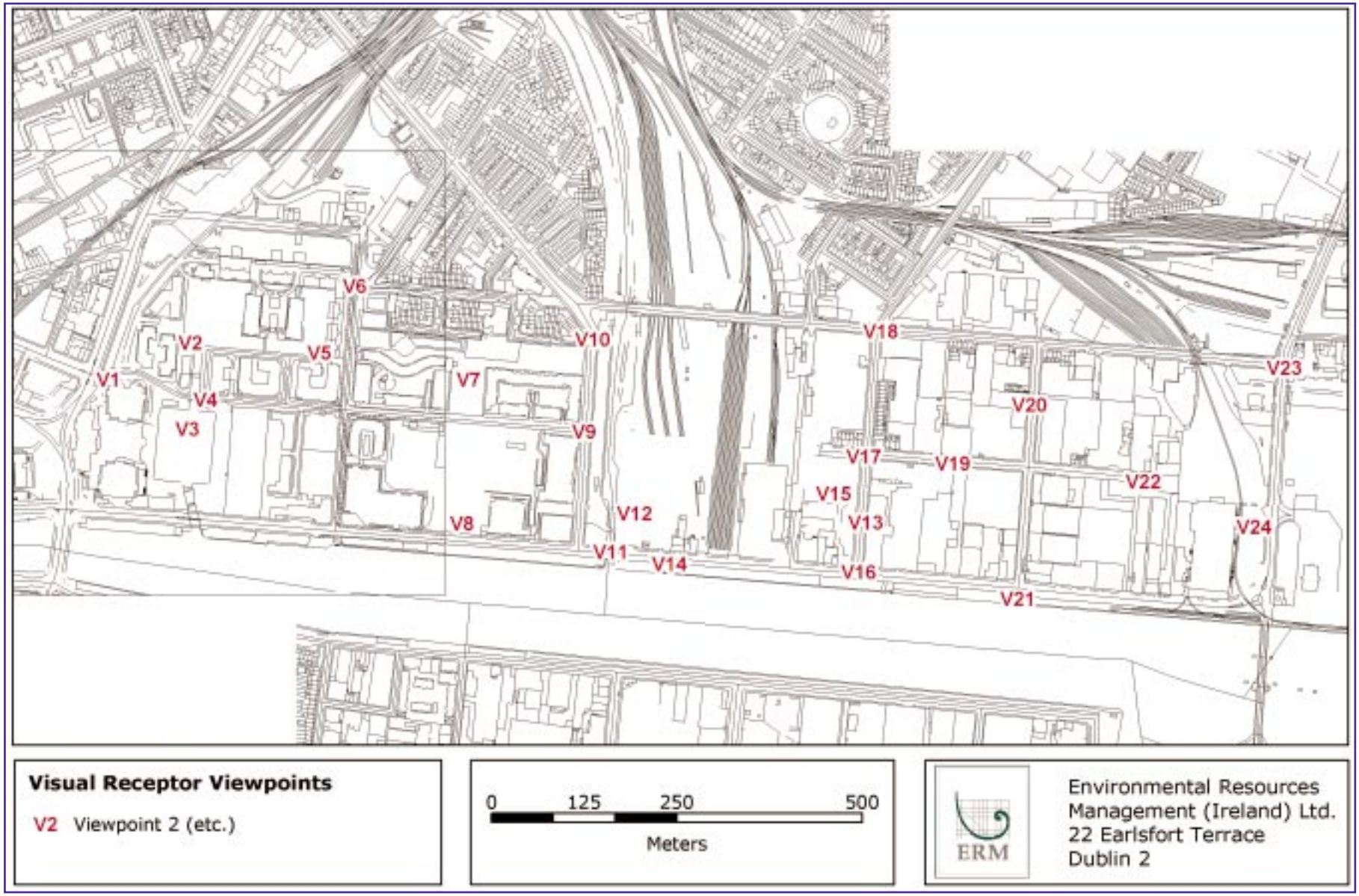


Figure 14.3 Visual Receptor Viewpoints



Chapter 15

15 CULTURAL HERITAGE

15.1 Introduction

This chapter outlines the archaeological and historical context of the area through which the Luas Line C1 is to be developed.

There are no archaeological monuments recorded in the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP) as being present on the route of the proposed Luas line. The nearest recorded archaeological sites include the quays and North Wall, and a mill site at Talbot Street. Amiens Street forms the eastern boundary of the historic City of Dublin (DU018:020).

15.2 Methodology

15.2.1 Overview

The purpose of this assessment was the identification and assessment of the potential impacts associated with the proposed Luas Line C1 extension on the archaeological, cultural and historical resources of the area.

For the purposes of assessing potential impacts upon cultural heritage, the assessment has focused upon the following resources:

- all sites of archaeological interest:
- all pre-1950 buildings and structures;
- selected post-1950 buildings and structures of high architectural, cultural and historical significance and interest; and
- landscape and townscape features including sites of historical events or those that provide a significant historical record or a setting for buildings or monuments of architectural or archaeological importance, historic landuse patterns, tracks and cultural elements such as sites referenced in folklore, legend, etc.

The geographical scope of the assessment comprises the proposed alignment of Line C1 plus land within a corridor 500m either side of the alignment. Information relating to sites and features outside of this core area will be referenced where these provide insights or parallels to the wider historical, cultural or archaeological context.

15.2.2 Key Tasks

In September 2000, Dúchas, the Heritage Service, issued guidance on undertaking archaeological assessments within the EIA process, which emphasised the following:

- documentary and cartographic research regarding the location of the proposed development with particular reference to the archaeological landscape;
- site visit(s) to assess the nature of the development and its impact on archaeological monuments, features and possible deposits;
- a detailed record of any upstanding monuments that will be affected by the development;
- recommendations with regard to visual amenity of the development in relation to the archaeological landscape; and
- recommended mitigation measures to protect archaeological deposits/features.

These requirements formed the basis of the methodology developed and implemented during the assessment of cultural heritage impacts.

In 2004, the Department of the Environment, Heritage and Local Government published the *Architectural Heritage Protection Guidelines for Planning Authorities* under Section 28 and Section 52 of the *Planning and Development Act 2000*. The guidelines relate to development objectives:

- for protecting structures or parts of structures, which are of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest; and
- for preserving the character of architectural conservation areas.

Under Section 28 of the Act, planning authorities (including An Bord Pleanála) are required to have regard to the published guidelines in the perform-

ance of their duties.

The baseline investigations involve the compilation and collation of an inventory of recorded historic and cultural resources (including upstanding and buried archaeological resources) of the route alignment and surrounding area.

15.2.3 Principal Sources

The following sources were used during the assessment of impacts to cultural heritage:

Sites and Monuments Record (SMR) of the National Parks and Wildlife Service (formerly Dúchas) and the Office of Public Works. The SMR forms the basis for the statutory Record of Monuments and Places (RMP), which is the list of all archaeological monuments protected under the National Monuments Act (Appendix 1).

The *topographical files of the National Museum of Ireland (NMI),* these identify recorded stray finds, provenanced to townland or city ward or street, and are held in the museum's archive. Very few finds have been recorded in the study area.

the Dublin City Development Plan (2005) was consulted to identify buildings, features, sites and other structures listed for preservation or protection. The policy for the listing of buildings for preservation or protection is set down within this plan, although this has been superseded by the Architectural Heritage Act 1999 which regards all buildings and architectural features listed in the Development Plan as protected structures. In addition, the Planning and Development Act, 2000 (Section 57) prevent developments from materially affecting any protected structure or unique elements of the structure and this will be taken into account when designing the layout of the preferred route.

Docklands North Lotts: Planning Scheme 2002 with regard to protected structures.

Members of the study team undertook an initial site visit and walkover in the autumn of 2001; the area was revisited during the summer of 2003 to identify any notable changes. In addition, a review of current planning documents was undertaken during the spring of 2005 to identify whether any further listings or designations had been made in the interim period.

15.2.4 Limitations

As this was essentially a desktop review and site walk over, no intrusive archaeological investigations were carried out. Nonetheless, this desktop approach is sufficient for this stage in the assessment process.

15.3 Description of the Receiving Environment

15.3.1 Local History

The North Strand was, until the eighteenth century, a 'remote wasteland' between the high and low tide watermark (De Courcy 1996, 270). Although the city developed throughout the seventeenth century towards the south, it was only following the establishment of the quays on the banks of the Liffey in the eighteenth century that development spilled eastward onto ground that had been a floodplain in the seventeenth century.

During the medieval period the shoreline extended from a small promontory near the Abbey Theatre to the corner of Amiens Street and Store Street. It continued along Amiens Street as far as its junction with Portland Row and Seville Street, then ran between Ballybough Road and North Strand Road to Luke Kelly Bridge and on to Fairview and Clontarf towards Sutton (De Courcy 1996). The land above high tide consisted of coarse river meadows and would have been dotted with shrubs and trees.

The building of the North Wall (DU018:020564) began in 1710, and in 1717 the city allocated the new land, which was known as the North Lotts, east of the North Strand to one hundred and thirty two individuals.

The reclamation of the area between the city and Ringsend on the southern side of the Liffey was accelerated by the granting of an estate along the strand in 1713 to Sir John Rogerson, who immediately began to enclose his new land with a massive

sea wall, thus relieving the newly established Ballast Office of the responsibility. Plans were made to extend Rogerson's wall out into the bay to provide safer entry for shipping into the port, allowing the Ballast Office to concentrate its efforts on the northern bank of the river, and as early as May 1712, work commenced along the line of the present-day Eden and Custom House Quays. As the northern wall began to extend further into the eastern sloblands, the City Assembly ordered that the area between the Tolka and the Liffey rivers, along with the sloblands between the Tolka and Clontarf, be re-surveyed and notionally divided into 132 lots, to be known as the North Lots (*Calendar of Ancient Records of Dublin* vii, 30-34).

The survey was carried out by Macklin in 1717, and the resultant schematic map (known as Bolton's Map after the sitting lord mayor) shows both the plots themselves and the names of the initial lease-holders. The best illustration of what the City Assembly intended, is Rocque's *Plan of the city of Dublin and the environs* (1756), published just as the reclamation project should have been nearing completion.

Rocque depicts the great North Wall as having an underlying strand extending eastwards for over half its length, fronted a wide quayside, with Mayor Street running parallel to the north. These two thoroughfares were linked by six streets, spaced at regular intervals: an unnamed street to the west, Commons Street, Guild Street, Wapping Street, Fish Street and the East Wall; the areas in between were divided into plots as indicated on the earlier Bolton's Map. Further to the north lay Sheriff Street, again linked to the waterfront by connecting streets that terminated along its line. The plots between Mayor Street and Sheriff Street were wider than those on the waterfront and were possibly laid out to accommodate the larger houses of the new inhabitants. The area north of Sheriff Street is laid out in larger plots that were accessible from The Strand to the west and from West Road, Church Road, East Road and the East Quay, all angled off Sheriff Street, to the northeast. A pool of water is depicted in the northeastern corner of the polder, while there still appear to be streams running through the northern part of the area, indicating the unfinished state of the reclamation work. The original idea to extend the polder across the Tolka and to lay out the area as far as Clontarf had been abandoned by the 1730s, and the Tolka was never channelled into a canal. Reclamation in this area did not commence until the early years of the twentieth century (Myles 2000).

Following the building of the North Quay wall from 1710, the development of the North Strand Road, originally known as the Strand, and Amiens Street began. This was an important thoroughfare, and in 1717 the Corporation recommended that 'the road or strand leading from the Abbotts [Mabbot's] Wall toward Ballybough Bridge be all eighty feet wide' (De Courcy 1996, 270). Before the end of the century, the Wide Streets Commission had begun to use the name North Strand. In the final decade of the eighteenth century, following the building of the Custom House and the development of Beresford Place, the city end of North Strand was relocated at the junction of Store Street and Amiens Street. There had been virtually no building along the North Strand during the eighteenth century; however, building continued steadily throughout the succeeding century. The Ordnance Survey map of 1838 shows the west side largely complete, although the east side was undeveloped except in the vicinity of modern Seville Place. The use of the name, Amiens Street, had been adopted by the Wide Streets Commission by 1826, and applied to that portion of the North Strand from the junction of Portland Row and Seville Place to the city. The street was renamed after Viscount Amiens, created Earl of Aldborough in 1777, who in 1796 built Aldborough House on Portland Row (Sutton 2000).

15.3.2 Buildings of Artistic, Historic and Architectural Merit

The entire historic core of Dublin is given one generic number in the SMR and RMP: DU018:020. All sites within this historic core are prefixed with this code and are then given their own unique

number, e.g. site 505 within the historic core is listed as DU 018:020505. The maps relevant to the proposed development are sheet 3264D of the Dublin 1:5,000 series, and Sheet 18 of the original Ordnance Survey six-inch maps.

Table 15.3a presents the sites recorded in the general area around the C1 Luas Line.

Table 15.3a Buildings of Artistic, Historic and Architectural Merit

Location: Talbot Street Site Type: ***Tide mill and mill pond (site of)*** RMP No. DU018:020501 NGR: 31646/23489 Map No. 3264D Comment: A tide mill is one in which water is let into a basin at high tide, dammed, and allowed to flow as the tide ebbs, thus driving a mill wheel. Phillips's map of 1685 shows an extensive tidal pool, which he described as a millpond, between Mabbot's corner and the future Mabbot Street (at high tide, two large pools lay behind the shoreline between the Portland Row and Amiens Street junction), suggesting that the mill lay behind Mabbot's Wall and near Mabbot Street. Rocque makes no reference to Mabbot's mill in his map of 1756, as by this time the millpond had been filled in to become pasture and gardens.
Location: Abbey St Lower/Amiens St Site Type: ***Sea wall (site of)*** RMP No. DU018:020505 NGR: 31646/23463 Map No. 3264D Comment: The sea wall built here is the most southerly element of what was to become the North Strand. A wall is shown at this point on de Gomme's map of Dublin.
Location: Custom House Quay/North Wall Quay Site Type: ***Quay*** RMP No. DU018:020564 NGR: 31801/23439 Map No. 3264A/B Comment: This section of the northern city quays was walled from 1710 onwards.

15.3.3 Archaeological Finds

The National Museum records very few finds from this area. An iron knife (NMI ref. 1954:168), possibly Viking or medieval in date, was found on a gravel bed, presumably the old foreshore, during the digging of the foundations for the church on Church Road in East Wall. During the dredging of Dublin Harbour, between the Bull Wall and the North Wall extension in 1970, a wooden boat was discovered. Although the workmen were not able to lift the boat, they did recover a rim sherd of red pottery, part of a thin copper vessel, clay pipe fragments (NMI ref. 1970:190–197) and a quantity of animal bones.

15.3.4 Protected Structures within the Study Area

The Dublin City Development Plan (2005) lists a number of structures within this area that are to be preserved or protected. This legislation has been superseded by the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999, which includes all listed buildings and structures as protected structures. These structures are marked on maps E and F of the Dublin City Development Plan.

As the *Table 15.3b* indicates, most of the buildings in this area are mid-nineteenth century or later, as one would expect from the date of development of the area after its reclamation from the sea. The sites in bold are those situated on the proposed route. The sites in plain text are in the general area around the proposed routes.

Table 15.3b Protected Structures within the Study Area

Ref.	Street	Description
99	Amiens Street	North Star Hotel
100	**Amiens Street**	**Connolly Station: all 19th-century portions of the main railway station complex**
280	Royal Canal	Two swing bridges on North Wall Quay over the Royal Canal
2135	**Custom House Quay**	**Stack A, Stack C (vaults), warehouse**
2136	**Custom House Quay**	**Harbourmaster public house**
2137	**Custom House Quay**	**Swing bridges**
2138	**Custom House Quay**	**The Custom House**
3205	**George's Dock**	**Limestone ashlar dock walls with granite copings, granite and cast iron bollards, steps, lock gates, cast iron mooring rings, ladders and winches**
4062	**Inner Dock**	**Limestone ashlar dock walls with granite copings, granite and cast iron bollards, steps, lock gates, cast iron mooring rings, ladders and winches**
5166	**Mayor Street Lower**	**Former excise building**
5942	North Wall Quay	Royal Canal Swing Bridges
5943	North Wall Quay	Two Swing Bridges
5944	North Wall Quay	Granite ashlar quay walls with granite copings, stone setts, bollards, steps, lock gates, mooring rings, lamp standards and machinery
5945	North Wall Quay	The Wool Store and hexagonal lantern
5946	North Wall Quay	Former British Rail Hotel
5947	North Wall Quay	Granite Walls at British Rail Hotel; railings, gates, and adjoining setts in cul-de-sac
5948	North Wall Quay	Former goods depot (The Point)
5949	North Wall Quay	CIÉ goods depot, including curved wall and chimneys
5950	North Wall Quay	No. 47, Campion's public house
5951	North Wall Quay	No. 73, façade
5952/3	North Wall Quay	Nos. 81, 82, business premises
8020	Store Street	Busáras
8021	Store Street	Coroner's Court; façade

Among the earliest structures in the area are the Inner Dock, George's Dock and Spencer Dock, all of which were part of the initial infrastructural development of this area, half a century in advance of the railways. *Figure 15.3a* illustrates the location of the protected structures within the study area.

Access to George's Dock is via a 70m channel and lock leading from the Liffey at an angle of approximately 70 degrees. Another channel, 86m in length, leads into the Inner or Revenue Dock, part of which is now partly occupied by one of the Financial Services Centre buildings. The continuous route along the North Wall Quay across the entrance to George's Lock was originally maintained by a swing bridge, which was replaced in 1935 by twin cast iron Scherzer bridges, similar to those at the entrance to the Royal Canal at Spencer Dock. Of the buildings associated with Custom House Docks, Stack A, the Tobacco Store is currently undergoing restoration, while only the vaults of stack C survived the area's redevelopment for the IFSC.

Luas Line C1 will cross the replacement bridge between George's Dock and the Inner Dock, and the docks themselves would be the only protected structures directly impacted upon by the proposed development. A section of the proposed route also crosses the Royal Canal Dock (at the southern end of Spencer Dock) at Wapping Street. The dock was originally traversed by a bridge (as shown on the first edition Ordnance Survey maps) before the severance of Lower and Upper Mayor Street by the construction of the railway yards to the east of the dock. The second edition Ordnance Survey map shows the bridge was subsequently removed.

The perimeter of George's Dock and the Harbourmaster Public House are also in a small Conservation Area, under the Dublin City Development Plan, (2005). This designation places restrictions upon the external appearance of developments in this area, which, as a rule, must not materially affect the character of the area. The Plan also lists Mayor Street Lower, Guild Street and Sheriff Street Lower as being streets where all stone setts are to be retained, restored or reintroduced.

The Docklands North Lotts: Planning Scheme (2002) lists the following structures along the proposed route that require protection:

- Canal Dock at Spencer Dock;
- Stone Setts on Guild Street;
- Stone Setts on Mayor Street Upper, east end;
- Stone Setts on Castleforbes Road;
- Stone Setts in the former railway yard adjoining Spencer Dock; and
- The Point at East Wall Road.

The stone setts located on Castleforbes Road and on Mayor Street Upper are the closest protected structure to Luas Line C1, being located to the south of the tracks.

15.3.5 Archaeological Cartographic Evidence

As described above, Dublin developed on the edge of the tidal mudflats of the Liffey delta, and this part of the city was not reclaimed until the late seventeenth century. Speed's map of Dublin (1673) shows the city on the northern side of the Liffey extending no further east than the approximate line of what would eventually become O'Connell Street.

The map entitled 'The City and Suburbs of Dublin from Kilmainham to Rings-End' by Bernard de Gomme, dated to 1673, shows the 'Road to *Howth*', and shows the bay extending from the Strand (now the North Strand Road) in a series of tidal islands, as the quay walls were yet to be built. A wall shown by de Gomme running along the Strand road is believed to be Mabbot's Wall, mentioned above. A second map described as 'A Map of Dublin Harbour 1673' also by de Gomme describes all of the area now comprising O'Connell Street, Gardiner Street and Abbey Street as 'marsh ground' (De Courcy 1996).

Charles Brooking's map of 1728 records that the North Quay wall had been built by this time. The area was still liable to flooding and the area behind the North Wall Quay and Custom House Quay, nei-

ther of which is named, is marked 'This Part is Walled in but as yet over flow'd by ye Tide.' Development up to this date has been contained to the west of Strand Road, which is also unnamed. One structure to the east of this road appears to be located on what is now Beresford Place or in the grounds of the Custom House. Mabbot Street, now Corporation Street, is first named by Brooking.

The plots of land known as the North Lotts, which were laid out to the rear of the North Wall, are recorded on Rocque's 1756 map of the city of Dublin. The only identifiable structures recorded by Rocque on the newly reclaimed ground are a glasshouse on the quays (DU018:020152), and 'The Pound', an enclosure for the detention of stray animals, shown where the entrance to the Connolly Station vehicle ramp previously stood. Rocque also shows The Strand, the newly laid-out Sheriff Street ('Sherriff Street') and Mayor Street, which are divided into narrow lots. The reclaimed land ends at what is named East Quay.

Duncan's map of Dublin, published in 1821, shows no additional reclamation, but does indicate that the newly reclaimed land was being rapidly developed. The Custom House is shown, as is the newly completed Royal Canal. The Royal Canal Dock and Spencer Dock, and the Old Dock (beside the Custom House), Inner Dock and Richmond Dock are all shown.

The first edition Ordnance Survey six-inch map shows increased development around the docks, with timber yards, warehouses, and a variety of industries extending down the North Wall. Mayor Street is a continuous line from Commons Street to the East Wall Road, although the dotted lines along parts of the street suggest the area had not been fully developed. There is a 'Baths' shown at the junction of Mayor Street and East Wall Road.

By the time the second edition Ordnance Survey map was produced in 1875, the 'Drogheda Railway Terminus' had been constructed, but the Station vehicle ramp, constructed in 1875, would not be recorded until a later addition, published in 1889. An enclosing wall around the site of the new terminal on the second edition continues along the line of Amiens Street to Store Street. This map shows extensive stores around the new Dublin and Drogheda line (subsequently the Great Northern Railway) terminus, including goods stores, a tobacco store (Stack A), a sugar store, and two 'Spirit Vaults'. One of the main effects the railways had was to interrupt the streets running down through North Wall; while bridges were built over Sheriff Street, Mayor Street was divided between Mayor Street Lower to the west of the Royal Canal, and Mayor Street East to the east of the London and North Western Railway Station. The street was also truncated at the eastern end by the Great Southern and Western Railway station.

In addition to the Dublin and Drogheda terminus, two other termini were also built: the London and Northwestern Railway with its stations between the Grand Canal Docks and Wapping Street, and the Great Southern and Western Railway, with a station between East Wall or East Quay and North Wall. Further land had been reclaimed by the late nineteenth century and further slips and yards are shown to the east of the East Wall.

As the Wide Street Commissioners laid out Store Street and Beresford Place during the late eighteenth century, a terrace of vast warehouses was erected on what was subsequently the site of Busáras (McCullough, 1989). On the 1847, 1866 and 1889 Ordnance Survey map editions, the warehouses, comprising 'Old tobacco stores' and 'Stores for general goods' extend across Amiens Street at its junction with Store Street. The Old Dock beside the Customs House was not filled in until 1927, and only as recently as 1952 was Beresford Place extended over the new ground to enclose the Custom House in a semicircular street. This extension also branched northwards to meet the junction of Store Street and Amiens Street to form Memorial Street.

15.3.6 Site Inspection

The Luas Line C1 route was walked in November 2001 and August 2003.

The route begins at Connolly Station. The route then runs past the IFSC and over the bridge at Harbourmaster Place, between the two Custom House Docks. The route then crosses Commons Street, and runs down Mayor Street past the former excise building (now a bar) (*image below*). There are several surviving areas of cobbling along Mayor Street. The wall along Spencer Dock at Guild Street is in very good condition, but appears to have been rebuilt in places, as some areas are of roughly coursed limestone, while other areas are string coursed.

Excise Bar, IFSC

Spencer Dock is somewhat dilapidated, although the Scherzer bridges are in good condition, and the dock is relatively clear of debris. The area where Mayor Street crossed the canal is rather disturbed and has been partly rebuilt. The canal is tidal as far as the first lock at Newcomen Bridge. The rest of the western side of the yard is largely derelict, although some cobbling and railway tracks survive, and the eastern side of the yard is still in use by CIÉ. This area is currently under redevelopment.

The boundary wall on New Wapping Street is lower than that on Guild Street and although it appears to be well built, it sags in places. Mayor Street Upper continues eastwards from a small truncated portion to the west of New Wapping Street, past several terraces of houses on the junction between the two streets, which are shown on the 1935 OS six-inch map, but not on the second edition.

Mayor Street Upper continues eastwards through somewhat dilapidated yards and warehouses. There are extant areas of cobbling, as at the junction with Castleforbes Road. The street peters out to the rear of some warehouses built to the rear of The Point. The IFSC buildings at Harbourmaster Place are visible from the end of the street.

15.4 Likely Evolution of Environment in Absence of Development

As the area through which the Luas Line C1 extension is planned to pass is scheduled for considerable redevelopment over the forthcoming 10-15 years, some disturbance to subsurface archaeological deposits is likely even in the event of the Luas Line C1 not proceeding.

15.5 Potential Impacts of the Proposed Development

15.5.1 Overview

With the exception of a few sites at the far western end of the route, there are no archaeological features recorded within the study area.

The nearest recorded archaeological sites include the Quays and North Wall, and a mill site at Talbot Street. Amiens Street forms the eastern boundary of the historic City of Dublin.

15.5.2 Construction Impacts

Excavation works will take place along the Luas Line C1 route for the preparation of foundations, installation of tracks, associated services and drainage, hard surfaces and landscaping.

Although such disturbance of subsurface deposits has the potential to impact upon features of archaeological significance, much of the route is to be constructed over areas of fill material imported into the area during reclamation works in the eighteenth and nineteenth centuries. As such the likelihood of construction works revealing archaeological deposits is considered slight but should such features be identified, due process will be implemented.

The construction works may result in the disturbance of the protected stone setts in Castleforbes Road and Mayor Street Upper; in circumstances where such disturbance is unavoidable, cobbles will be removed, under supervision, for reinstatement following the completion of construction works.

15.5.3 Operation Impacts

There are no archaeological features recorded within the study area.

Buildings of historical interest such as the Excise building on Mayor Street would not appear to be effected by the operational phase other than by the appearance of wires.

Luas Line C1 will have no significant direct or indirect impact on these monuments or their settings.

15.6 Mitigation Measures

The recommendations in this report are subject to discussion with and approval from the National Parks and Wildlife Service, the City Archaeologist, and the relevant local planning authority.

The RPA will ensure full adherence to the relevant sections of National Monuments Legislation (1930–1994) and Architectural Heritage legislation (1999), which state that in the event of the discovery of archaeological finds or remains, the Office of Public Works (formerly Dúchas) and the NMI should be notified within four days.

The recently published statutory Architectural Heritage Protection, guidelines for Planning Authorities (2005) requires that proposals to widen sections of a bridge that is a protected structure should ensure the least possible structural and visual damage to the bridge. However, the George's Dock bridge is not a protected structure. Elsewhere within the guidelines, where work to canals is considered, the minimum possible impact is required and expert advice is identified as a possibility. The RPA has considered this in the design of the route alignment.

The RPA will make appropriate provision to allow for and fund whatever archaeological work may be needed on the site if any remains are noted after topsoil removal.

15.7 Predicted Residual Impacts of The Proposed Development

The new route will have a positive benefit, in that it will restore Mayor Street to its former length, rejoining Upper and Lower Mayor Street after their one hundred and fifty year severance by the railway yard, which is now largely derelict, although there are some railway buildings, tracks and cobbling of historical and architectural interest still on the site. This will reinstate the street as shown by Rocque; whose maps show the street as it was laid out immediately after the reclamation project was

completed. The bridge that originally crossed over Spencer Dock or Royal Canal Dock, which was removed in the mid-nineteenth century will need to be reinstated to allow the tram to cross the dock.

There are relatively few features that would be directly affected by the route under consideration, and these are listed in the preceding tables. Buildings of historical interest such as the excise building on Mayor Street would not appear to be effected other than by the appearance of wires, as there is to be no structural element attached to or situated immediately in front of such buildings, these would not be adversely affected by the construction of Luas Line C1. General features of interest that should be restored or reinstated after construction would include kerbing or cobbling where encountered along the route, Commons Street and Mayor Street Upper and Lower.

15.8 Conclusions

The route discussed in this report crosses an area of land that was reclaimed from the tidal mudflats at the mouth of the River Liffey from the early eighteenth century onwards. The area is characterised by industrial and infrastructural activity including the Royal Canal Docks, the Custom House Docks and several railways and rail terminals. With the exception of a few sites at the far western end of the proposed route, there are no archaeological features recorded within the study area.

This route option has the advantage of avoiding the early eighteenth century docks, and their associated cobbling quay walls, and other features protected by the Architectural Heritage legislation. Overall the route option is more in keeping with the industrial heritage of the area, confining the light rail system to the area of Connolly Station and avoiding the earlier dockland features.

Harbourmaster Pub

Scherzer Bridge

Custom House

Figure 15.3a Protected Structures

Chapter 16

16 CUMULATIVE AND CROSS-MEDIA IMPACTS

16.1 Scope of Assessment

The scope of this chapter of the EIS has been derived through reference to the EPA's *Guidelines on the Information to be contained in environmental Impact Statements (2002)* and the European Commission's *Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions (E.C. 1999).*

The purpose of this chapter is to determine the inter-relationships between Luas Line C1 and the various affected environmental media. This includes cumulative impacts (impacts which accumulate over space or time to generate a larger overall impact), cross-media impacts and other impact interactions.

The EC Guidelines state why this is an important part of the EIA process:

"An impact which directly affects one environmental medium may also have an indirect impact on other media (sometimes referred to as cross media impacts). This indirect effect can sometimes be more significant than the direct effect."
(E.C. 1999, p8)

For example, in the absence of the analysis of indirect impacts, insignificant amounts of soil entering the canal may not constitute a significant impact, however in combination with an increase in vibration levels, the cumulative impact on aquatic species may be more significant.

The scope of study therefore covers all of the aspects of the proposed development and all of the environmental media described in *Chapters 6-15.*

16.2 Methodology

There are several methods by which cumulative impacts, cross-media impacts and impact interactions can be identified and evaluated. Key to best practice in the evaluation and resolution of these aspects is their consideration throughout the EIA process, thereby ensuring that due account is taken of how the proposed development may affect the various environmental media and of how the project design may be altered to take any significant impacts into account.

Following the completion of the various EIA technical studies, a validation process was initiated using a summary matrix that allowed the impacts of certain project activities (*e.g.* excavation, traffic movements) upon certain environmental media (*e.g.* ecological resources, water resources and quality) to be presented in a readable format. The matrix is presented as *Figure 16.3a* below.

For the purposes of this section, the "receiving environment" is defined as all aspects of the environment that are described in *Chapters 6-15*. As such, the geographical scope of the assessment is variable with certain impacts not going beyond the immediate footprint of Luas Line C1 (*e.g.* impacts on archaeology), whilst others may have impacts at a distance from the site (*e.g*. noise, traffic and transport etc.).

16.3 Impact Interaction Matrix

The proposed development includes both the construction and operational phases. These have been sub-divided into aspects of the development that were identified as being sources of impacts in *Chapter 6-15*. These impact sources form the vertical axis of the matrix in *Figure 16.3a* and are structured as described in *Table 16.3a*.

Table 16.3a Potential Sources of Impacts

Stage of Development	Source of Impact
Construction	General Construction Works (inc. utility diversion)
	Re-direction of Traffic
	Movements of Construction Traffic
	Changes to local access
	Erection of temporary ancillary developments
	Employment opportunities
	Accidental spillages of chemicals
	Removal of vegetation
	Removal and disposal of soil
	Installation of hardstanding areas
Operation	Movement of LUAS vehicles on-street
	Changes to traffic flow
	Changes to local vehicular access
	Changes to city-wide access
	Access for pedestrians and cyclists
	Presence of permanent structures

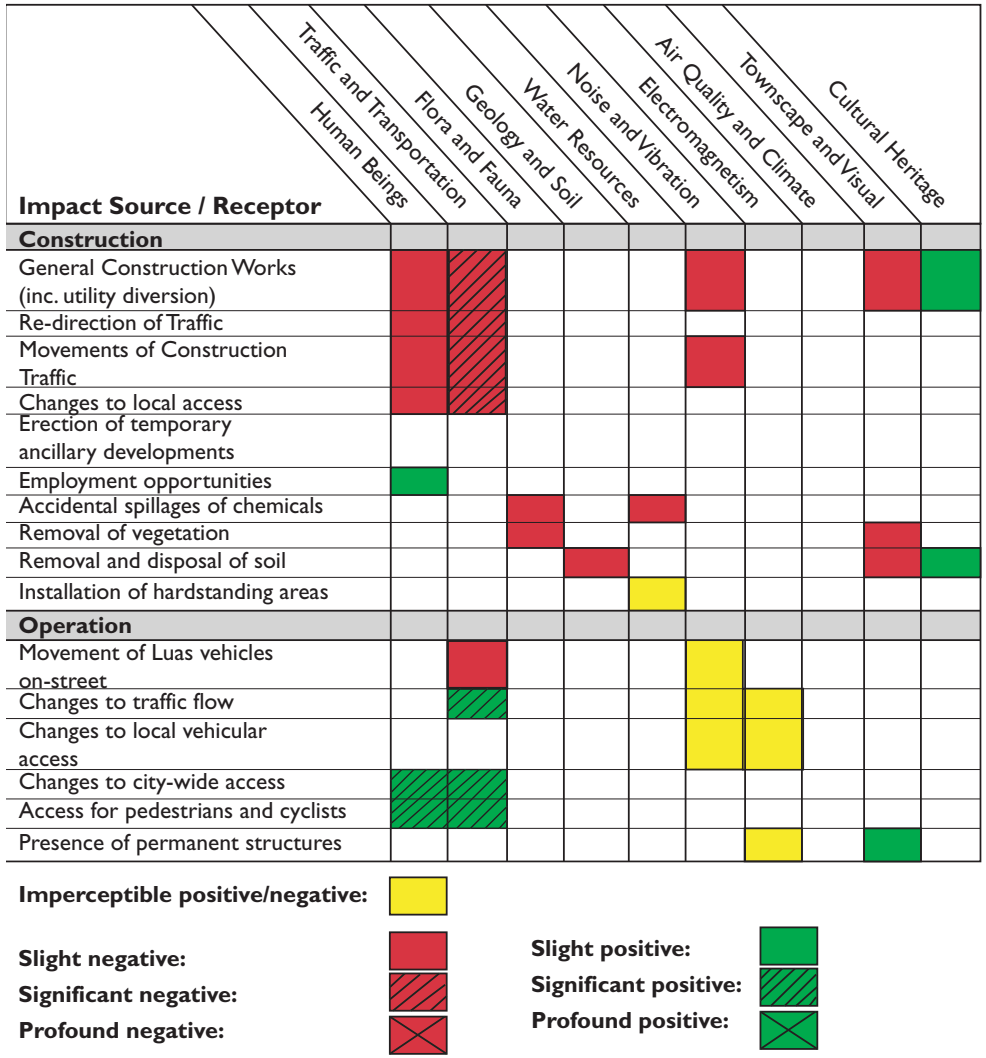
The horizontal axis comprises the impact receptor (e.g. human beings, noise and vibration) that may be affected by aspects of the project. Each of these components is described in more detail in *Chapters 6-15*.

The matrix is a method of presenting the results of evaluating the significance of project impacts on the environment. The significance of the impact is described using specific terms that are defined in more detail in *Table 16.3b* below and are based upon the definitions contained within the revised EPA EIA Guidelines.

Table 16.3b Impact Significance

Positive impact	A change that improves the quality of the environment (for example, by reducing vehicular emissions; or improving social mobility and accessibility, or removing nuisances or improving amenities).
Negative impact	A change that reduces the quality of the environment (such as, for example, a deterioration in air quality or diminishing the mobility and accessibility; or damaging health or property or by causing nuisance).
Neutral impact	A change that does not affect the quality of the environment.
Imperceptible positive/negative impact	An impact capable of measurement but without noticeable consequences.
Slight positive/ negative impact	An impact that causes noticeable changes in the character of the environment without affecting its sensitivities.
Significant positive/ negative impact	An impact that, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Profound positive/ negative impact	An impact that obliterates sensitive characteristics.

Figure 16.3a Impact Interaction Matrix



16.4 Cumulative Impacts

Cumulative impacts result when a number of distinct impacts are added together, in time or space, to create one larger, more significant impact. *Figure 16.3a* facilitates the identification of cumulative impacts resulting from the proposed development alone, by highlighting where impacts may occur against any particular environmental media more than once. Looking vertically down the column, it can be seen that the impact receptor that may receive impacts from several sources include human beings, traffic and transportation and noise and vibration.

Cumulatively, these impacts may be significant if they occur close together in terms of location and time. Therefore it is important to consider if the impacts on human beings *etc.* may occur in different locations or in one location. In the case of the proposed Luas Line C1, the impacts will all be concentrated in a relatively small area. Whilst this may generate a significant cumulative impact on a local scale, it does mean that the impact does not affect traffic and transport or human beings across other areas of the city of Dublin and that the physical extent and therefore duration of the impact is limited.

Cumulative impacts may also result from impacts occurring on the environment as a result of several developments occurring in the same location or at the same time. Prediction of these types of cumulative impacts is limited by the accuracy of information on the intended programme for other developments that may occur at the same time as the proposed Luas scheme or the probability that such development activities will overlap.

For example, as a result of the extensive redevelopment programme for the Dublin Docklands area (new housing, office space, National Conference Centre and hotel, proposed new bridge crossing the Liffey, redevelopment of The Point etc), the impact of Luas Line C1 on local social patterns and local amenity will be that of a contributor to a wider cumulative impact, rather than an isolated

direct impact. A listing of specific cumulative impacts that may arise is provided below.

Construction Cumulative Impacts

Construction noise – the extensive nearby developments being constructed along the route, many being constructed concurrently with Luas Line C1.

Traffic and pedestrian disruption – other developments under construction will simultaneously be causing such disruption and associated severance and reduced access to local residences, businesses and retail outlets at times.

Operational Cumulative Impacts

Regeneration of the Docklands area - Luas will play a key role in allowing and enhancing the future development planned for the area, as set out in the *Docklands North Lotts Planning Scheme* 2002.

Accessibility - Will improve transport access to the area, and thus attract new businesses and residents to the area.

Improved traffic flow - In conjunction with the other Luas lines being developed and the Dublin Port Tunnel, Luas Line C1 will improve local and regional traffic flow as a result of removing vehicles from the road.

Indirect Impacts

Indirect impacts are self-explanatory and involve an impact on an environmental component that is caused by the proposed development influencing a different environmental component.

As *Figure 16.5a* shows, there are a limited number of indirect impacts that are expected. These are caused by the impacts on traffic and transport, noise and vibration and townscape and visual impacts. They all impact upon human beings during the construction phase where they have a negative impact, albeit temporary, short-term and reversible. There are also indirect impacts upon air quality and climate and noise and vibration as a result of traffic and transport impacts. Again these impacts are temporary and short-term and will become positive in nature as operations commence.

Table 16.5a Key Indirect and Cross - Media Impacts

Important Source (horizontal axis) on receptor (vertical axis)	**Traffic and Transportation**	**Noise and Vibration**	**Townscape and Visual**
Human Beings	Temporary short-term negative impacts as a result of restrictions on traffic flows, access during construction. Will change to long-term positive during operation.	Temporary short-term negative impacts as a result of restrictions on traffic flows, access during construction. Will change to long-term positive during operation.	Temporary short-term negative impacts as a result of restrictions on traffic flows, access during construction. Will change to long-term positive during operation.
Noise & Vibration	Temporary, short-term negative impacts as a result of construction activities. Will change to long-term positive during operation.		
Air Quality and Climate	Temporary, short-term negative impacts as a result of construction activities. Will change to long-term neutral during operation		

16.6 Residual Impacts

Residual Impacts represent the degree of environmental change that will occur after mitigation measures are applied. *Table 16.6a* summarises the residual impacts that are expected to arise after mitigation measures have been successfully implemented.

Table 16.6a Summary of Residual Impacts

Environmental Media	Residual Impact
Human Beings	Positive residual impacts on regeneration opportunities and public transport.
Traffic and Transportation	Positive residual impacts on traffic and transportation through reduction in traffic journey times and reductions in traffic volumes, resulting in significant residual positive impacts for pedestrians.
Noise and Vibration	Daytime construction noise impacts will be short-term but significant near sensitive receptors. Predicted noise levels during operation are less than the current ambient noise levels recorded and are therefore not significant.
Air Quality and Climate	The operation of Luas is predicted to cause negligible residual impacts to air quality at sensitive receptors.
Townscape and Visual	Construction activities will generally have a negative impact on the townscape character and visual amenity of all three character areas; however as these works are temporary, impacts are not considered to be significant. There are positive residual impacts associated with improvements in streetscapes, lighting, access and circulation, although there are some negative residual visual impacts along Mayor Street Lower.
Cultural Heritage	Minor positive impacts, with the restoration of Mayor Street to its former length, rejoining Upper and Lower Mayor Street after their one hundred and fifty year severance by the railway yard.

Chapters 6-15 of this EIS include a range of comprehensive mitigation and management measures, which will ensure that the impacts on the individual environmental media are reduced to acceptable levels. These measures have been consolidated in *Chapter 17, Environmental Management and Monitoring Plan*, which can be used as a single, consolidated set of measures, which will allow cumulative and cross-media impacts to be mitigated effectively. Nevertheless, there will be measurable changes to the receiving environment that are residual impacts.

16.7 Technical Limitations

The judgements and considerations made within this EIS are considered technically valid in light of the available information and technical expertise.

16.8 Conclusions

The mitigation measures and monitoring requirements will be implemented in an integrated manner within an overall framework of measures. This will allow efficient coverage of the different environmental media and permit cumulative impacts to be addressed at an early stage.

Chapter 17

17 STATEMENT OF ASSESSMENT

The Environmental Impact Assessment process involved several stages. Initially the most appropriate alignment for the Luas Line C1 was identified through a Route Assessment Study. This stage of the assessment involved the identification, evaluation and comparison of a number of potential alignments to identify a preferred route or combination of routes. The preferred route, the Mayor Street alignment, that was chosen offered, comparatively, the smallest environmental impact and maximum operational, public transport benefits.

A detailed environmental impact assessment was then undertaken for this preferred route. This EIA process enabled the preferred route to be explored in more detail in order to enhance its benefits and minimise its negative impacts.

At the heart of the EIA process was a series of technical studies that were undertaken from November 2001 to April 2005. These technical studies included detailed baseline studies, field surveys and consultation on the following topics:

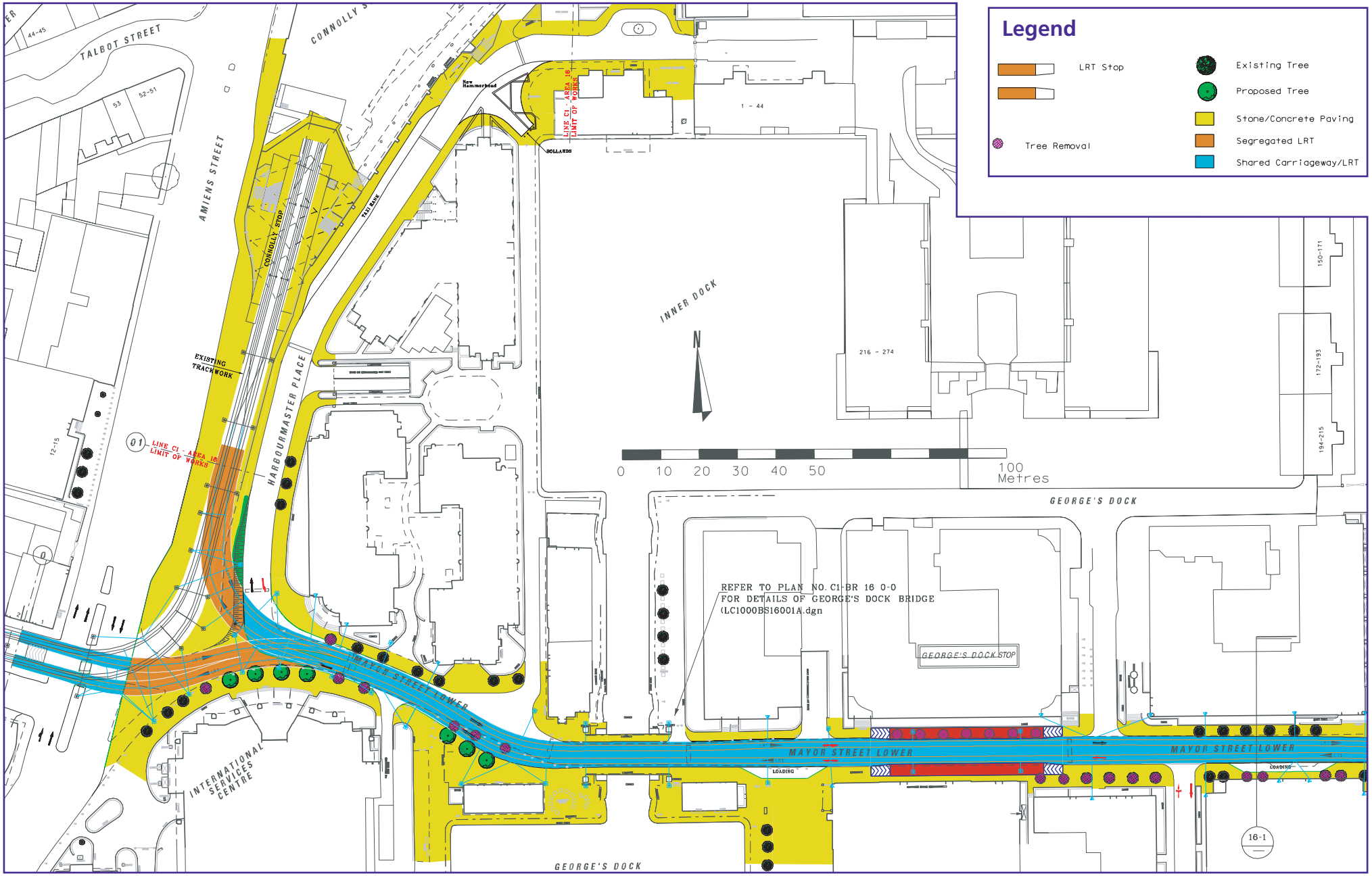
- Social and Economic Context;
- Planning and Development Context;
- Traffic and Transportation;
- Ecological Resources;
- Geology and Soil;
- Water Resources;
- Noise and Vibration;
- Electromagnetic;
- Climate and Air Quality;
- Townscape and Visual; and
- Cultural Heritage.

These topic areas, and the methods employed to assess likely impacts, were identified and defined during the scoping stage as being of potential significance, either during the construction or operation of the proposed new line extension.

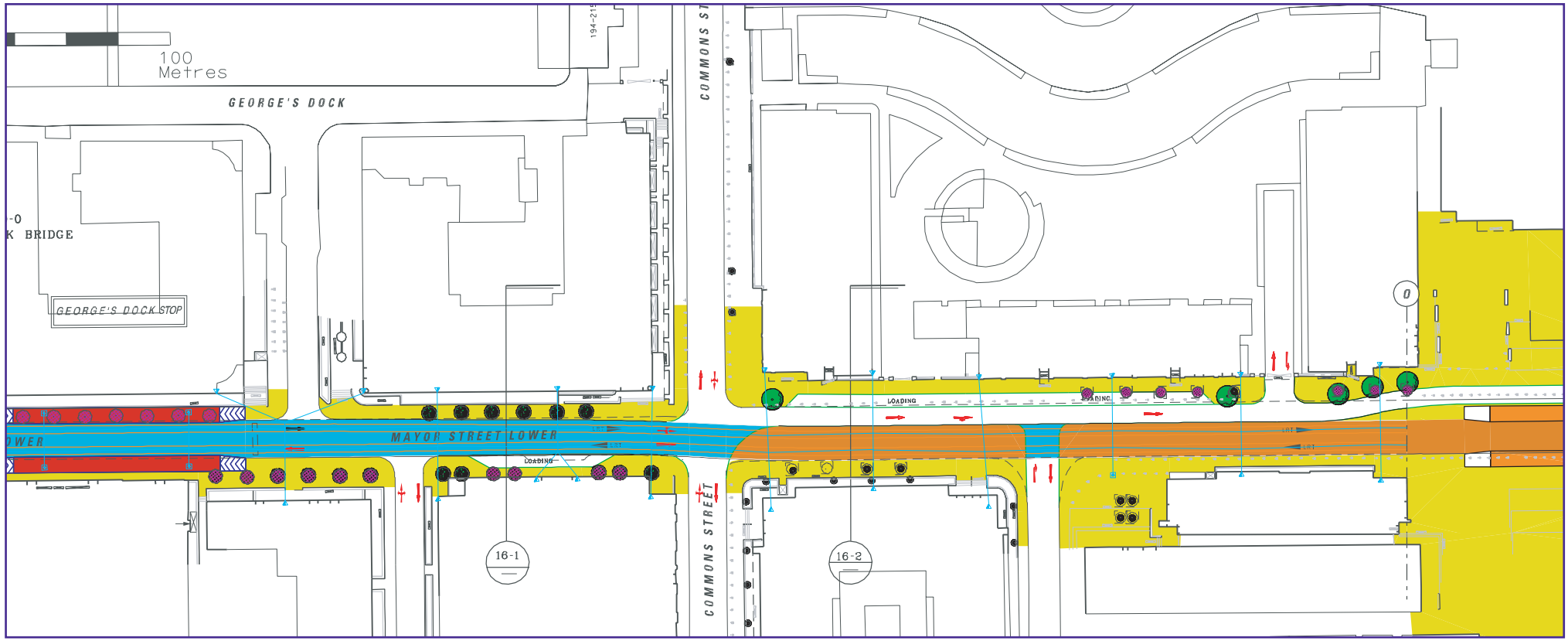
Data generated by the study were then analysed in order to identify potential impacts and the possible interactions of impacts on a variety of media. Consequently, and of particular importance, the EIA identified a range of mitigation and management measures, which will ensure that the negative impacts on the individual environmental media are reduced to acceptable levels, whilst maximising potential environmental benefits.

The EIS concluded that although there will be several potentially negative impacts, once suitable mitigating measures are successfully implemented, none of these will be significant in the long term. Significant positive impacts will result from the proposed development, including improved access to the Docklands area, a reduction in traffic flows and consequential air quality benefits. The EIS also recommended several management measures to ensure that these key benefits are realised throughout the construction and operation of Luas Line C1.

Annex A Landscape Insertion Plans



Landscape Insertion Plans

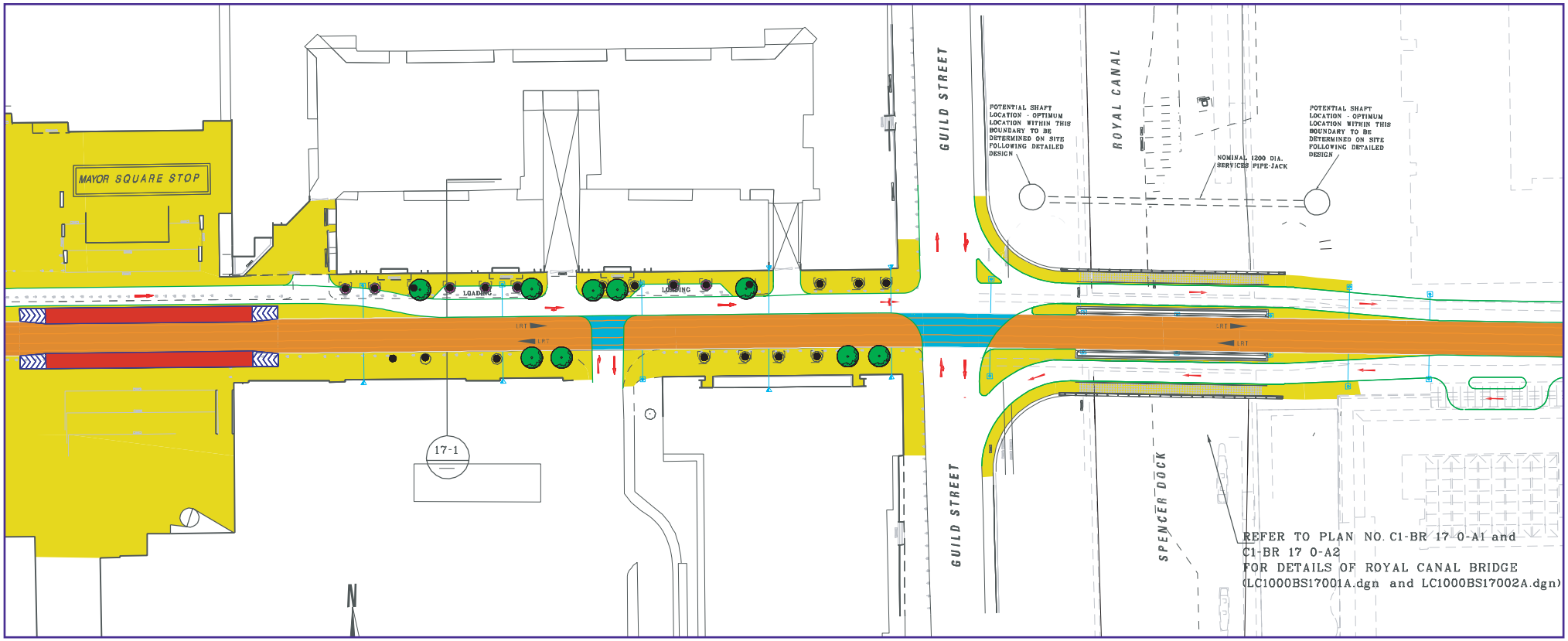


Mayor Street to Mayor Square

Legend

- LRT Stop
- Tree Removal
- Existing Tree
- Proposed Tree
- Stone/Concrete Paving
- Segregated LRT
- Shared Carriageway/LRT

Landscape Insertion Plans

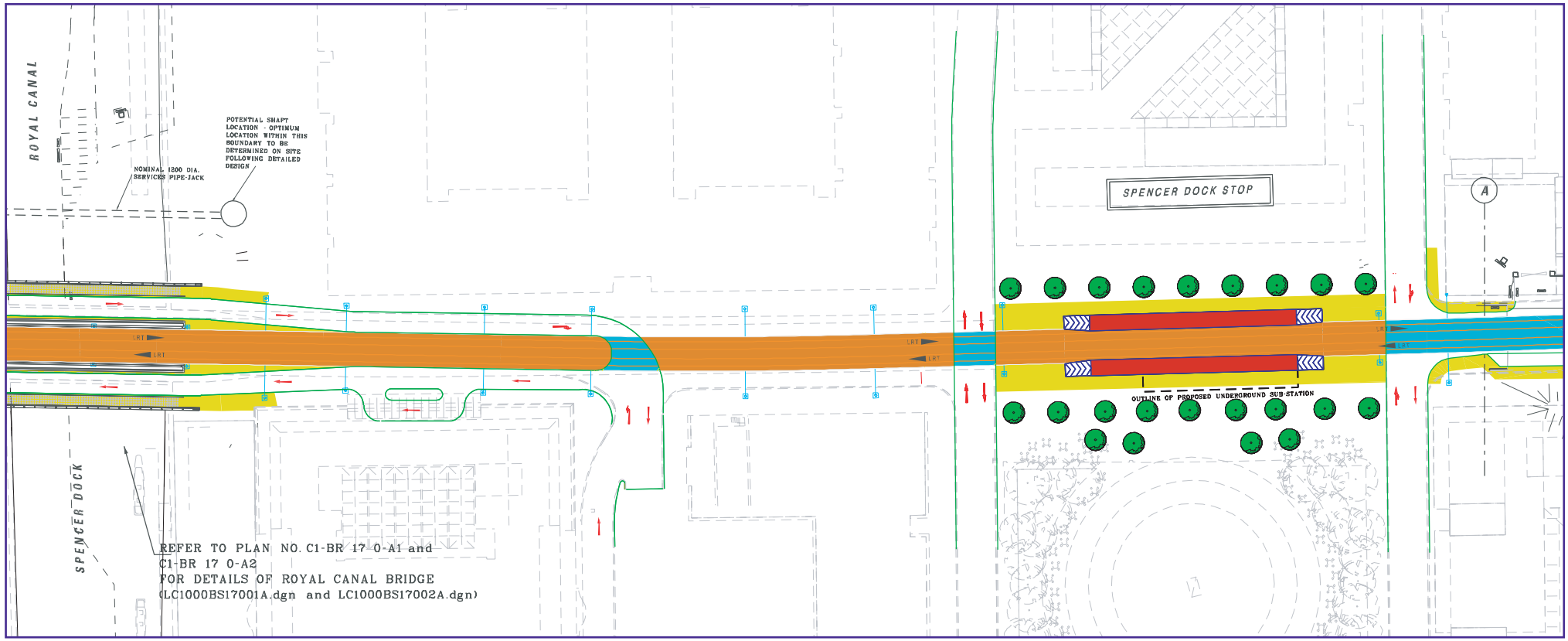


Mayor Square to Spencer Dock

Legend

- LRT Stop
- Tree Removal
- Existing Tree
- Proposed Tree
- Stone/Concrete Paving
- Segregated LRT
- Shared Carriageway/LRT

Landscape Insertion Plans



Spencer Dock to First Link Road

Legend

- LRT Stop
- Tree Removal
- Existing Tree
- Proposed Tree
- Stone/Concrete Paving
- Segregated LRT
- Shared Carriageway/LRT

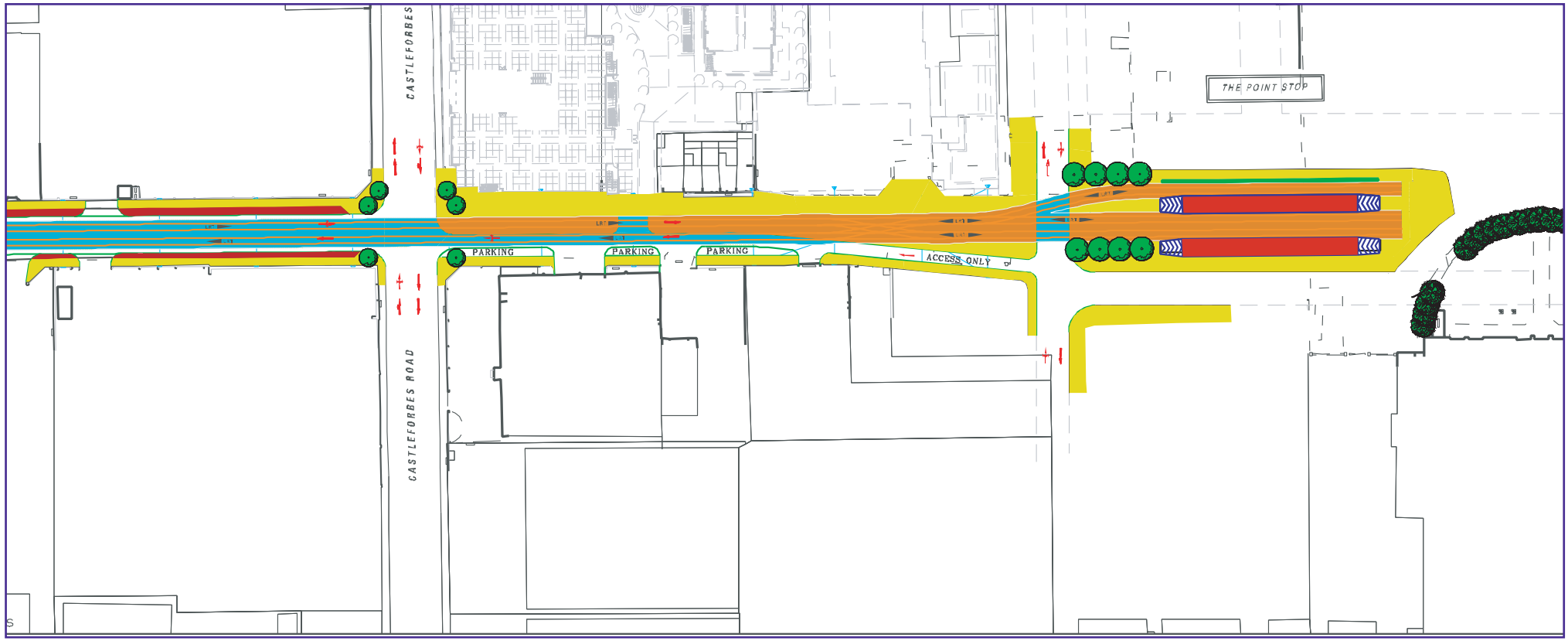
Landscape Insertion Plans

First Link Road to Castleforbes Road

Legend

- LRT Stop
- Tree Removal
- Existing Tree
- Proposed Tree
- Stone/Concrete Paving
- Segregated LRT
- Shared Carriageway/LRT

Landscape Insertion Plans



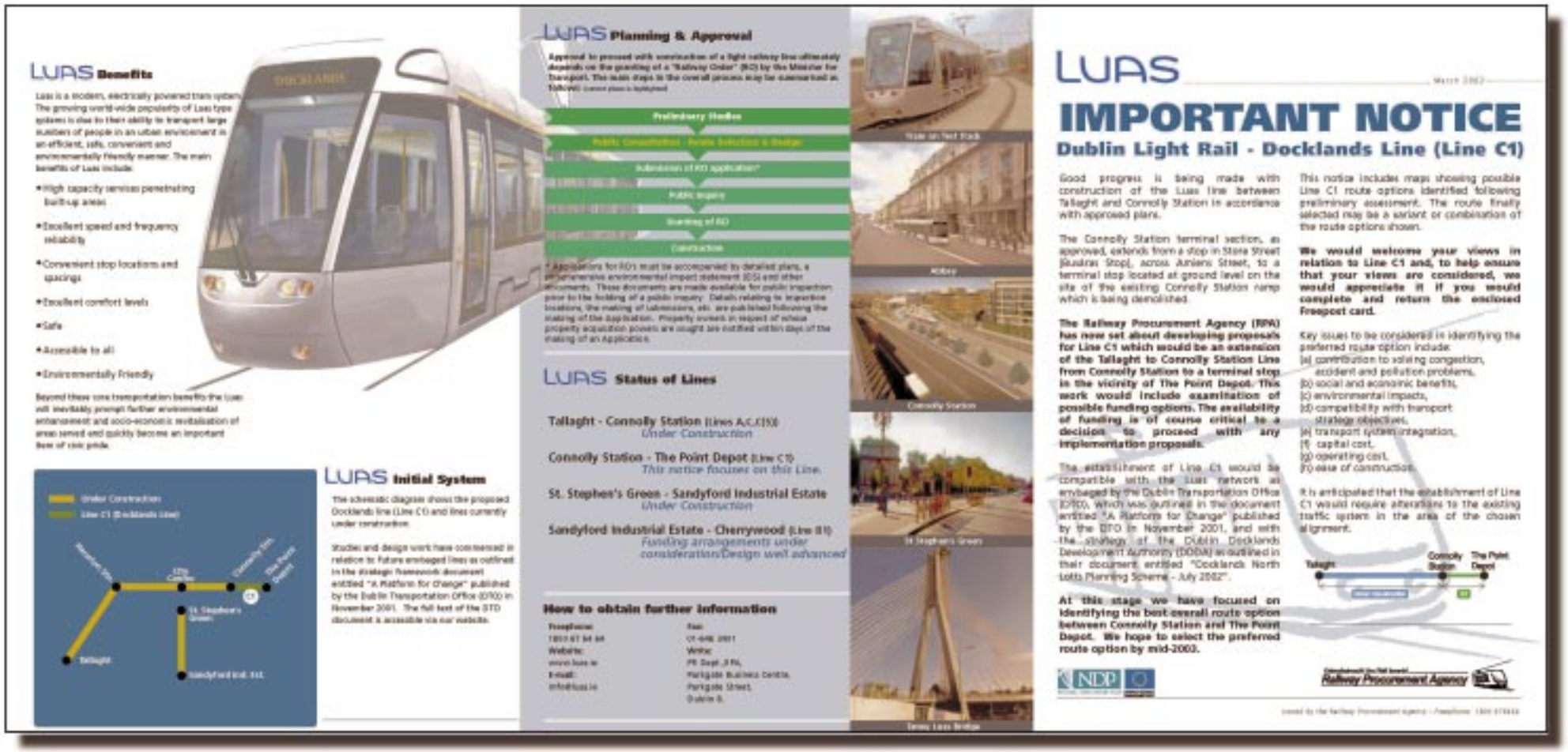
Castleforbes Road to The Point Depot

Legend

- LRT Stop
- Tree Removal
- Existing Tree
- Proposed Tree
- Stone/Concrete Paving
- Segregated LRT
- Shared Carriageway/LRT

Annex B

RPA Consultation Newsletter March 2003 (outside spread)



LUAS Benefits

Luas is a modern, electrically powered tram system. The growing world-wide popularity of Luas type systems is due to their ability to transport large numbers of people in an urban environment in an efficient, safe, convenient and environmentally friendly manner. The main benefits of Luas include:

- High capacity services penetrating built-up areas
- Excellent speed and frequency reliability
- Convenient stop locations and spacings
- Excellent comfort levels
- Safe
- Accessible to all
- Environmentally Friendly

Beyond these core transportation benefits the Luas will inevitably prompt further environmental enhancement and socio-economic revitalisation of areas served and quickly become an important item of civic pride.

LUAS Initial System

The schematic diagram shows the proposed Docklands line (Line C1) and lines currently under construction.

Studies and design work have commenced in relation to future envisaged lines as outlined in the strategic framework document entitled "A Platform for Change" published by the Dublin Transportation Office (DTO) in November 2001. The full text of the DTO document is accessible via our website.

LUAS Planning & Approval

Approval to proceed with construction of a light railway line ultimately depends on the granting of a "Railway Order" (RO) by the Minister for Transport. The main steps in the overall process may be summarised as follows:

Preliminary Studies

Public Consultation - Public Selection & Design

Submission of RO application*

Public Inquiry

Granting of RO

Construction

* Applications for RO's must be accompanied by detailed plans, a comprehensive environmental impact statement (EIS) and other documents. These documents are made available for public inspection prior to the holding of a public inquiry. Details relating to respective locations, the making of submissions, etc. are published following the making of the Application. Property owners in respect of whose property acquisition powers are sought are notified within days of the making of an Application.

LUAS Status of Lines

Tallaght - Connolly Station (Lines A/C/C1(S))
Under Construction

Connolly Station - The Point Depot (Line C1)
This notice focuses on this Line.

St. Stephen's Green - Sandyford Industrial Estate
Under Construction

Sandyford Industrial Estate - Cherrywood (Line B1)
Funding arrangements under consideration/Design well advanced

How to obtain further information

Freephone: 1800 87 84 84
Website: www.luas.ie
E-mail: info@luas.ie
Fax: 01-846 2881
Write: PB Dept. 3 FG, Parkgate Business Centre, Parkgate Street, Dublin 8.

LUAS

IMPORTANT NOTICE

Dublin Light Rail - Docklands Line (Line C1)

Good progress is being made with construction of the Luas line between Tallaght and Connolly Station in accordance with approved plans.

The Connolly Station terminal section, as approved, extends from a stop in Store Street (Busáras Stop), across Amiens Street, to a terminal stop located at ground level on the site of the existing Connolly Station ramp which is being demolished.

The Railway Procurement Agency (RPA) has now set about developing proposals for Line C1 which would be an extension of the Tallaght to Connolly Station Line from Connolly Station to a terminal stop in the vicinity of The Point Depot. This work would include examination of possible funding options. The availability of funding is of course critical to a decision to proceed with any implementation proposals.

The establishment of Line C1 would be compatible with the Luas network as envisaged by the Dublin Transportation Office (DTO), which was outlined in the document entitled "A Platform for Change" published by the DTO in November 2001, and with the strategy of the Dublin Docklands Development Authority (DDDA) as outlined in their document entitled "Docklands North Lotts Planning Scheme - July 2002".

At this stage we have focused on identifying the best overall route option between Connolly Station and The Point Depot. We hope to select the preferred route option by mid-2003.

This notice includes maps showing possible Line C1 route options identified following preliminary assessment. The route finally selected may be a variant or combination of the route options shown.

We would welcome your views in relation to Line C1 and, to help ensure that your views are considered, we would appreciate it if you would complete and return the enclosed Freepost card.

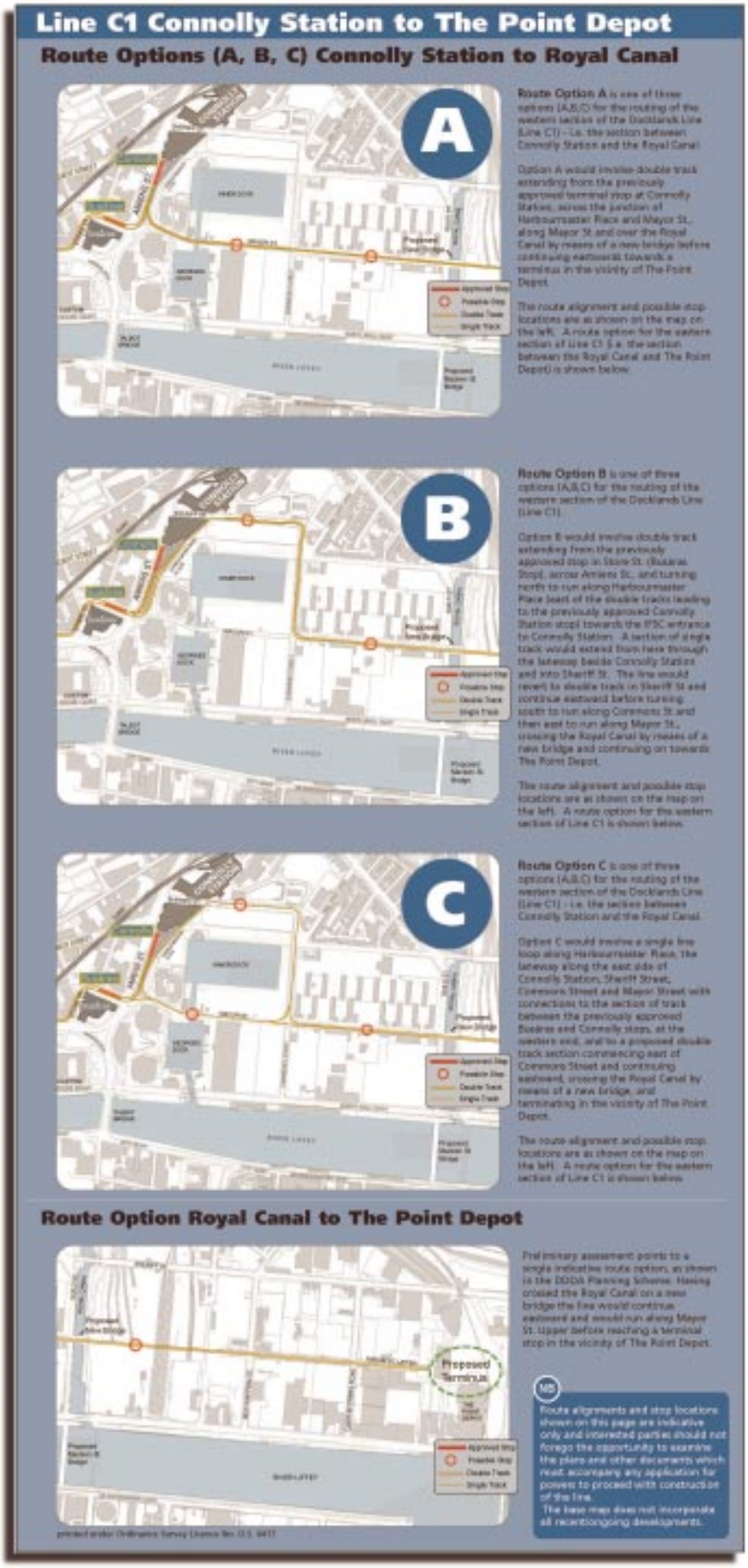
Key issues to be considered in identifying the preferred route option include:

(a) contribution to solving congestion, accident and pollution problems,
(b) social and economic benefits,
(c) environmental impacts,
(d) compatibility with transport strategy objectives,
(e) transport system integration,
(f) capital cost,
(g) operating cost,
(h) ease of construction.

It is anticipated that the establishment of Line C1 would require alterations to the existing traffic system in the area of the chosen alignment.

NDP

Railway Procurement Agency


Line C1 Connolly Station to The Point Depot
Route Options (A, B, C) Connolly Station to Royal Canal
A
Route Option A is one of three options (A,B,C) for the routing of the western section of the Docklands Line (Line C1) - i.e. the section between Connolly Station and the Royal Canal.
Option A would involve double track extending from the previously approved terminal stop at Connolly Station, across the junction of Harbourmaster Place and Mayor St., along Mayor St and over the Royal Canal by means of a new bridge before continuing eastwards towards a terminus in the vicinity of The Point Depot.
The route alignment and possible stop locations are as shown on the map on the left. A route option for the eastern section of Line C1 (i.e. the section between the Royal Canal and The Point Depot) is shown below.
B
Route Option B is one of three options (A,B,C) for the routing of the western section of the Docklands Line (Line C1).
Option B would involve double track extending from the previously approved stop in Store St. (Busáras Stop), across Amiens St., and turning north to run along Harbourmaster Place (east of the double tracks leading to the previously approved Connolly Station stop) towards the IFSC entrance to Connolly Station. A section of single track would extend from here through the laneway beside Connolly Station and into Sheriff St. The line would revert to double track in Sheriff St and continue eastward before turning south to run along Commons St and then east to run along Mayor St., crossing the Royal Canal by means of a new bridge and continuing on towards The Point Depot.
The route alignment and possible stop locations are as shown on the map on the left. A route option for the eastern section of Line C1 is shown below.
C
Route Option C is one of three options (A,B,C) for the routing of the western section of the Docklands Line (Line C1) - i.e. the section between Connolly Station and the Royal Canal.
Option C would involve a single line loop along Harbourmaster Place, the laneway along the east side of Connolly Station, Sheriff Street, Commons Street and Mayor Street with connections to the section of track between the previously approved Busáras and Connolly stops, at the western end, and to a proposed double track section commencing east of Commons Street and continuing eastward, crossing the Royal Canal by means of a new bridge, and terminating in the vicinity of The Point Depot.
The route alignment and possible stop locations are as shown on the map on the left. A route option for the eastern section of Line C1 is shown below.
Route Option Royal Canal to The Point Depot
Proposed Terminus
Preliminary assessment points to a single indicative route option, as shown in the DDDA Planning Scheme. Having crossed the Royal Canal on a new bridge the line would continue eastward and would run along Mayor St. Upper before reaching a terminal stop in the vicinity of The Point Depot.
MB
Route alignments and stop locations shown on this page are indicative only and interested parties should not forego the opportunity to examine the plans and other documents which must accompany any application for powers to proceed with construction of the Line.
The base map does not incorporate all recent/ongoing developments.

Annex C Supporting information on Climate and Air Quality

INTRODUCTION

The data presented in the following tables are derived from the Traffic Modelling undertaken by Faber Maunsell [1] .

Table 1.1 CO_2 Emissions from Affected Routes in the Do Nothing Scenario

Road Name	Annual Emissions of CO_2 from Traffic (tonnes/year)
N. Amiens Street	369
Amiens - Harbourmaster	2
Harbourmaster Place	2
Harbourmaster - Commons	28
N. Commons Street	193
S. Commons Street	130
North Wall Quay West	727
North Wall Quay East	706
Commons - Guild	99
N. Guild Street	97
S. Guild Street	59
Spencer Dock - New Link	2
N. First Link Road	20
S. First Link Road	19
Second Link - New Wapping	2
N. New Wapping Street	18
S. New Wapping Street	23
New Wapping - Castleforbes	7
N. Castleforbes Street	140
S. Castleforbes Street	142
Castleforbes - Third Link	7
TOTAL	**2,793**

Table 1.2 CO_2 Emissions from Affected Routes and the Change from the Do Nothing Scenario

Road Name	Do Nothing 2008 Annual Emissions of CO_2 from Traffic (tonnes/year)	Luas 2008 Annual Emissions of CO_2 from Traffic (tonnes/year)	Change in CO_2 Emissions (tonnes/year)
N. Amiens Street	369	324	-45
Amiens - Harbourmaster	2	0	-2
Harbourmaster Place	2	2	0
Harbourmaster - Commons	28	25	-3
N. Commons Street	193	209	15
S. Commons Street	130	181	51
North Wall Quay West	727	801	74
North Wall Quay East	706	846	139
Commons - Guild	99	92	-7
N. Guild Street	97	98	1
S. Guild Street	59	51	-7
Spencer Dock - New Link	2	2	0
N. First Link Road	20	23	3
S. First Link Road	19	22	3
Second Link - New Wapping	2	1	-1
N. New Wapping Street	18	23	4
S. New Wapping Street	23	26	3
New Wapping - Castleforbes	7	11	4
N. Castleforbes Street	140	129	-11
S. Castleforbes Street	142	131	-11
Castleforbes - Third Link	7	7	0
TOTAL	**2,793**	**3,002**	**209**

Table 1.3 Changes in Traffic as a Result of the Operation of Luas 2008

Road Name	Do Minimum Traffic Flows (annual average daily flows)	With Luas Traffic Flows (annual average daily flows)	% Change in Traffic
N. Amiens Street	20368	20736	2
Amiens – Harbourmaster	1518	0	-100
Harbourmaster Place	362	363	0
Harbourmaster - Commons	2218	2337	5
N. Commons Street	8355	8418	1
S. Commons Street	7056	7549	7
North Wall Quay West	31061	32782	6
North Wall Quay East	31110	33290	7
Commons – Guild	5270	5043	-4
N. Guild Street	8253	7856	-5
S. Guild Street	4902	3620	-26
Spencer Dock - New Link	506	503	-1
N. First Link Road	1202	1828	52
S. First Link Road	1048	1693	61
First Link – Second Link	0	0	0
N. Second Link Road	0	0	0
S. Second Link Road	0	0	0
Second Link – New Wapping	216	184	-15
N. New Wapping Street	1385	1586	15
S. New Wapping Street	1548	1686	9
New Wapping - Castleforbes	183	215	18
N. Castleforbes Street	8124	7449	-8
S. Castleforbes Street	8047	7418	-8
Castleforbes - Third Link	173	233	34
N. Third Link Road	0	0	0
S. Third Link Road	0	0	0

Source: Faber Maunsell

Table 1.4 Do Minimum Pollutant Concentrations at Sensitive Receptors

Receptor	NO_2 Annual Mean µg m^{-3}	PM_{10} Annual Mean µg m^{-3}	Number of days PM_{10} 24hour mean >50 µg m^{-3}	Benzene Annual Mean µg m^{-3}
1 Store Street	37.26	20.59	4.16	4.92
Commerzbank	38.25	21.17	4.98	4.95
Spencer Dock Apartments (NE Corner)(a)	37.82	20.75	4.38	4.91
PWH Coopers, Spencer Dock (a)	37.74	20.71	4.33	4.91
Roadside, Second Link - New Wapping Link(b)	37.14	20.46	3.98	4.90
No 5 Mayor Upper St	37.57	20.69	4.30	4.91
Roadside, New Wapping – Castleforbes Link(b)	37.15	20.47	4.00	4.90
Roadside, Castleforbes – Third Link Link(b)	37.46	20.58	4.14	4.90
Assessment Criteria	*40*	*40*	*7*	*5*

The distance of these receptors to the roads included in the assessment have been estimated from plans on the brochure for the Spencer Dock development. www.spencerdock.ie

A worst case estimate of concentrations of pollutants at the roadside has been used, as there were no identifiable sensitive receptors along the route.

Table 1.5 Pollutant Concentrations at Sensitive Receptors in 2008

Receptor	Do Nothing NO_2 Annual Mean µg m^{-3}	Do Nothing PM_{10} Annual Mean µg m^{-3}	Do Nothing Benzene Annual Mean µg m^{-3}	Change in NO_2 Annual Mean µg m^{-3} as a Result of Luas	Change in PM_{10} Annual Mean µg m^{-3} as a Result of Luas	Change in Benzene Annual Mean µg m^{-3} as a Result of Luas
1 Store Street[a]	37.26	20.59	4.92	Decrease of 0.26 µg m^{-3}	Decrease of 0.19 µg m^{-3}	Decrease of 0.02 µg m^{-3}
Commerzbank	38.25	21.17	4.95	Increase of 0.08 µg m^{-3}	Decrease of 0.04 µg m^{-3}	Decrease of 0.01 µg m^{-3}
Spencer Dock Apartments (NE Corner)[b]	37.82	20.75	4.91	Decrease of 0.14 µg m^{-3}	Decrease of 0.01 µg m^{-3}	No Change
PWH Coopers, Spencer Dock[b]	37.74	20.71	4.91	Decrease of 0.13 µg m^{-3}	Decrease of 0.01 µg m^{-3}	No Change
Roadside, Second Link - New Wapping Link[c]	37.14	20.46	4.90	Decrease of 0.11 µg m^{-3}	Decrease of 0.01 µg m^{-3}	No Change
No 5 Mayor Upper Street	37.57	20.69	4.91	Increase of 0.21 µg m^{-3}	Increase of 0.08 µg m^{-3}	No Change
Roadside, New Wapping – Castleforbes Link[c]	37.15	20.47	4.90	Increase of 0.12 µg m^{-3}	Increase of 0.06 µg m^{-3}	No Change
Roadside, Castleforbes - Third Link Link[c]	37.46	20.58	4.90	Decrease of 0.08 µg m^{-3}	Decrease of 0.03 µg m^{-3}	No Change
Assessment Criteria	***40***	***40***	***7***	***5***	***Assessment Criteria***	***40***

(a) This road link will be closed once the Luas scheme is in place, hence the data used is taken from the background concentrations for 2002 used in the DMRB assessment. This is a worst case scenario, as it is almost certain that background concentrations in 2008 will be lower than those measured in 2002.

(b) The distance of these receptors to the roads included in the assessment have been estimated from plans on the brochure for the Spencer Dock development. www.spencer-dock.ie

(c) A worst case estimate of concentrations of pollutants at the roadside has been used as there were no identifiable sensitive receptors along the route.

Notes:

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