METRO NORTH

ST. STEPHEN'S GREEN, AIRPORT, BELINSTOWN

UPDATED DETAILED BUSINESS CASE

July 2010

Contents

Important Notice

This Metro North – St. Stephen's Green, Airport, Belinstown Updated Detailed Business Case (DBC) has been prepared by RPA for the confidential consideration and use of Government.

Because of the sensitive nature of the information contained in the DBC, the DBC should not be disclosed outside RPA, National Transport Authority or Government departments. RPA considers the DBC to be an exempt record and therefore not able to be released under the Freedom of Information Act 1997. Premature release of the DBC would, in the opinion of RPA, be contrary to the public interest. It contains:

- commercially sensitive information
- information that was provided in confidence
- advice for consideration by Government
- information relating to the deliberative processes of a public body, and
- information relating to the financial and economic interests of the State.

RPA must be notified upon a request being made for access to the DBC under the Freedom of Information Act 1997, or any other legislation.

1. Executive Summary

1.1 Introduction

Development of an extensive Metro and light rail network for the Greater Dublin Area is a key element of the strategy for tackling congestion in Dublin, enhancing economic competitiveness and ensuring a sustainable, attractive city. RPA has successfully delivered the first two lines of this network, the Luas Red and Green Lines.

In November 2002 RPA presented the Outline Business Case (OBC) for the Dublin Metro Project to the Department of Transport. The OBC presented a range of practical options available for route alignments, financial structures and programmes. In June 2003 a Revised Proposal was prepared which presented a single recommended option for metro from the Airport to City Centre while keeping open the option of an extension to Swords.

In November 2005, the Government announced its 10 year transport investment programme, Transport 21, which built on the recommendations of A Platform for Change document. The initiative provides for Government investment in a metro line (Metro North) from north of Swords to St. Stephen's Green, and an orbital line, Metro West, linking the Luas Red Line to Metro North and linking the towns of Tallaght, Clondalkin and Blanchardstown. Transport 21 also includes the development of a Luas line from the city centre to Lucan (Luas Line F) and Luas Broombridge (Luas Line BXD) which links the Luas Red and Green Lines and continues northwest to Broombridge as well as other extensions to the Luas Red and Green Lines.

An important feature of the overall rail development plans identified as part of Transport 21 is the development of an integrated network which will enable passengers to transfer between suburban rail, metro and Luas at a number of interchange stations. Metro North is the central spine of that network. St. Stephen's Green will be a key interchange point enabling transfer between Luas, metro and bus, and suburban rail once the Dart Underground is completed.

This Updated Detailed Business Case (DBC) for Metro North draws together the many aspects of work undertaken to date on Metro North since Transport 21 was announced.

The DBC demonstrates that there is a strong economic case for the implementation of Metro North under a range of different scenarios. The benefit to cost ratio of the project is 2:1 when taking account of wider economic benefits and in excess of 1.5:1 using traditional economic appraisal methods. The scheme is therefore of substantial societal worth, with benefits well in excess of costs.

1.2 Approval Required

In January 2008 RPA was advised that Government had approved the exchequer funding of enabling works and property acquisition as part of the approval of the overall funding structure for Metro North.

Subsequent to that approval it was confirmed by the Department of Transport during 2009 that a further Government decision would be required to proceed with enabling works in advance of signing the PPP contract.

This DBC has been prepared in response to this request. RPA is seeking approval to award enabling works contracts immediately following the Railway Order becoming operational in October 2010. This approval is essential if Metro North is to be delivered in the timescales set out in the *Renewed Programme for Government*, indeed failure to grant this approval could put the entire project at risk with

subsequent impacts on other major public transport PPPs including DART Underground.

This approval requires a commitment by Government of approximately €76 million during 2011.

1.3 Background

The implementation of Metro North is central to Irish Government transport policy as set out in Transport 21 and reinforced by the revised Programme for Government published in 2010. The project is fully aligned with local and regional planning policy in Ireland and indeed underpins the entire land use strategy for Fingal County for the next 25 years. Metro North is the key to the sustainable continued expansion and economic growth of the Airport City Region and to Dublin as a whole.

Metro North is a commuter rail line serving key destinations including:

- The New Swords Town Centre;
- Dublin Airport;
- Ballymun Town Centre;
- Dublin City University;
- St Patrick's College;
- Croke Park;
- Mater Misericordiae University Hospital;
- The new Mater Adult Hospital, now under construction;
- The planned National Paediatric Hospital;
- The Mater Private Hospital;
- Temple Street Children's Hospital;
- Rotunda Hospital;
- Dublin Central retail development;
- Henry Street;
- Temple Bar;
- Trinity College;
- Grafton Street; and
- The South East quadrant employment centre

The project links the Dublin City University main campus south of Collins Avenue with St Patrick's College in Drumcondra and Trinity College in the city centre, providing opportunities for these educational institutions that do not currently exist.

Metro North is the catalyst for future sustainable development in the corridor it serves and ensures that the benefits of significant Government investment in the regeneration of Ballymun are achieved in full. Metro North will also act as an important catalyst for urban regeneration in the North inner city area.

All European cities with which Dublin is competing have rail links to the airport and of the top 20 busiest airports in Europe only Dublin and Palma de Mallorca do not have a rail link.

In 2008, 93% of visitors to Dublin travelled via air, indicating the vast majority of visitors must either use public transport or hire a car once they arrive in Dublin. Metro North will significantly improve the tourist experience in Ireland, by providing an easily

accessible, clean, safe, quick, frequent and reliable connection between Dublin Airport and the city centre. The metro will be easily accessible from both airport terminals, providing a high quality public transport interchange for users of Dublin Airport.

With airport passengers and workers accounting for approximately 20% of all Metro North trips the airport is an extremely important stop on the line. It is not however the sole rationale for the project with 80% of trips boarding and alighting at other locations.

The future success of Ireland's economy is closely related to the development of Dublin as an internationally competitive city region. Through transforming the public transport landscape of Dublin, Metro North will improve the quality of life, sustainability and attractiveness of the city, which is critical to the increasingly important challenge of attracting and retaining the most highly educated, creative internationally-mobile talent.

Services on Metro North will run every 5 minutes at peak when the system opens but this can be reduced to allow services to run every 2 minutes as demand increases over time. Metro North will provide significant journey time savings such as shortening the journey time from Swords to city centre from an average of 50 minutes currently by bus to 25 minutes by metro and Ballymun to city centre from an average of 25 minutes to 14 minutes. It is worth noting that the bus times quoted are averages and bus journey times can vary considerably and journey times well above the average can be experienced at times of congestion. One of the key advantages of Metro is the consistency and reliability of service and journey times which cannot be guaranteed with other modes.

Metro North will assist the delivery of a number of regeneration and social-improvement programmes. Close to the Metro North alignment there are a total of four designated Revitalising Areas by Planning, Investment and Development (RAPID) areas and four Integrated Action Plans (IAPs), which have been prepared under the Urban Renewal Scheme. The largest regeneration project along the Metro North alignment is Ballymun, being managed by Ballymun Regeneration Ltd. Metro North will greatly assist with all of the regeneration and renewal objectives for this area of Dublin which has suffered socially challenging conditions for generations.

A joint study between the RPA and the DTO was carried out during 2004 to provide a quantitative expression of the likely changes in accessibility by public transport within a defined area that would be achieved by implementing a metro system between Dublin Airport and St Stephen's Green. The study concluded that the opening of a metro system would greatly increase accessibility to the city centre, the airport, and Swords with increased savings in journey time further out along the line. The increased accessibility has the practical effect of bringing significantly greater numbers of residences within easy access of the city centre and airport and will greatly reduce travel times.

The study assessed the increase in households within specified public transport travel times to Dublin Airport and City Centre. The study showed significant increases in the number of households (over 18,250 additional households) within 45 minutes of Dublin Airport and just under 3,000 additional households within 30 minutes of Dublin City Centre in the morning peak.

Densification of development will also contribute to more sustainable development and assist in tackling urban sprawl. If Metro North were not to proceed, it would not be possible for planning policies, designed to tackle urban sprawl, to continue to be implemented.

A significant part of any public transport investment is attracting people out of cars and on to public transport. A considerable proportion of the new boardings on Metro North come from the highway network. RPA estimates approximately 12 million car trips per annum will be taken off the roads. Significant environmental benefits are therefore generated as a result of Metro North.

Metro North, through providing a public transport option to commuters who currently use a car, has an important role to play in reducing emissions from the road-transport sector in Ireland and is critical in Ireland striving to reduce emissions from its road-transport sector and meet its EU climate change commitments.

Other trends suggest that high capacity public transport modes such as Metro North may become a necessity in future to deal with significant mode switching from private car to public transport. The prospect of peak-oil, and the introduction of environmental taxes and demand-management measures to deal with climate change, has the potential to create a step-change in the demand for public transport in future as the cost of private motoring increases significantly.

1.4 Project Definition

Following a request from Government in 2002, RPA prepared the OBC for the proposed metro system identified in *A Platform for Change*. The OBC concluded that there was a strong case for metro overall and presented a range of options for phasing the implementation of metro. Following Government feedback, RPA submitted an updated Revised Proposal for metro in June 2003, recommending that Government approve a metro line from the city centre to the airport, as contained in *An Agreed Programme for Government 2002,* with an option to extend this to Swords. As part of this work, a number of project alternatives, including heavy rail, light rail and bus options, were considered, but these did not meet the project objectives.

Transport 21 was announced in November 2005 and included provision for a metro line, to be known as Metro North, running from St. Stephen's Green to Swords.

Three main route alternatives, and a range of local route alternatives, were identified, taking account of the 2002/2003 work, and these were evaluated against a number of objectives, including compliance with transport and land-use policy; environmental impact; social and economic benefits; transport integration; construction and operation costs; operational safety and efficiency and construction risk and efficiency.

RPA undertook an extensive public consultation process in order to inform the overall preferred route selection process which concluded in October 2006.

RPA applied for a Railway Order in September 2008 based on the selected route and system concept. It is anticipated that a decision will be made on the Railway Order application in mid August 2010 with the Railway Order becoming operational in October 2010.

The finalised route for Metro North is 18km long and runs between Belinstown, to the north of Swords, and St. Stephen's Green in the city centre as illustrated in Figure 1.1 below. The route runs largely at ground level and on elevated viaducts from Belinstown to north of the Airport, in tunnel through the airport, and back to ground level through the lands south of the airport, crossing over the M50 and then going underground again from north of Ballymun to its terminus at St. Stephen's Green. The Metro North route at ground level will look similar to the existing Luas system, with extended platforms for the longer trainsets.

Central to the ethos of Metro North is its accessibility to all users, including those with disabilities. All forms of disability will be accommodated, ranging from wheelchair users to blind and partially sighted, deaf users and people with cognitive or learning disabilities.

The route has been designed to safeguard the future possible extensions of the metro to the south, towards the Luas Green Line and to the north beyond Belinstown towards Donabate. Provision has also been made for an operating link with Metro West at Dardistown. In order to facilitate the development of interoperable systems in the future Metro North will be designed and constructed to comply with key standards and requirements which permit interoperability.

There are 17 stops along the route, 9 underground (below grade) and 8 at ground level (at grade). Underground stops will be provided at the Airport, Ballymun, Dublin

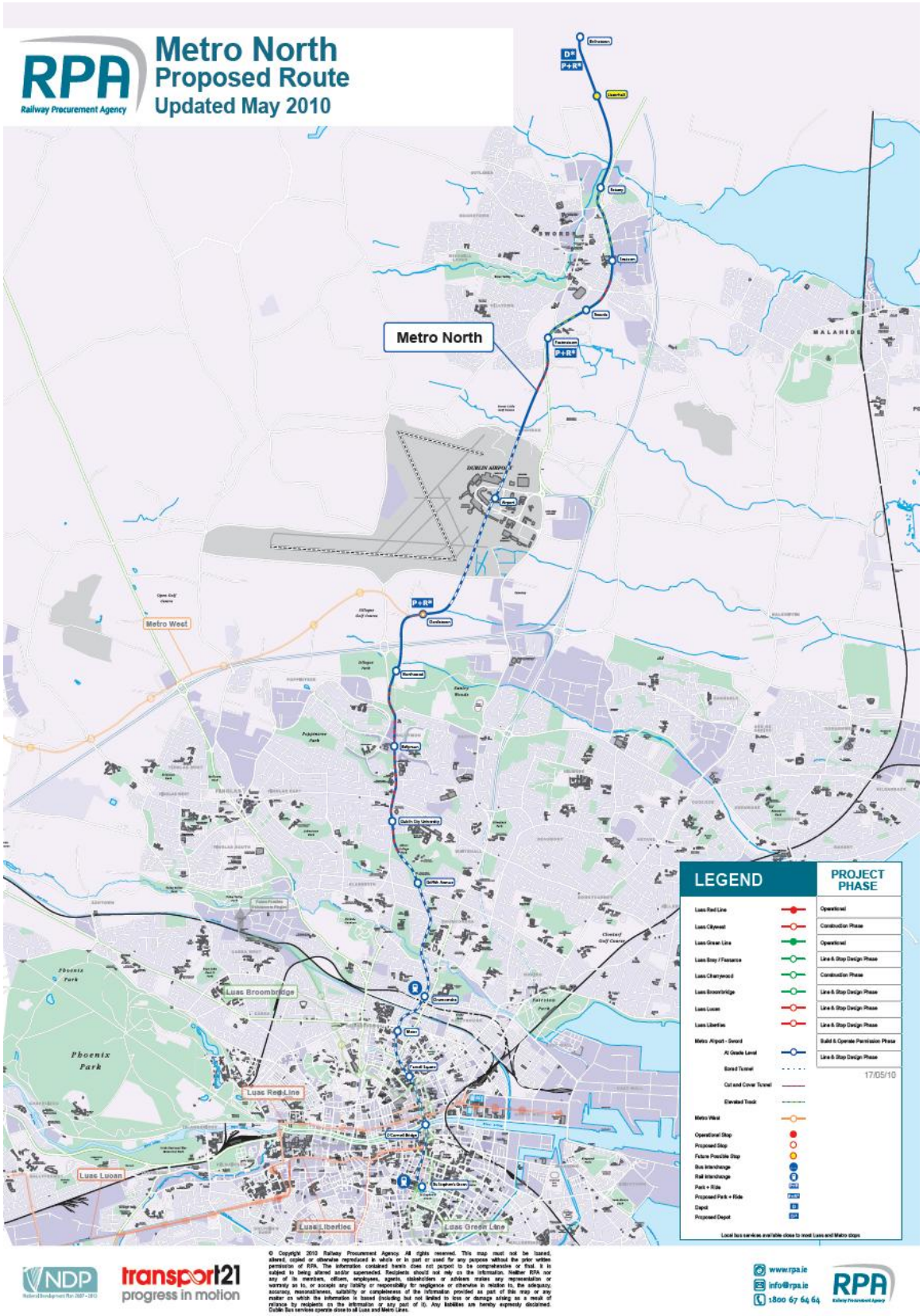
City University, Griffith Avenue, Drumcondra, Mater, Parnell Square, O'Connell Bridge and St Stephen's Green.

At ground level stops will be provided at Belinstown, Lissenhall (provisional), Estuary, Seatown, Swords, Fosterstown, Dardistown, and Northwood. Park & Ride facilities are provided at Dardistown, Fosterstown and Belinstown.

Metro North has been designed to accommodate up to 20,000 passengers per direction per hour (ppdph) ultimately. This high capacity can be achieved by running services at very frequent intervals. This would not be possible with an on-street system, particularly in the city centre, and so Metro North must have a dedicated route separated from the road network in these areas. This is achieved by running the metro vehicles in tunnel or on elevated structures.

This segregated route also allows Metro North to run at higher operational speeds than an on-street system. In the less congested outer suburban environment where less capacity is needed, Metro North can operate at street level using light rail operating principles. This design philosophy, common in many European countries, permits the expansion of the metro network at an economic cost while maximising the utilisation of the more expensive tunnel infrastructure.

Figure 1.1 Metro North Route



1.5 Transport Planning

Metro North provides an important strategic linkage between key areas of the Greater Dublin Area (GDA), including Dublin City Centre, Dublin City University (DCU), Ballymun Town Centre, Dublin Airport and Swords and its environs. The results of this analysis demonstrate that there is significant demand for travel along this corridor, which can only be catered for by a high capacity metro system.

In the Base Case scenario Metro North is forecast to have 36.3 million boardings annually. Furthermore, a considerable proportion of the new boardings on the system will come from the highway network. Using the Local Authority projected growth forecasts Metro North is forecast to carry over 48 million passengers each year.

The introduction of Metro North will additionally lead to an increase in heavy rail boardings and Luas boardings. The increase in heavy rail boardings is due to the opportunity for interchange with Metro North at St Stephen's Green and Drumcondra stops.

Bus boardings are forecast to decrease with the introduction of Metro North, however the National Transport Authority is committed to reconfiguring the bus network to complement the Transport 21 network. With a complementary bus network, the patronage on Metro North will increase, while patronage on the bus network would not decrease by the same amount.

On a per kilometre basis Metro North is forecast to be more heavily used than either the existing Red or Green lines in the No Growth, Moderate and Local Authority growth scenarios. This is to be expected as metro provides higher average speeds than can be achieved on light rail and this, coupled with the reliability and frequency of service, makes metro more attractive over other modes including private car and bus.

Further sensitivity tests indicate a stronger demand with the introduction of additional transport infrastructure. This increase in patronage highlights the fact that the other projects in Transport 21 cannot realise their full benefits without the integration effect of Metro North. Simply put, Metro North provides the backbone to Transport 21 linking all the other lines.

The introduction of Metro West into the Base Case scenario also leads to a stronger demand for Metro North, which highlights the complementary nature of the two schemes. The introduction of Luas Broombridge into the Base Case scenario leads to a slightly reduced demand for Metro North as existing Green Line passengers can now access areas further north than St. Stephen's Green without the need to transfer to Metro North to complete their journey.

Metro North's initial capacity, based on 5 minute headways in the AM peak, will be in the order of 8,000 ppdph. Metro North will open with a capacity of 8,000 passengers per direction per hour (ppdph). Capacity can be increased incrementally through the procurement of additional vehicles. The ultimate capacity, based on a 2 minute headway, will be in the order of 20,000 ppdph. This capacity will be sufficient to meet the forecast demand of approximately 17,000 ppdph.

1.6 Risk

RPA has undertaken detailed risk analysis, using a formalised risk management process, in developing the project to date. RPA is fully compliant with Department of Finance guidance in its approach to assessment of risk for the purposes of compilation of the Public Sector Benchmark.

Metro North is a complex project comprising a large number of elements and disciplines. In particular there is a requirement for an extensive underground system involving tunnels, caverns and deep excavations in variable ground conditions. RPA's risk management strategy recognises this and consequently RPA has adopted the Code of Practice for Risk Management of Tunnel Works.

The PPP contract has been structured to achieve substantial transfer of construction and availability risk so as to ensure the privately financed element of the project can be treated as "off balance sheet" for government accounting purposes.

In January 2008 Government approved funding of enabling works in the knowledge that significant expenditure on enabling works would take place in advance of reaching financial close and contract award on the Metro North PPP. The risk existed that money would be expended on enabling works prior to financial close, with a risk that the project may not reach financial close either due to affordability, value for money or other factors. The risk of not reaching financial close has however increased following the credit crisis and the risk of significant sunk costs being incurred on enabling works without certainty on financial close therefore needs to be addressed.

RPA, with the assistance of KPMG and NDFA has assessed the PPP market in 2009/2010 and likely developments in that market over the next 18 months and RPA believe that financial close for Metro North in late 2011 is achievable. The terms and conditions on which financial close may be achieved are less favourable for the state than would have been the case prior to the credit crisis. This is line with developments both for Irish debt in particular and more generally in the PPP market.

Greater stability has returned to financial markets in 2010 and if recent trends continue, RPA is confident that the required debt funding would be available to achieve financial close for Metro North. However, there remains a small risk that the preferred bidder for Metro North would not be able to secure the full amount of the funding for the project. RPA has been exploring with the NDFA an option for managing this risk. The National Pensions Reserve Fund may provide senior debt funding to the project and there is also or the possibility of further EIB funding

In order for Metro North to continue on programme and ensure PPP bidder confidence is retained in the project enabling works contracts need to be signed in October 2010. This requires a commitment by Government of approximately €76 million during 2011. This is to cover RPA expenditure and enabling works capital expenditure.

In the event that the project was unable to reach financial close and a decision was taken to cancel the project at the end of 2011 the net cost incurred on the project would be approximately €246 million. This includes an allowance for rectification costs and the cost of terminating enabling works contracts as well as the recovery to be made through sale of properties already acquired. Any development levies which had been remitted to RPA by the local authorities would need to be re-paid.

1.7 Economic Appraisal

There is a strong economic case for the implementation of Metro North under a range of different scenarios. The benefit to cost ratio of the project is 2:1 when taking account of wider economic benefits and in excess of 1.5:1 using traditional economic appraisal methods. The scheme is therefore of substantial societal worth, with benefits well in excess of costs.

Table 1.1 Economic Appraisal Results

	Base Case	Wider Economic Benefits
Benefit to Cost Ratio (BCR)	**1.55:1**	**2:1**
Internal Rate of Return (IRR)	**9.1%**	**13%**

Sensitivity testing demonstrates that the economic case for the scheme is resilient and retains its economic value-for-money even when adopting the most pessimistic demographic assumption of no growth in population and employment beyond 2006. Sensitivity testing also indicates that the benefits of the scheme will be enhanced following extension of the Luas network as planned under Transport 21. Assuming that Luas Broombridge is in place in advance of Metro North reduces the economic value of the scheme very slightly, although the case for the scheme remains extremely robust. Luas Broombridge connects the Red and Green Lines and continues northwards to serve the north west of the city.

The strong economic outcome is a result of the high user benefits of the scheme which are generated from journey time improvements, increased reliability and frequency, as well as the availability of new public transport journeys through interchange. There are also significant non-user benefits which reflect the reduction in highway congestion as a result of the scheme.

Metro North is a critical investment in the competitiveness and productivity of the Dublin economy, and by extension, the Irish economy. Increasingly economic growth is being driven by city regions which compete with each other to attract and retain the best human capital, in terms of education levels, creativity and entrepreneurship. By positively impacting on the quality of life, sustainability, attractiveness and connectivity of Dublin, Metro North will provide Dublin with a significant competitive edge in the challenge to attract internationally mobile human capital and investment.

Traditional cost benefit analysis fails to include many additional benefits which are known to exist as a result of investment in transport projects such as Metro North. Many of these impacts are related to role of Metro North in creating a more connected, efficient city, the so called ‘density dividend’ or agglomeration economies. It is likely that these wider economic impacts generated by Metro North will be significant, as a result of its significant journey time savings, its location serving Dublin city centre with its mix of relatively high productivity jobs, and its connection to Dublin Airport. A preliminary assessment of the wider impacts associated with Metro North indicates that including such impacts would increase the BCR of the scheme to 2:1

RPAs analysis indicates Metro North will generate approximately 19,000 employment years directly during construction. Direct employment on Metro North will be approximately 4,000 per year during construction.

In addition, the construction of Metro North will generate approximately 9,000 indirect and induced employment years, giving a total employment year generation of 28,000. Total employment, including indirect and induced effects, will be in excess of 5,500 per year during construction.

A multi-criteria analysis which assesses the scheme on the five criteria set out in the Common Appraisal Framework, and reported in the Project Appraisal Balance Sheet (PABS), indicates the scheme has substantial positive non-monetisable benefits, with few negative impacts after mitigation.

1.8 Project Finance and Cash-flows, Affordability and Value for Money

RPA received detailed bids from four pre-qualified PPP bidders in February 2009 and following a comprehensive tender evaluation process, shortlisted two bidders in June 2009 to proceed to the Best and Final Offer (BAFO) stage of the procurement.

Following completion of the tender evaluation, analysis was undertaken which demonstrated the shortlisted bidders provided value for money solutions and that the PPP costs as bid together with the non-PPP costs (RPA costs and retained risks, property and enabling works) were within the capital envelope for the project. It is worth noting that the value for money test was passed by both bidders with significant headroom.

The Metro North PPP procurement is at a critical stage and therefore this Updated Detailed Business case does not contain confidential bidder pricing information so as to ensure that the integrity of the procurement process is not compromised in any way.

It is intended to seek BAFOs from the two shortlisted bidders as soon as practicable after An Bord Pleanála makes a decision on the Railway Order. Following an evaluation of the BAFOs, a preferred bidder will be selected. It is envisaged that the Final Business Case will be prepared shortly after selection of the preferred bidder and it is intended that the preferred bidder's pricing will be incorporated within the Final Business Case. Clearly appropriate confidentiality protocols will need to be put in place for the Final Business Case so as to ensure that RPA's and the states commercial position is not compromised in any way.

The Capital Envelope for Metro North was approved by Government in January 2008. Subsequently it has been agreed, in order to provide an integrated solution at St. Stephen's Green for both Metro North and DART Underground, RPA will carry out certain works for Irish Rail in return for a budget transfer from the DART Underground Capital Envelope to the Metro North Capital Envelope subject to the approval of the National Transport Authority.

The proposed capital envelope for Metro North is set out in Table 1.2 below.

Table 1.2 Total Capital Envelope € million Nominal

Capital Envelope - Nominal	€ million Excluding VAT
Approved by Government - January 2008	3,748
DART Underground - transfer from Irish Rail	50
Total Revised Capital Envelope	**3,798**

The estimated net Exchequer funding requirement (in nominal terms) for Metro North over the construction period is estimated to be €1,586 million. This is within the January 2008 approved Exchequer construction period funding for Metro North which is €1,628 million. The funding requirement covers RPA project development and supervision costs, property acquisition costs, enabling works and a capital contribution to the PPP contractor during construction of up to €1,050 million. The balance of the capital cost of the project (>50%) will be funded by the private sector.

Development levy schemes have also been put in place by both DCC and FCC which reduce the overall funding required from the Exchequer. The levy estimates have

been adjusted to take account of the collapse in the property market. This will be revisited prior to the Final Business Case being submitted.

RPA is confident that the projected operating revenue will be sufficient to cover the ongoing cost of operating Metro North and will make a contribution to the PPP availability payment. Development levies will also reduce the Exchequer funding requirement which is estimated to be in the region of [text deleted] per annum following commencement of passenger services.

1.9 Commercial and Financial Structure & Procurement Strategy

RPA has carried out extensive work on the commercial structure and procurement strategy for Metro North since the OBC was developed in 2002.

The PPP commercial structure and procurement strategy adopted is a Design, Build, Finance & Maintain contract with a separate Operations Contract.

The structure has been designed specifically for Metro North and has been tailored to give the long term flexibility required recognising that Metro North is just one element of a light rail and metro network.

Specific provision has been made in the contractual structure through priced options for the following

- purchase of additional rolling stock should demand justify reducing the peak headway from five minutes to four minutes;
- the extension of the Operators scope to include the operation of Metro West.

The adopted strategy and contract structure was accepted by the market and the procurement competition attracted a strong list of candidates. RPA pre-qualified a strong panel of bidders who participated in the tendering stage of the process. RPA shortlisted two bidders in June 2009 and those two bidders will be invited to submit Best and Final Offers (BAFO) as soon as a decision is made on the Railway Order application.

RPA will require the bidders to price options at the BAFO stage of the competition for certain Luas Broombridge works and Metro West infrastructure in the vicinity of Dardistown. These options if exercised will be exchequer funded and approved within the context of approval of those projects. The value for money of procuring these elements of infrastructure through Metro North can only be tested and evaluated once the final bids for Metro North have been received.

RPA is bringing forward a suite of enabling works on the project. There is significant precedent for advance works for PPP projects being completed by separate contracts ahead of PPP contract award. The Government approved exchequer funding for the acquisition of property and carrying out enabling works in January 2008. There remains a very strong rationale for carrying out each of the enabling works packages for Metro North.

Enabling works to be undertaken on Metro North can be broken down into the following broad categories;

- Utility diversions and associated civil works;
- Mater Stop Box advance works;
- Heritage Works;
- Archaeological excavation and resolution;
- Liffey Temporary Bridge;

- St Patrick's College Retaining Wall; and
- Surveys and investigations.

RPA has carried out detailed analysis of the phasing of enabling works. RPA must proceed with enabling works as soon as the Railway Order is operational if the date for Metro North delivery in the Revised Programme for Government is to be achieved. Any significant delay in proceeding with enabling works as planned could result in collapse of the project.

In relation to the exchequer financing structure of Metro North, Government approved a capital contribution of up to €1 billion during construction. There is an argument, given the constraints in debt market capacity, for increasing the available capital contribution by €50 million and reducing the exchequer funded enabling works by an equivalent amount due to a switch in scope from enabling works to the PPP Contract. This does not result in an increase in the construction period Government approved Exchequer funding requirement.

1.10 Programme and Way Forward

Work is already well underway with PPP bidders in preparation for the BAFO stage of the competition. RPA will proceed with the issue of the PPP invitation to BAFO within the quickest practicable timescale after An Bord Pleanála has made a decision on the Railway Order application. Significant work has already been undertaken in relation to enabling works procurement and RPA will be in a position to award the first enabling works contracts in October 2010 once the Railway Order is operational.

Government approval to proceed with enabling works is required in October 2010 (at the same time as the Railway Order is operational) in order to keep Metro North on programme and to maintain a realistic possibility of achieving the target date of December 2016 for delivery of Metro North, as set out as a priority in the *Renewed Programme for Government*

Metro North enabling works construction can commence in January 2011. The final delivery date for Metro North is dependent on the outcome of the PPP BAFO process and the speed with which financial close can be reached which is dependent of a level of financial market stability.

The key programme dates for the project are set out in Table 1.3 below.

Table 1.3 Key Milestone Dates in Metro North Programme

Milestone/Activity	
Railway Order Decision	Aug10
BAFO invitation to PPP bidders	Sep 10
Government Approval of Enabling Works	Oct 10
Enforceable Railway Order	Oct 10
Award first Enabling Works contracts	Oct 10
Receipt of PPP BAFO Tenders	Dec 10
Commence Heritage Works	Jan 11
Commence Utility Works	Jan 11
Preferred PPP Bidder Selection	Mar 11
Government Approval of Final Business Case	Jun 11
PPP Contract Award	Q3/Q4 2011
PPP Construction Commencement	Q2-Q4 2012
PPP main construction completion	2016
Operational Service Commencement	Late 2016 or early 2017

The dates set out in the above table are dependent on a number of factors external to RPA including:

- Decision by An Bord Pleanála (ABP) on the Railway Order application by mid August 2010;
- Approval from Government in early October 2010 to proceed with enabling works;
- Operational Railway Order in October 2010 which assumes there is no application for judicial review;
- Timely approval of the Final Business Case by Government once a preferred PPP bidder is appointed;
- Continued stability of financial markets so that financial close can be achieved quickly once a preferred bidder is appointed;
- The two bidders have different construction programmes (including testing and commissioning), these programmes will be updated as part of the bidders BAFO submission. The final programme will be dependent on the programme of the preferred bidder. It should be noted that conditions imposed by ABP in the Railway Order may have the effect of extending the construction programme. Any delay in awarding enabling works contracts will also have a knock on impact on PPP bidders programmes as their access to the site would be delayed at critical locations.

1.11 Conclusion

Metro North is the central spine of a transport network envisaged in Transport 21. The implementation of Metro North is central to Irish government transport policy as set out in Transport 21 and reinforced by the revised Programme for Government published in 2010.

The project is fully aligned with local and regional planning policy in Ireland and indeed underpins the entire land use strategy for Fingal County for the next 25 years. Metro North is the key to the sustainable continued expansion and economic growth of the Airport City Region and to Dublin as a whole.

The future success of Ireland's economy is closely related to the development of Dublin as an internationally competitive city region. Through transforming the public transport landscape of Dublin, Metro North will improve the quality of life, sustainability and attractiveness of the city, which is critical to the increasingly important challenge of attracting and retaining the most highly educated, creative internationally mobile talent.

RPAs analysis indicates Metro North will generate approximately 19,000 employment years directly during construction and 28,000 when indirect employment is taken into account. This equates to over 5,500 jobs per year during construction.

Metro North is forecast to carry in excess of 36 million passengers per year. A considerable proportion of these passengers will come from the highway network removing approximately 12 million car trips per annum. RPA's forecasts are significantly below those of the local authorities which when used forecast that Metro North will carry over 48 million passengers each year.

There is a strong economic case for the implementation of Metro North under a range of different scenarios. The benefit to cost ratio of the project is 2:1 when taking wider economic benefits into account.

RPA is seeking approval to award Enabling Works contracts immediately following the Railway Order becoming operational in October 2010. This approval requires a commitment by Government of approximately €76 million during 2011.
RPA received detailed bids in February 2009, following completion of the tender evaluation, the shortlisted bids demonstrated value for money. The exchequer capital funding required for the project is within the existing Government approval.

Approval to proceed with the enabling works is essential if Metro North is to be delivered by the end of 2016, indeed failure to grant this approval could put the entire project at risk with subsequent impacts on other major public transport PPPs including DART Underground.

2. Background

2.1 Chapter Summary

- The implementation of Metro North is central to Irish government transport policy and is fully aligned with local and regional planning policy in Ireland.
- Metro North is a commuter rail line serving key destinations. The project links the Dublin City University main campus south of Collins Avenue with St Patrick's College in Drumcondra and Trinity College in the city centre, providing opportunities for these educational institutions that do not currently exist. It also serves Dublin Airport, six hospitals, Croke Park and a number of key retail centres in the city centre, Ballymun and Swords.
- Metro North is the catalyst for future sustainable development in the corridor it serves and ensures that the benefits of significant government investment in the regeneration of Ballymun are achieved in full.
- Metro North will act as an important catalyst for urban regeneration in the North inner city area.
- Other European cities that Dublin is competing with have rail links to the airport and of the top 20 busiest airports in Europe only Dublin and Palma de Mallorca do not have a rail link.
- In 2008, 93% of visitors to Dublin travelled via air, indicating the vast majority of visitors must either use public transport or hire a car once they arrive in Dublin. Metro North will significantly improve the tourist experience in Ireland, by providing an easily accessible, clean, safe, quick, frequent and reliable connection between Dublin Airport and the city centre.
- Only 20% of all Metro North trips are to and from the airport with 80% of trips boarding and alighting at other locations.
- Metro North will generate much needed employment during the construction phase with the expectation that approximately 4,000 direct construction jobs will be generated for a significant proportion of the main construction programme. There will also be secondary spin off impacts due to the expenditure of wages in the local economy by the construction workforce. When these effects are included, Metro North is expected to generate approximately 6,000 jobs during the three years of peak construction, and in excess of 3,000 during the remaining years.
- The future success of Ireland's economy is closely related to the development of Dublin as an internationally-competitive city region. Through transforming the public transport landscape of Dublin, Metro North will improve the quality of life, sustainability and attractiveness of the city, which is critical to the increasingly important challenge of attracting and retaining the most highly educated, creative internationally-mobile talent.
- A significant part of any public transport investment is attracting people out of cars and on to public transport. A considerable proportion of the new boardings on Metro North come from the highway network. RPA estimates approximately 12 million car trips per annum will be taken off the roads. This modal shift will also generate significant environmental benefits.
- Metro North will provide significant journey time savings such as shortening the journey time from Swords to city centre from an average of 50 minutes currently experienced by bus to 25 minutes by metro and Ballymun to city centre from as long as 25 minutes to 14 minutes. Journey time from Dublin airport to the city centre will be less than 20 minutes with a train arriving every 5 minutes during peak times. Bus journey times can vary significantly from the average at times of congestion. One of the key advantages of Metro is the consistency and reliability of service and journey

times which cannot be guaranteed with other modes.

- Metro North will assist the delivery of a number of regeneration and social-improvement programmes. The largest regeneration project along the Metro North alignment is Ballymun and the project will greatly assist with all of the regeneration and renewal objectives for this area of Dublin which has suffered socially challenging conditions for generations.
- Metro North will greatly increase accessibility to the city centre, the airport, and Swords with increased savings in journey time further out along the line. The increased accessibility has the practical effect of bringing significantly greater numbers of residences within easy access of the city centre and airport and will greatly reduce travel times. Densification of development will also contribute to more sustainable development and assist in tackling urban sprawl. If Metro North were not to proceed, it would not be possible for planning policies, designed to tackle urban sprawl, to continue to be implemented.
- Metro North, through providing a public transport option to commuters who currently use a car, has an important role to play in reducing emissions from the road-transport sector in Ireland and is critical in Ireland striving to reduce emissions from its road-transport sector and meet its EU climate change commitments.
- Other trends suggest that high capacity public transport modes such as Metro North may become a necessity in future to deal with significant mode switching from private car to public transport. The prospect of peak-oil, and the introduction of environmental taxes and demand-management measures to deal with climate change, has the potential to create a step-change in the demand for public transport in future as the cost of private motoring increases significantly.

2.2 Introduction

The implementation of Metro North is an essential part of Irish government transport policy as set out in Transport 21 and reinforced by the revised Programme for Government published in October 2010. The project is fully aligned with local and regional planning policy in Ireland and indeed underpins the entire land use strategy for Fingal County for the next 25 years. Metro North is the key to the sustainable continued expansion and economic growth of the Airport City Region and to Dublin as a whole.

Metro North is a commuter rail line serving key destinations including:

- The New Swords Town Centre;
- Dublin Airport;
- Ballymun Town Centre;
- Dublin City University;
- St Patrick's College;
- Croke Park;
- Mater Misericordiae University Hospital;
- The new Mater Adult Hospital, now under construction;
- The planned National Paediatric Hospital;
- The Mater Private Hospital;
- Temple Street Children's Hospital;
- Rotunda Hospital;

- Dublin Central retail development;
- Henry Street;
- Temple Bar;
- Trinity College;
- Grafton Street; and
- The South East quadrant employment centre

The project links the Dublin City University main campus south of Collins Avenue with St Patrick's College in Drumcondra and Trinity College in the city centre, providing opportunities for these educational institutions that do not currently exist.

Metro North is the catalyst for future sustainable development in the corridor it serves and ensures that the benefits of significant government investment in the regeneration of Ballymun are achieved in full. Metro North will also act as an important catalyst for urban regeneration in the North inner city area.

While Metro North will provide this important catalyst and will complement any growth in the economy its economic viability is not dependent on such growth as demonstrated by the analysis set out in Chapter 7 – Cost Benefit Analysis.

Metro North will address a significant deficit in public transport infrastructure in north Dublin city and in Fingal, the fastest growing county in Ireland with a 26% growth in population between 2002 and 2006 and 39% under the age of 25. It will facilitate development in the corridor which is forecast by Fingal County Council to generate up to 37,000 additional jobs and more than double the existing level of economic activity and employment in the area over the medium to long term.

The newly expanded Dublin Airport needs good quality, high capacity public transport as it grows in the medium to long term. Other European cities Dublin is competing with have rail links to the airport and of the top 20 busiest airports in Europe only Dublin and Palma de Mallorca do not have a rail link[1].

In 2008, 93% of visitors to Dublin travelled via air, indicating the vast majority of visitors must either use public transport or rent a car once they arrive in Dublin. Metro North will significantly improve the tourist experience in Ireland, by providing an easily accessible, clean, safe, quick, frequent and reliable connection between Dublin Airport and the city centre. The Metro will be easily accessible from both airport terminals, providing a high quality public transport interchange for users of Dublin Airport.

A lot of airport workers live in Swords and its environs and Metro North will provide these people with very good access to the airport. With airport passengers and workers accounting for approximately 20% of all Metro North trips the airport is an extremely important Stop on the line. It is not however the sole rationale for the project with 80% of trips boarding and alighting at other locations.

2.3 Economy & Jobs

Metro North will generate much needed employment during the construction phase with the expectation that approximately 4,000 direct construction jobs will be generated for a significant proportion of the main construction programme. Other sectors of the regional economy are likely to benefit such as those in the construction material supply industry (concrete; aggregate production; and reinforcement fabrication), plant hire, and those providing technical support services (Engineers; Architects; Quantity Surveyors). There will also be secondary spin off impacts due to the expenditure of wages in the local economy by the construction workforce. When

[1] *Source: Airport Council International 2007 Final Statistics*

these effects are included, Metro North is expected to generate approximately 6,000 jobs during the three years of peak construction, and in excess of 3,000 during the remaining years.

RPA conservatively estimated that one indirect job is created for every two direct construction jobs. The Construction Industry Federation has estimated employment generation due to construction at much higher levels estimating that for every €100million of capital spent up to 1,000 jobs are generated in the economy. The employment estimates for Metro North assume a significantly lower rate of employment generation per €m of capital expenditure.

This employment will come at a time when a range of other major infrastructure projects across the state are coming to an end including the M50 Widening Programme; Aviva Stadium; Terminal 2; and the National Conference Centre.

The future success of Ireland's economy is closely related to the development of Dublin as an internationally-competitive city region. Through transforming the public transport landscape of Dublin, Metro North will improve the quality of life, sustainability and attractiveness of city, which is critical to the increasingly important challenge of attracting and retaining the most highly educated, creative internationally-mobile talent. Allowing Dublin to attract and retain the best international talent will assist in fostering important innovation networks, and will encourage the development of a critical mass of knowledge-based industries. Metro North will also increase the productive capacity of the city through allowing a more concentrated pattern of development to emerge in Dublin, with all the associated economies of scale, the so-called 'density dividend'.

The global economy is increasingly dominated by competition between city regions for internationally mobile talent and investment. As the only city on the island of Ireland with the critical mass to develop into a truly competitive city-region, it is critical that investment in public transport in Dublin is of sufficient scale and is appropriately targeted. The successful emergence of Dublin as a competitive city region within Europe, which is attractive to foreign investment and foreign workers, is critical to the growth of the overall Irish economy, and Metro North is key to achieving this.

2.4 Transportation Benefits

A significant rationale for any public transport investment is attracting people out of cars and on to public transport. A considerable proportion of the new boardings on Metro North come from the highway network (~12 million car trips per annum will be taken off the roads). Metro North will encourage modal shift by offering a fast, efficient service coupled with world class interchange with other high capacity transit routes. Metro North is the central north-south spine and first element of the proposed urban rail network for Dublin with other projects in Transport 21 not realising their full benefits without the integration effect of Metro North. RPA's analysis shows an increase in trips made on the Heavy Rail network when Metro North is introduced. This increase is due to the possibility of interchange between Metro and Heavy Rail at St Stephen's Green and Drumcondra stops.

Metro North will provide excellent interchange with:

- The Luas Green Line at St Stephen's Green;
- DART Underground at St Stephen's Green;
- The Luas Red Line at Abbey Street;
- The Ground Transportation Centre at Dublin Airport;
- DART at Drumcondra; and
- Bus at all Stops along the route

The National Transport Authority (Draft Policy Note 08 – Bus Network) is committed to reconfiguring the bus network to complement the Transport 21 network. With a

complimentary bus network, the patronage on Metro North will increase, while patronage on the bus network will not decrease by the same amount.

Services on Metro North will run every 5 minutes at peak when the system opens but this can be reduced to allow services to run every 2 minutes as demand increases over time. Metro North will provide significant journey time savings such as shortening the journey time from Swords to city centre from an average of 50 minutes currently by bus to 25 minutes by metro and Ballymun to city centre from an average of 25 minutes to 14 minutes. It is worth noting that the bus times quoted are averages and bus journey times can vary considerably and journey times well above the average can be experienced at times of congestion. One of the key advantages of Metro is the consistency and reliability of service and journey times which cannot be guaranteed with other modes.

In addition to the Dublin Bus services serving the Swords area an express bus service links Swords to the city centre via the Port tunnel. This service would at times have a competitive journey time with Metro North but would not be as attractive due to its limited catchment from its terminus, relatively poor frequency and the fact that being an express service it bypasses almost all the trip attractors and generators along the route that are outlined above.

Fast and reliable journey times are critical to the success of a metro or light rail line in achieving modal shift. This is particularly true on long routes such as Metro North. It is also particularly true for a route serving the airport, where business travellers require frequent service and speedy access to their final destinations. The journey time by metro from Dublin airport to the city centre is less than 20 minutes.

2.5 Social Inclusion

Metro North will assist the delivery of a number of regeneration and social-improvement programmes. Close to the Metro North alignment there are a total of four designated Revitalising Areas by Planning, Investment and Development (RAPID) areas and four Integrated Action Plans (IAPs), which have been prepared under the Urban Renewal Scheme. RAPID is an initiative led by the Department of Community, Rural and Gaeltacht Affairs to focus investment into the most concentrated areas of disadvantage in the country. The aims of RAPID are to increase investment made by Government Departments, integrate the delivery of public services and facilitate opportunities for communities to contribute towards strategic improvements.

The four RAPID areas are the Ballymun RAPID Area, Dublin City North East Inner City RAPID Area, Dublin City North West Inner City RAPID Area and Dublin City South East Inner City RAPID Area.

The four Urban Renewal Schemes, covered by Integrated Area Plans (IAPs) are for Ballymun, O'Connell Street, the North East Inner City and the Historic Area Rejuvenation Project (HARP). IAPs use a targeted approach to urban renewal to encourage physical development and to tackle socio-economic issues.

The largest regeneration project along the Metro North alignment is Ballymun, being managed by Ballymun Regeneration Ltd and Dublin City Council. Metro North will greatly assist with all of the regeneration and renewal objectives for this area of Dublin which has suffered socially challenging conditions for generations. The proposed scheme will provide the resident population (significant percentages of who are unemployed and with minimal educational qualifications) with direct, high-frequency and regular transport options to key employment and other land use destinations in the Greater Dublin Area, thereby assisting with the regeneration objectives.

2.6 Accessibility

Accessibility is defined as the measure of the capacity of a location to be reached by, or to reach different locations. Therefore, the capacity and the structure of transport infrastructure are key elements in the determination of accessibility. The economic

and social welfare for any individual is dependent upon the opportunities or choices available to them. The demand for travel is derived from the needs of individuals and businesses to reach opportunities not available at the trip origin. Accessibility measures seek to define the level of opportunity and choice, taking account of both the existence of opportunities, and the transport options available to reach them.

A joint study between RPA and the DTO was carried out during 2004 to provide a quantitative expression of the likely changes in accessibility by public transport within a defined area that would be achieved by implementing a Metro System between Dublin Airport and Saint Stephen's Green.

The study concluded that the opening of a Metro system would greatly increase accessibility to the city centre, the airport, and Swords with increased savings in journey time further out along the line. The increased accessibility has the practical effect of bringing a significant greater numbers of residences within easy access of the city centre and airport and could greatly reduce travel times.

The study also assessed the increase in households within specified public transport travel times to Dublin Airport and City Centre. The study showed significant increases in the number of households (over 18,250 additional households) within 45 minutes of Dublin Airport and just under 3,000 additional households within 30 minutes of Dublin City Centre in the morning peak.

Metro North will have a positive impact on the ability of residents within the local labour market, through enhanced public transport accessibility, to access the large number of jobs that exist and are scheduled to be created in the area.

2.7 Environmental benefits

A number of environmental benefits accrue as a result of Metro North. RPA estimates that there will be a significant modal shift from car to Metro North and in total approximately 12 million car trips per annum will be taken off the roads.

Densification of development will also contribute to more sustainable development and assist in tackling urban sprawl. The growth in population and employment in the Greater Dublin Area has taken place in a highly car dependent and unsustainable way. It is estimated that the area occupied by the Dublin agglomeration is approximately three times the area occupied by continental European cities of comparable population. This low density urban sprawl has resulted directly in severe traffic congestion and a very high total cost of providing infrastructure to the population served. Recent planning policies and decisions by the local authorities and by An Bord Pleanála in anticipation of Metro North support medium to high density development within the Metro North catchment area. The corridor served by Metro North provides a unique opportunity to ensure that development in Dublin for generations to come can take place in a sustainable way. If Metro North were not to proceed, it would not be possible for these planning policies to continue to be implemented.

In Ireland emissions in 2007 stood at 69.2 million tonnes of CO_2 equivalent (Mt CO_2e) and were nearly 25% above the 1990 baseline estimate. The most significant and sustained increase has been in the transport sector, where emissions have increased to over two and three quarters times their 1990 levels, due almost entirely to road transport.

Metro North, through providing a public transport option to commuters who currently use a car, has an important role to play in reducing emissions from the road-transport sector in Ireland. The Metro North CBA includes the reduction in CO2 emissions from car trips that have been removed from the road as a result of the scheme. In addition to reductions in carbon emissions and other Greenhouse Gases, Metro North will also reduce emissions of Non-Greenhouse Gases (Non-GHGs) such as Nitrogen Oxides (NOx), Volatile Organic Compounds (VOCs), and Particulate Matter (PM). These gases are emitted from road transport and are particularly harmful to human health.

Metro North has been designed to closely integrate with land-use planning in Fingal to achieve a new, more concentrated form of settlement in future in Dublin; this more sustainable approach to development and land-use planning will help to minimise future road-transport emissions.

Investment in transport modes such as Metro North, which have significantly lower emissions per passenger kilometre than highway modes, is critical to Ireland meeting its requirement to reduce emissions from its road-transport sector and meet its EU climate change commitments.

Other trends suggest that high capacity public transport modes such as Metro North may become a necessity in future to deal with significant mode switching from private car to public transport. The prospect of peak-oil, and the introduction of environmental taxes and demand-management measures to deal with climate change, has the potential to create a step-change in the demand for public transport in future as the cost of private motoring increases significantly.

2.8 Transport Policy

A Platform for Change 2001

In 2001 the Dublin Transportation Office (DTO) published *A Platform for Change – Outline of an Integrated Transportation Strategy for the Greater Dublin Area – 2000 to 2016*. This report was an update of the Dublin Transportation Initiative final report of 1994 and was developed as a consequence of the unprecedented economic growth and associated traffic congestion experienced in Dublin in the late 1990s.

The DTO strategy identified the need for an enhanced public transport network building on Luas, at that stage under construction and more extensive that that proposed in the DTI report, and enhanced to include a higher capacity Metro network.

A Platform for Change identified a Metro system as a key element of the transport network. It envisaged a segregated, high performance, high capacity rail network including an extensive Metro system of approximately 70km with radial and orbital lines integrated with other transit modes, serving multiple transit markets in addition to the peak commuting and airport markets, and improving accessibility to employment for all groups.

Transport 21 (2006 – 2016)

In 2005 the Government's 10-year investment strategy for transport to 2015, *Transport 21*, was announced. *Transport 21* sets out the Government's 10 year plan for transport infrastructure across the nation amounting to €34 billion of capital investment in roads, public transport and regional airports.

The strategy seeks the provision of an efficient, reliable and sustainable national transport network which would underpin Ireland's economic growth and competitiveness. Environmental and economic sustainability; increased accessibility; increased use of public transport; increases in capacity; and enhanced quality comprise the main aims of the strategy.

Seven new Luas projects are included in Transport 21 along with two Metro projects – Metro North and Metro West.

Importantly the *Transport 21* strategy aims to deliver an integrated, sustainable public transport plan, with a bus network fully coordinated with and complementing the rail network.

2.9 Land Use and Transport Policy

Land use and transport policy at a national level is captured in the *National Development Plan 2007 – 2013 (2006), Transport 21 (2005)* and the *National Spatial Strategy, (2002)*. The *Regional Planning Guidelines Greater Dublin Area 2004-2016 (RPG)*, the *Dublin City Development Plan 2005 – 2011* , the *Fingal County Council Development Plan 2005 – 2011* and other local policies form the framework for

development at local level. Appendix 1 sets out more detailed information on Land Use and Transport Policy.

National Development Plan 2007 – 2013

The National Development Plan (NDP) is a plan devised to guide infrastructural development in a co-ordinated manner. The National Development Plan covers the seven year period to 2013 and includes amongst its key themes the elimination of major infrastructure deficits to improve the quality of life for all.

Specifically with regard to the urban areas, the Plan notes that it is not sustainable to promote road and car transport as the major long-term mode of passenger transport. The growth in population and employment, together with the environmental imperative to reduce carbon emissions, demands a major modal shift from car to public transport. It is vital, the Plan states, that the workforce has access to reliable and efficient means of transport which is environmentally sustainable.

The NDP states:

"the following projects will be advanced in line with the timetable in Transport 21…Completion of the Metro North line from the city centre to Swords via Dublin Airport".

The plan goes further stating the importance of Metro North in providing improved public transport connections to the Greater Dublin Area.

The NDP recognises that: -

- Public transport projects such as Metro North are needed because they help Dublin enhance its competitiveness and ensure its position as a leading international urban metropolis;
- Transport infrastructure programmes are an economic priority;
- Public transport and investment in public transport are viewed as a means of supporting sustainable development; and
- Modal shift from private vehicles to public transport is necessary in order to promote efficiency, quality of life, competitiveness and environmental sustainability.

National Spatial Strategy (NSS) for Ireland 2002 – 2020

The National Spatial Strategy (NSS) is a 20 year planning framework for Ireland. The NSS endorses the principle of increased use of public transport in major urban areas and notes that for balanced development the performance of the Greater Dublin Area be built upon and physically consolidated and that the Greater Dublin Area's vital national role is secured in terms of improved mobility, urban design quality, social mix, international and regional connections.

The Regional Planning Guidelines (RPGs) Greater Dublin Area 2004-2016

The Regional Planning Guidelines (RPGs) develop the national policy and strategy outlined in the NSS at a regional and area specific level. The RPGs identify the critical relationship between land use development and infrastructure provision with a key infrastructure element being public transport. The RPGs identify the marrying of development with high quality public transport provision and take the principle of the transportation strategy for the Dublin metropolitan region set out by the DTO in *A Platform for Chang*e as the basis for regional development and consolidation of the metropolitan region.

Dublin City Development Plan 2005 to 2011

The Dublin City Development Plan 2005–2011 was adopted by Dublin City Council and came into effect in March 2005. The plan states:

"Dublin City Council support the measures currently being implemented or proposed by the Railway Procurement Agency…to enhance capacity on existing lines services and provide new infrastructure", which includes the provision of Metro North.

The written statement goes further and states that Dublin City Council:

"supports a City Centre rail connection to Dublin International Airport with a preference for stops at Dublin City University and Ballymun."

There has been significant investment in Ballymun over the past decade or so. Metro North will ensure that the benefits of this government investment in the regeneration of the Ballymun are achieved in full. Metro North will also act as an important catalyst for urban regeneration in the North inner city area.

Metro North- A link to the Future (2005)

A feature of the strategic infrastructure legislation and sub-regional land use and transportation planning is that it makes provision for trans-boundary planning and for integration of planning strategies between local authorities and transportation agencies. This study was prepared in 2005 by Fingal County Council in association with Dublin City Council, Dublin Airport Authority and the Railway Procurement Agency.

The report identified that in the current rail map of the Dublin region, there is an entire empty segment of the city region, influenced in the past by Phoenix Park and Dublin Airport, with the airport at the centre of the rail transport void. On a capacity and return basis, Metro was the preferred model for rail based transportation provision.

The report concluded that Dublin airport and the city region cannot cope with projected levels of growth without the provision of Metro North.

Fingal County Council Development Plan 2005 to 2011

The Fingal County Council Development Plan 2005 to 2011 sets outs Fingal County Council's policies and objectives for the development of the County up to 2011. A number of policies contained in the plan refer to Metro North and in particular the plan promotes:

"the development of a new and improved rail based transport system, including a metro link, from Dublin City to swords via the airport".

Objective T06 of the Development Plan aims

"To facilitate and promote the development of a Metro line from the City Centre to Dublin Airport and on to Swords by protecting the preferred route identified by the Railway Procurement Agency, preparing and implementing proposals for the integration of this line with the development of adjoining lands in co-operation with the developers of such lands, and implementing a scheme under Section 49 of the Planning and Development Act 2000".

Fingal County Development Plan Variation 29

The preparation of a comprehensive Swords LAP was commenced in 2007, with a 6-week period of non-statutory public consultation. It became apparent that a Variation of the CDP was needed to accommodate a new Swords Plan.

Fingal County Council has adopted a Strategic Vision for Swords *Your Swords, An Emerging City - Strategic Vision 2035*, which will inform the preparation of LAPs and provide a statutory context for accommodating Metro North.

A proposed variation, adopted as Variation 29, in conjunction with this elaborated 'Strategic Vision 2035' document, to be realised through subsequent statutory processes, sets out the Council's vision and gives it a formal basis.

The Strategic Vision is dependent on Metro North. Swords will have:

"an integrated transport strategy, comprising significant public transport services (including Metro North and local and regional bus services) and strategically important road infrastructure".

It is anticipated that Swords will be a major transport hub with an integrated public transport system, and will exploit the opportunities that the development of Metro North presents.

"Metro North will facilitate the optimal development of Swords Town in future years and the Council will maximise the benefits of and the efficient use of the Metro for the benefit of those living and working in the Town".

Major population growth in Swords will be facilitated by Metro North. As a result, demand for new housing will be substantially concentrated within the catchment zone of Metro North.

The Vision reflects, that the changes have led to a more legible and rational integration of Metro North into the existing and proposed urban form of Swords, with lands to the north of the town strategically located along the proposed Metro North and adjacent to the M1 and Belfast - Dublin corridor. The Strategic Vision envisages that this area could in the future accommodate the development of a substantial mixed-use urban district providing for a significant level of employment.

Economic Development Strategy for the Metro North Economic Corridor 2008

This report was commissioned by Fingal County Council and prepared by Indecon International Economic Consultants, with support from other consultants. It related to the identified Metro North Economic Corridor (MNEC), which is an area of land that is approximately 1km on either side of the Metro North alignment as it extends through Fingal. This strategy has a 20 year horizon, extending to 2030 and is designed to deliver a fundamentally changed vision for the development of Swords and the MNEC, which coincide with the delivery of major infrastructure investment, including in particular, the Metro North.

The strategy is envisaged as playing a central role in shaping other economic development and planning strategies for Fingal in the future, including the Swords Town Area Plan and is designed to ensure the maximum economic benefits are derived from Government investment in Metro North, thereby maximising value for money.

It identified undeveloped land banks, which are particularly relevant to the Corridor, which will be important for the economic development of the area. It identified that in the future one of the key strengths of the MNEC will be the Metro North rail link, along with other infrastructure and advantages that pertain to the area. It is envisaged there will be significant land use changes within the corridor, including the "Airport City" concept, science and technology related development, education, research & development and healthcare including population concentration.

Swords Masterplan (2008)

The anticipated arrival of the Metro North in Swords will facilitate the economic growth and expansion of Swords in line with the projections of the Regional Planning Guidelines. The Fingal County Development Plan 2005-2011 identified the need for a Masterplan for Swords Town Centre to guide its future growth and development. It is key to the future success of Swords as a multi-functional high quality major town centre within the Dublin-City region, that the traditional town centre extend in a compact manner to the south and south east and integrate fully with Metro North.

Further details on Land Use and Transport Policy are set out in Appendix 1.

2.10 Conclusions

The implementation of Metro North is central to Irish government transport policy as set out in Transport 21 and reinforced by the revised Programme for Government published in 2010. The project is fully aligned with local and regional planning policy

in Ireland and indeed underpins the entire land use strategy for Fingal County for the next 25 years. Metro North is the key to the sustainable continued expansion and economic growth of the Airport City Region and to Dublin as a whole.

Metro North is a commuter rail line serving key destinations. The project links the Dublin City University main campus north of Collins Avenue with St Patrick's College in Drumcondra and Trinity College in the city centre, providing opportunities for these educational institutions that do not currently exist. It also serves Dublin Airport, six hospitals, Croke Park and a number of key retail centres in the city centre, Ballymun and Swords.

Metro North is the catalyst for future sustainable development in the corridor it serves and ensures that the benefits of significant government investment in the regeneration of Ballymun are achieved in full. Metro North will also act as an important catalyst for urban regeneration in the North inner city area.

Other European cities Dublin is competing with have rail links to the airport and of the top 20 busiest airports in Europe only Dublin and Palma de Mallorca do not have a rail link.

In 2008, 93% of visitors to Dublin travelled via air, indicating the vast majority of visitors must either use public transport or hire a car once they arrive in Dublin. Metro North will significantly improve the tourist experience in Ireland, by providing an easily accessible, clean, safe, quick, frequent and reliable connection between Dublin Airport and the city centre. The Metro will be easily accessible from both airport terminals, providing a high quality public transport interchange for users of Dublin Airport.

With airport passengers and workers accounting for approximately 20% of all Metro North trips the airport is an extremely important Stop on the line. It is not however the sole rationale for the project with 80% of trips boarding and alighting at other locations

Metro North will generate much needed employment during the construction phase with the expectation that approximately 4,000 direct construction jobs will be generated for a significant proportion of the main construction programme. There will also be secondary spin off impacts due to the expenditure of wages in the local economy by the construction workforce. When these effects are included, Metro North is expected to generate approximately 6,000 jobs during the three years of peak construction, and in excess of 3,000 during the remaining years.

The future success of Ireland's economy is closely related to the development of Dublin as an internationally competitive city region. Through transforming the public transport landscape of Dublin, Metro North will improve the quality of life, sustainability and attractiveness of city, which is critical to the increasingly important challenge of attracting and retaining the most highly educated, creative internationally mobile talent.

Services on Metro North will run every 5 minutes at peak when the system opens but this can be reduced to allow services to run every 2 minutes as demand increases over time. Metro North will provide significant journey time savings such as shortening the journey time from Swords to city centre from an average of 50 minutes currently by bus to 25 minutes by Metro North and Ballymun to city centre from an average of 25 minutes to 14 minutes. It is worth noting that the bus times quoted are averages and bus journey times can vary considerably and journey times well above the average can be experienced at times of congestion. One of the key advantages of metro is the consistency and reliability of service and journey times which cannot be guaranteed with other modes.

Metro North will assist the delivery of a number of regeneration and social-improvement programmes. Close to the Metro North alignment there are a total of four designated Revitalising Areas by Planning, Investment and Development (RAPID) areas and four Integrated Action Plans (IAPs), which have been prepared under the Urban Renewal Scheme. The largest regeneration project along the Metro

North alignment is Ballymun, being managed by Ballymun Regeneration Ltd. Metro North will greatly assist with all of the regeneration and renewal objectives for this area of Dublin which has suffered socially challenging conditions for generations.

A joint study between the RPA and the DTO was carried out during 2004 to provide a quantitative expression of the likely changes in accessibility by public transport within a defined area that would be achieved by implementing a metro system between Dublin Airport and St Stephen's Green. The study concluded that the opening of a metro system would greatly increase accessibility to the city centre, the airport, and Swords with increased savings in journey time further out along the line. The increased accessibility has the practical effect of bringing a significant greater numbers of residences within easy access of the city centre and airport and could greatly reduce travel times.

The study assessed the increase in households within specified public transport travel times to Dublin Airport and City Centre. The study showed significant increases in the number of households (over 18,250 additional households) within 45 minutes of Dublin Airport and just under 3,000 additional households within 30 minutes of Dublin City Centre in the morning peak.

Densification of development will also contribute to more sustainable development and assist in tackling urban sprawl. If Metro North were not to proceed, it would not be possible for planning policies, designed to tackle urban sprawl, to continue to be implemented.

A significant part of any public transport investment is attracting people out of cars and on to public transport. A considerable proportion of the new boardings on Metro North come from the highway network. RPA estimates approximately 12 million car trips per annum will be taken off the roads. Significant environmental benefits are therefore generated as a result of Metro North.

Metro North, through providing a public transport option to commuters who currently use a car, has an important role to play in reducing emissions from the road transport sector in Ireland and is critical in Ireland striving to reduce emissions from its road transport sector and meet its EU climate change commitments.

Other trends suggest that high capacity public transport modes such as Metro North may become a necessity in future to deal with significant mode switching from private car to public transport. The prospect of peak-oil, and the introduction of environmental taxes and demand-management measures to deal with climate change, has the potential to create a step-change in the demand for public transport in future as the cost of private motoring increases significantly.

3. Project Definition

3.1 Chapter summary

- The development of an extensive and integrated public transport network throughout Dublin has been Government policy for over a decade.
- Transport 21 was announced in November 2005 and included provision for a Metro line to be known as Metro North from St. Stephen's Green to Swords.
- Metro North will build on the success of the Luas system in realising modal shift from private car to public transport by offering commuters in its catchment area a mode of transport of real choice.
- The route for Metro North is 18km long and runs between Belinstown, to the north of Swords, and St. Stephen's Green in the city centre. There are 17 stops along the route, 9 underground (below grade) and 8 at ground level (at grade).
- Metro North will offer extremely fast journey times to commuters along its catchment and to passengers arriving at Dublin Airport.
- The journey time between St. Stephen's Green and the Airport will be in the region of 20 minutes and from St. Stephen's Green to Swords less than 30 minutes.
- RPA undertook an extensive public consultation process in order to inform the overall preferred route selection process which concluded in October 2006.
- Metro North has been designed to safeguard the future possible extensions of the metro network to the south and to the north.
- Metro North has been designed to accommodate 20,000 passengers per hour per direction ultimately. This high capacity can be achieved by running services at very frequent intervals. This would not be possible with an on-street system, particularly in the city centre.

3.2 Background

In January 2002 Government instructed RPA to prepare a business case for the proposed metro line from Dublin Airport and Blanchardstown to Shanganagh identified in *A Platform for Change.*

In November 2002 RPA presented the Outline Business Case (OBC) for the Metro project to Government. The OBC included work on project definition, particularly in relation to system sizing and concept; a capital cost estimate reflecting the current stage of project definition; an assessment of funding available from property and development gains; a preliminary risk assessment; recommendations on the appropriate commercial structure for the concession; a cost benefit analysis; projected cash flows and a programme going forward.

The OBC concluded that there was a strong case for metro overall and proposed that the project be advanced as a Public Private Partnership under a Design, Build, Finance and Maintain (DBFM) arrangement with a separate concession for the operation of the metro.

The OBC presented a range of options for phasing the implementation of metro:

Option 1 – Dublin Airport and Blanchardstown to Shanganagh

Option 2 – Option 1 plus Swords extension

Option 3 – Dublin Airport to city centre

Option 3a – Dublin Airport to city centre plus Swords extension

Option 4 – Dublin Airport and Blanchardstown to city centre.

The OBC included an economic and financial analysis, and considered the advantages and disadvantages of the different implementation options. Government feedback on the OBC was that priority should be given to the Dublin Airport to city centre as the most affordable implementation option and the one contained in *An Agreed Programme for Government* published in June 2002.

The Revised Proposal prepared in 2003 by RPA recommended that Government approve Option 3 while keeping open the option of a Swords extension as it was considered that the extension to Swords makes a significantly better transport project due to increased patronage results and the strong support there would be from stakeholders in the Fingal area. In particular this option would deliver a much reduced journey time between Swords and the city centre, and greater opportunities for park and ride and property development and potential development levies to fund the project.The metro line from Swords via Dublin Airport to St. Stephen's Green as recommended in the Revised Proposal, now known as Metro North, was included in the Government's approved investment strategy *Transport 21,* announced in November 2005.

3.3 Project scope

The OBC and the Revised Proposal were both based on an assumed alignment, but noted that the final choice of alignment could not take place until after public consultation and an environmental assessment of route options. Following the submission of the Revised Proposal, RPA prepared a number of reports for Government on various project options. These reports set out a number of decisions to be made by the Department of Transport, along with RPA recommendations, in order to clearly define the scope of the project.

RPA met with the Department of Transport on 16 January 2006 to agree the scope of the project. The following key issues were agreed.

Table 3.1 Agreed Project Scope

Issue	Agreement
System concept and segregation	Metro North should be a light metro based on the German Stadtbahn systems. The metro should be segregated through the city centre. Outside the tunnel sections, opportunities for line of sight running on an unsegregated alignment may be considered.
Route	The Metro North route should be determined based on public consultation and an environmental assessment of route options.
Capacity	It was agreed that Metro North platforms and infrastructure should be designed to meet an ultimate capacity of 20,000 passengers per hour per direction.
Airport Stop	The Revised Proposal assumed an elevated metro stop at Dublin Airport, remote from the terminal. RPA should consider the

	advantages and costs of providing an underground stop at Dublin Airport adjacent to the terminal.
St. Stephen's Green Stop	It was agreed that RPA would liaise with Iarnród Éireann in relation to the design of the St. Stephen's Green Metro North – DART Underground interchange.
Future extensions	It was agreed that Metro North should be designed to facilitate the construction of Metro West without disruption to operations on Metro North, subject to an appropriate budget transfer. It was also agreed that Metro North should be designed and constructed so as not to preclude future extensions southwards to Shanganagh and Tallaght.
Specification	It was agreed that Metro North should adopt reduced specifications, including simpler station finishes, and equipment and facilities sized to suit Metro North rather than the ultimate metro network.
Commercial structure	It was agreed that Metro North should be delivered under a Design, Build, Finance and Maintain contract with a separate Operations contract. It was also agreed that RPA should retain the responsibility for the Railway Order process

3.4 Project alternatives

During the development of the Metro North scheme prior to the announcement of Transport 21 a number of fundamentally different project alternatives and system concepts were examined and rejected in favour of the metro concept.

A heavy rail link to Dublin Airport from either the DART or the Maynooth suburban rail line was proposed by Iarnród Éireann. This would not have achieved the objectives of Metro North. In particular, such a link would not address traffic congestion as it would not serve as a commuter system for north Dublin city and county and would only serve people wishing to make direct connections between the city centre and the airport. While the airport is an important destination for Metro North, it accounts for less than 20% of Metro North patronage.

As part of its submission to Government, RPA studied the alternative of building a pre-Metro system. This would be very similar in concept to the existing Luas system with a high degree of unsegregated running, though capable of future segregation through alterations to the infrastructure. While this had significant advantages in terms of initial capital cost, the overall investment to bring it up to full metro standard in the future is likely to exceed the cost of building to metro standard from the outset. The future upgrade would be very disruptive involving, for instance, the replacement of street running sections with elevated tracks, and would require long term interruptions to the metro service while being implemented.

A bus alternative could not provide the capacity required to achieve the objectives of the project. While high capacity Bus Rapid Transit systems exist, these require dedicated busways segregated from other road traffic. Dublin has insufficient space at street level for such busways and thus a Bus Rapid Transit system would need similar infrastructure to metro in order to achieve the necessary capacity.

3.5 Route alignment and stop location alternatives

The OBC and the Revised Proposal were both based on an assumed route, but noted that the final choice of route alignment could not take place until after public consultation and an environmental assessment of route options.

In February 2006, RPA commenced an extensive public consultation exercise to support the route evaluation. RPA used a mix of print and radio advertising, newsletter distribution, website communications and public open-days to prompt and facilitate input from members of the public in relation to the possible route options. RPA considered all submissions from members of the public when selecting the best overall route option.

Four main route alternatives were considered during this phase:

- the Central Route running from St. Stephen's Green to an elevated stop at Dublin Airport via O'Connell Street, the Mater Hospital and Ballymun, continuing on to Swords and Lissenhall via the main Swords Road.
- the West Route running from St. Stephen's Green to an underground stop at Dublin Airport via Tara Street DART Station, Broadstone and Finglas, continuing on to Swords and Lissenhall via the main Swords Road.
- the East Route running from St. Stephen's Green to to an elevated stop at Dublin Airport via O'Connell Street, the Mater Hospital, Drumcondra and Whitehall, continuing on to Swords and Lissenhall via Nevinstown.
- a variant of the Central Route, developed by RPA in response to public consultation, merging two of the city centre stops and interchanging with Drumcondra station by following the East Route to Drumcondra before crossing back to rejoin the Central Route at DCU via a new stop on Griffith Avenue.

The feedback from public consultation also led to a number of local route options being considered, including:

- a variant of the East Route through Clonshaugh Industrial Estate with an additional stop at Kilmore (approximately 1km from Beaumont Hospital)
- a variant of the city centre route which proposed the relocation of the Upper O'Connell Street stop to the plaza of the Department of Education on Marlborough Street
- a variant of the city centre route which proposed an additional stop at Parnell Square

The main route alternatives were evaluated against a number of objectives, including compliance with transport and land-use policy; environmental impact; social and economic benefits; transport integration; construction and operation costs; operational safety and efficiency and construction risk and efficiency. In October 2006, RPA announced the variant of the Central Route, with an underground stop at Dublin Airport, as the preferred overall route for Metro North.

Following the selection of the preferred route, options for individual stops, and the associated track alignment between the stops, along the preferred route corridor were considered. During that stage, environmental assessment and public consultation continued and more local alternatives were studied and evaluated to optimise the design of Metro North and mitigate potential negative environmental impacts. The significant alternatives considered during this stage included:

- alternative tunnel alignments in Drumcondra, to minimise tunnelling impacts on people and property
- alternative vertical alignments in Ballymun
- alternative locations for the Dublin City University stop
- alternative locations for the maintenance depot

RPA applied for a Railway Order in September 2008 based on the selected route and system concept, which is described in more detail in the following sections. It is

anticipated that a decision will be made on the Railway Order application in mid August 2010.

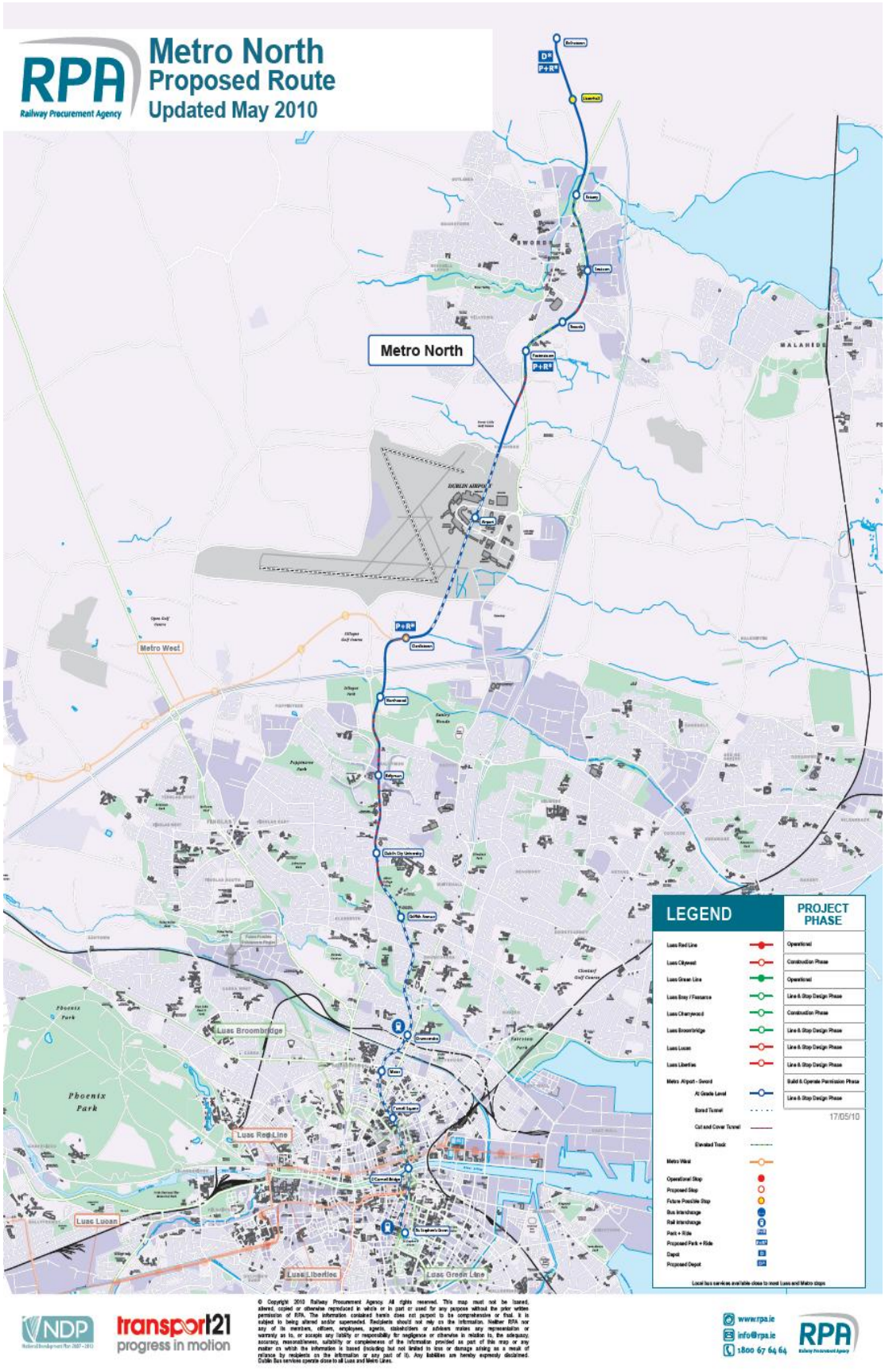
3.6 Detailed description of the route

The Metro North route is 18km long and runs between Belinstown, to the north of Swords, and St. Stephen's Green in the city centre. There are 17 stops along the route, 9 underground (below grade) and 8 at ground level (at grade).

The route runs largely at ground level or on elevated viaducts from Belinstown to north of the Airport, in tunnel through the airport, and then back to ground level through the lands south of the airport, crossing over the M50 and then going underground again from north of Ballymun to its terminus at St. Stephen's Green. The route has been designed to safeguard the future possible extensions of the metro network to the south, towards the Luas Green line and Tallaght and to the north beyond Belinstown towards Donabate. Provision has also been made for an operating link with the proposed Metro West at Dardistown.

The route map included at Figure 3.1 illustrates the geographical location of the route.

Figure 3.1 Metro North Route



The northern terminus is **Belinstown Stop**, which incorporates a 2,000 space multi-storey Park and Ride car park to attract commuters from a much wider catchment along the M1 motorway and the old Belfast Road, the R132 and surrounding areas. Belinstown Stop is located in a greenfield area at the boundary of the development zone being proposed by Fingal County Council for the Lissenhall area north of Swords.

From Belinstown, the alignment runs southwards, across greenfield land at surface level, to **Lissenhall Stop** which serves the heart of the proposed future development zone which will be developed in an integrated fashion around the metro. The construction of the stop at Lissenhall is not currently within the project scope and will be built later when the proposed development in the vicinity of Lissenhall takes place. The scheme has been designed so that the future construction and integration of the stop at Lissenhall can be accommodated with minimum disruption to services.

The alignment continues southwards at surface level crossing the Broad Meadow River and the Ward River and running along the western verge of the R132 to **Estuary Stop** which serves the large populated area to the north-west of Swords and the southern part of the Lissenhall development area.

The alignment rises up onto an elevated section of track which runs along the median of the R132 crossing over the Estuary and Seatown roundabouts before descending to **Seatown Stop** located at-grade in the central median of the R132. This stop serves existing residential and industrial areas, which also provide opportunities for high density development in the future. The Estuary and Seatown Roundabouts are to be converted to signal controlled junctions.

The alignment proceeds southwards on the surface along the central median of the R132 and then descends to pass under the Malahide Roundabout. To the south of the roundabout, the alignment emerges from the underpass and rises to the surface in the median of the R132 to **Swords Stop**. Swords Stop is located adjacent to the Pavilions Shopping Centre and will be an integral part of a proposed extended Swords main street which will link the Pavilions with the proposed Barrysparks development to the east of the R132. Good quality bus interchange facilities will make this stop accessible to commuters living in West Swords, Malahide and Feltrim. Initially, access to this stop is by pedestrian crossings of the R132. However, provision is made to allow this stop to be accessed from a possible future east-west bridge over the R132.

South of Swords Stop, the alignment rises up onto an elevated section of track to cross over Pinnock Hill roundabout and continues south to the at-grade **Fosterstown Stop** located beside Airside Retail Park on the R132. Good quality bus interchange facilities and a 300 space surface Park and Ride car park located at the Fosterstown stop will attract commuters from a wider catchment including Boróimhe, River Valley, Holywell, Malahide, Feltrim and Kinsealy.

The alignment then continues southwards crossing under the R132 south of the Airside junction and running at surface level and on embankments through a greenfield area to a tunnel portal north of the airport. A turn back facility is provided in the area to the north of the airport to allow some metro services to commence and terminate at the airport in the future if required. A tunnel portal and ventilation building is also located in this area. The alignment traverses the airport in tunnel in a southerly direction.

Airport Stop is located underground in the heart of Dublin Airport and provides easy access to both Terminal 1 and the new Terminal 2 building. The metro stop forms part of the Ground Transportation Centre, a major transportation hub included in the Masterplan for Dublin Airport.

South of the airport the alignment emerges from tunnel and rises to surface level. A tunnel portal and ventilation building is located in this area. The alignment then turns south-west to cross agricultural lands between Dublin Airport and the M50 motorway. **Dardistown Stop** is located in the heart of this area south of the airport which is the

site of a major planned development expected to generate significant levels of population and employment. Good quality bus interchange facilities and a 300 space surface Park and Ride car park located at Dardistown Stop will attract commuters from a much wider catchment along the M50 motorway and connecting routes. Space provision is made at this stop for a future operational link to the proposed Metro West line.

Continuing south, the alignment crosses over the M50 and Old Ballymun Road to the at-grade **Northwood Stop**. This stop serves the existing Northwood high density development to the east and the area of North Ballymun on both sides of the R108 which is zoned for significant redevelopment. Metro North will link the planned science and technology uses in this area with major third level educational facilities, including Dublin City University and Trinity College.

South of Northwood Stop, the alignment descends into a cut and cover tunnel running beneath the median of Ballymun Road. Ballymun is a high density residential area which is being redeveloped as part of a major regeneration programme. **Ballymun Stop** is a shallow underground stop located in the heart of the town centre, beside the civic plaza and a planned new shopping centre, and provides easy access to local amenities including the Civic Centre and the Axis Theatre.

The alignment continues south in a cut and cover tunnel along the Ballymun Road, crossing under Collins Avenue to **DCU Stop**. This is a shallow underground stop on the east side of Ballymun Road beside Albert College housing estate. DCU Stop serves the 10,000 students and staff at Dublin City University and the 1,800 seat Helix Theatre, as well as serving the local residential areas. Good quality bus interchange facilities will be provided to attract commuters from along the Swords Road to Finglas Orbital Quality Bus Corridor.

The alignment continues in a cut and cover tunnel under Albert College Park, entering twin bored tunnels near the southern boundary of the Park. The alignment remains underground in bored tunnel until the terminus at St. Stephen's Green. **Griffith Avenue Stop** is located on Dublin City University lands off Griffith Avenue and serves the local residential areas, including the areas around Drumcondra Road Upper, St. Mobhi Road and Home Farm Road. It will link the planned university facilities on this site with the main Dublin City University campus and the planned science and technology uses in north Ballymun.

Proceeding in a south-easterly direction, the alignment continues in tunnel under St. Patrick's College playing fields. An emergency access and ventilation shaft is located in the southwest corner of the college playing fields.

The alignment continues in tunnel under the Tolka River to **Drumcondra Stop**. This stop is located to the west of Lower Drumcondra Road and incorporates a new interchange with the existing Drumcondra Railway Station. Commuters on the Maynooth suburban rail line will be able to interchange easily at this stop to access the heart of the city centre or to travel to Dublin Airport. As well as serving the local residential area, this stop serves the educational institutions at St. Patrick's College and Clonliffe College and will provide quick access for crowds attending matches and other events at Croke Park from the outer suburban park and ride sites.

The alignment turns in a south-westerly direction passing under a second mainline railway and the Royal Canal, to **Mater Stop**, located under the Mater Hospital's existing surface car park. Mater Stop serves the Mater Hospital campus which includes the existing Mater Hospital, the New Adult Hospital currently under construction and the Mater Private Hospital. The campus has also been selected as the site for the new National Paediatric Hospital, development of which is well underway. The stop serves local communities in the Dorset Street and Phibsborough areas and is adjacent to Mountjoy, where a major redevelopment is planned.

On leaving the Mater Hospital the alignment turns south easterly under the Dorset Street/North Frederick Street junction and on to **Parnell Square Stop** located on Parnell Square East. This stop serves the Rotunda Hospital, the Gate Theatre and

the surrounding areas and provides convenient access to the proposed Dublin Central development in Upper O'Connell Street. The stop will act as a catalyst for regeneration of the area in concert with the Dublin City Council Parnell Square master plan.

To the south of Parnell Square, the alignment proceeds in tunnel under O'Connell Street to **O'Connell Bridge Stop**. This landmark stop is situated at the very heart of Dublin City, beneath the River Liffey. Exits to the south of the river provide ready access to the Temple Bar district, Trinity College, bus services on Westmoreland Street, D'Olier Street and the Quays and DART services at Tara Street via a short walk. Exits to the north of the river serve the busy retail areas around O'Connell Street, including Henry Street, Talbot Street and Abbey Street. Metro passengers will be able to transfer to Docklands, Connolly Station, Heuston Station and Tallaght via the Luas Red Line.

From O'Connell Bridge the alignment proceeds beneath Westmoreland Street and College Green and under buildings between Clarendon Street and Grafton Street. The terminus, **St. Stephen's Green Stop**, is located in the northwest corner of the Green. Entrances to this stop are outside the Green on St. Stephen's Green North and St. Stephen's Green West. This stop serves the busy retail district around Grafton Street and the business and tourist areas surrounding St. Stephen's Green. Metro passengers will be no more than a 10 minute walk from most of the major tourist attractions in Dublin, including Dublin Castle, the National Concert Hall and St. Stephen's Green itself. From here Metro passengers will be able to continue to Ranelagh, Dundrum, Sandyford and Cherrywood on the Luas Green Line, and, in the future, will be able to interchange to the DART Underground to reach any destination on the DART network.

3.7 Scheme concept and capacity

Metro North is similar in concept to metro systems in many European cities of similar size to Dublin and is not a heavy metro system such as London Underground. Metro North vehicles will look and feel similar to the light rail vehicles in use on the Luas system, though will be considerably longer by being coupled together to form trainsets. A very positive feature of the Luas system is the very small gaps that exist between the door thresholds and the edges of the platforms. This feature has been maintained on the Metro North. These small gaps facilitate access for people in wheelchairs, people with prams and buggies and people with mobility difficulties.

Metro North will provide sufficient capacity to permit a more sustainable pattern of high density urban development and to permit the successful growth of Dublin Airport. The forecast passenger demand in the morning peak hour in the forecast year of 2016 is approximately 6,000 passengers per hour per direction. Metro North will operate initially with a capacity of 8,000 passengers per hour per direction. Demand will grow over time with growth in population and employment along the Metro North catchment. Metro North has been designed so that its capacity can be increased incrementally to 20,000 passengers per hour per direction over time to meet this growing demand.

Metro North achieves this high capacity by running services at very frequent intervals. This would not be possible with an on-street system, particularly in the city centre, and so Metro North must have a dedicated route separated from the road network in these areas. This is achieved by running the Metro vehicles or LMVs in tunnel or on elevated structures. This segregated route also allows Metro to run at higher operational speeds than an on-street system. In the less congested outer suburban environment where less capacity is needed, Metro can operate at street level using light rail operating principles. This design philosophy, common in many European countries, permits the expansion of the metro network at an economic cost while maximising the utilisation of the more expensive tunnel infrastructure. In Dublin's case, this philosophy allows Metro West to be developed largely on surface at an economic cost, while utilising the Metro North tunnels to access the city centre and

the airport and will allow for the future connection of the Luas Green line to Metro North, and the running of through services all the way from Bray to Swords, the airport and Blanchardstown, without the need for expensive alterations to the existing Luas network.

Metro North will build on the success of the Luas system in realising modal shift from private car to public transport by offering commuters in its catchment area a mode of transport of real choice. Metro North will offer extremely fast journey times to commuters along its catchment and to passengers arriving at Dublin Airport. The journey time between St. Stephen's Green and the Airport will be in the region of 20 minutes and from St. Stephen's Green to Belinstown it has been estimated to be in the region of 31.5 minutes. As noted in Chapter 2 the average journey times achieved by bus from Swords and Ballymun to the city centre are double the journey time that can be achieved on Metro North. It is important to note that Metro North's dedicated infrastructure will ensure that these journey times are consistently achieved and are not susceptible to disruption from road traffic. Services will be regular and frequent to ensure that passengers are not suffering long waiting times at metro stops.

3.8 Interoperability

Interoperability between Metro and Luas systems is required as Metro North will be a significant element of an overall light rail network having the ultimate capability of physical integration with Luas. The reasons for this approach are:

- Metro and Luas will operate alongside each other within a relatively compact urban area and may share facilities in the future;
- Metro West vehicles will operate over both Metro North and Luas infrastructure and an integrated approach to systems design is therefore required;
- A single operator will be responsible for Metro North and Metro West operations which will be managed from a single control room;
- It may be necessary to convert Luas to metro standard on certain routes in the future as the network and demand grows. The DTO's A Platform for Change envisaged a direct link between Metro North and the Luas Green Line, which would involve extending the tunnel from St. Stephen's Green to form an operational link with the Luas Green Line. The Luas Green line has been designed to accommodate upgrade to metro standard if required in the future.

In order to facilitate the development of interoperable systems in the future Metro North will be designed and constructed to comply with the following the following key standards and requirements:

Table 3.2

System Element	Interoperability requirements
Gauge	The track gauge shall be 1435 mm. The structure gauge and developed kinematic envelope will be based on a nominal 2400mm wide vehicle
Wheel / Rail Profile	The wheel profile/railhead will be compatible with that of Luas. The wheel and rail profiles must allow safe running of Luas

	vehicles on Metro North infrastructure and vice versa
Vehicle / Platform interface	The edge of platforms shall be at 1240mm from the centreline of track on tangential track. The platform height above rail shall be 280mm
Systems	There must be compatibility of key control and communication systems, in particular the radio system and the automatic vehicle location system with those in use on the Luas infrastructure
Operating Voltage for Traction	The nominal operating voltage shall be 750V DC
Loadings	The loadings imposed by the Metro North vehicles (including maintenance vehicles) must not exceed those permissible on the Luas Green Line structures south of Beechwood Stop
Warning Devices	The Metro North vehicle warning signals (chime and horn) must make a similar sound to those of a Luas Vehicle
Rescue	Metro vehicles shall be able to rescue each other, and rescue, or be rescued by Luas vehicles
Pantograph Height	The Metro North vehicle pantographs must operate under the full range of Luas wire heights, without being at their maximum or limiting positions. (wire height minimum 3.7m above rail, maximum 6.3m above rail)

3.9 Operating Pattern and Timetable

Metro North will be designed to operate an ultimate peak service running at two minute headways (i.e. 30 trains per hour in each direction).

At opening the peak service will run at five minute headways as follows:

Table 3.3

Service direction	Peak hours
Southbound	07:30 to 09:30 hours and 16:30 to 18:30 hours Monday to Friday excluding Bank Holidays
Northbound	8:00 to 9:00 hours and 16:30 to 18:30 hours Monday to Friday excluding Bank Holidays

It is envisaged that services shall operate between the following hours and will stop at all stops along the route:

Table 3.4

Days	Operating hours
Mondays to Thursdays	05:00 to 00:30
Fridays	05:00 to 02:30
Saturdays	05:00 to 02:30
Sundays and bank holidays	07:00 to 23:30

Additional services shall be operated during the month of December and to cater for special events.

3.10 Accessibility

Central to the ethos of Metro North is its accessibility to all users, including those with disabilities. All forms of disability will be accommodated, ranging from wheelchair users to blind and partially sighted, deaf users and people with cognitive or learning disabilities.

In developing the design for Metro North, RPA has consulted with representatives of the National Council for the Blind of Ireland, the Irish Wheelchair Association, the National Association for the Deaf and the National Council on Ageing and Older People.

The design of Metro North will comply with the technical guidance arising from part 3 of the Disability Act 2005, as published by the National Disability Authority. In particular, all underground stops will have a minimum of two lifts serving each platform; the platform edge to door threshold interface will be level with a minimal gap as on Luas; passenger help points in the stops and on the vehicles will include an inductive loop facility and the design of the system will incorporate tactile surfaces, audio and visual emergency warnings, tactile maps and guides, user-friendly websites, and accessible timetables and other passenger information.

3.11 Detailed system description

3.11.1 Vehicles

The Metro North light metro vehicles (LMVs) shall be designed and built to relevant international or equivalent national standards to ensure that they meet the requirements of the Guidelines for the Design of Railway Infrastructure and Rolling Stock and gain acceptance of the Railway Safety Commission.

The LMV will be bi-directional with a width of 2.4 metres, a nominal length of 45 metres and be built for operation on a 1435 mm gauge. Vehicles shall have a minimum of 70% low floor area and the ability to negotiate curves of 25 metre radius. The LMV will be able to operate continuously at 70 kph. LMVs will normally operate in coupled trainsets.

Seats for about 80 passengers, floor space suitable for storage of luggage and other designated facilities for the mobility impaired shall be provided according to the applicable regulations.

Each LMV is to have an incident recorder as part of an on-LMV monitoring system incorporating the recording of critical events and data capture and storage.

It is estimated that a fleet of 84 LMVs will be required to accommodate ultimate peak service running at two minute headways with trainsets of two coupled LMVs. A fleet of 36 LMVs will be required initially to accommodate the peak opening service running at five minute headways with trainsets of two coupled LMVs.

3.11.2 Stops

Platforms on all stops will be 94 metres in length. The platform surface will be 280 mm above rail level and the face of the platform will be 1242 mm from the centreline of the track. The minimum platform widths will be 3.5m on side platforms and 6 metres on island platforms.

All stops will have the following facilities:

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

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

- Shelters with integrated seating (double sided shelters shall be provided on island platforms)
- Smart card validators
- Off-street parking provision for one service vehicle at each stop
- Cycle storage facilities
- 'Kiss and ride' lay-bys
- Bus and taxi interchange facilities
- A traction power sub-station
- Communication equipment cabinet with telephone

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

- Lifts and escalators (except at DCU and Ballymun which may be shallow stops) serving street, concourse and platform levels
- Directional signage
- Emergency escape staircases and fire fighting lifts at each end of the stop
- Ticket control gates including smart card validators
- Local control room
- Staff facilities
- Deterrent systems to prevent passenger from entering the tunnels

- Equipment rooms for CCTV, signalling, and communications systems, low voltage and high voltage switch rooms, and the associated uninterruptible power supply equipment rooms
- Electrical and mechanical emergency ventilation plant rooms/plenum rooms
- A traction power sub-station
- A sub-station for general power supply
- A fire detection system throughout the stop and in the equipment rooms
- A fan assisted emergency ventilation system at each end of the below grade stops (excluding Ballymun and DCU

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

3.11.3 Tunnels

Metro North will run underground from St. Stephen's Green to south of Northwood Stop, a distance of about 7.8km, and also beneath Dublin Airport, a distance of about 2.4km. It is envisaged that tunnel configuration will be as follows:

- Twin bore running tunnels between St. Stephen's Green and Albert College Park
- A ventilation and intervention shaft will be provided between the Stops at Drumcondra and Griffith Avenue
- Twin cell cut and cover running tunnels between Albert College Park up to immediately south of Northwood Stop
- Twin-bore running tunnels beneath Dublin Airport

All running tunnels will be sized to accommodate the developed kinematic envelope (DKE) of the LMVs, evacuation and access walkways, permanent way, drainage and all other systems and equipment.

The configuration of the bored tunnel sections will comprise twin bores with a single track in each bore. The internal tunnel diameter will be approximately 6 metres. Evacuation and access walkways will be provided on opposite sides of the tunnel at LMVs door height and at rail level respectively.

The cut and cover sections of tunnel will be a twin box tunnel with a wall dividing the tunnel cells. Cut and cover sections will also feature a walkway and access on opposite sides of the tunnel.

Cross passages will be provided between the two running tunnels for emergency escape to the non incident bore and for access by emergency personnel. Cross passages shall be no more than 250m apart or 250m from the nearest stop, tunnel portal or intervention shaft. Cross passages in bored tunnels will be fitted with two sets of double leaf bi-directional doors with adequate space between doors to enable opening. Cross passages in cut and cover tunnels will be fitted with sliding doors hung on the external face of the dividing wall. A two hour fire separation will be provided between the tunnel bores or cut and cover cells.

Provision will be made at the tunnel portals for access by the emergency services. The tunnel portals shall also be monitored by CCTV.

The fire strategy for Metro North requires intervention points for emergency access and egress to the twin bore running tunnels between St. Stephen's Green and Albert College Park, and at the airport, and to the twin cell cut and cover running tunnels between Albert College Park and Northwood Stop. Intervention points and

emergency access and egress will be provided at stops and the tunnel portals. A ventilation and intervention shaft will be also be provided between the stops at Drumcondra and Griffith Avenue Stops at St Patrick's College.

3.11.4 Structures

Metro North will include principal structures as described in the following table.

Table 3.5 Description of Principal Structures

Name	Purpose
Lissenhall Bridge	To carry Metro North over the Broad Meadow River
Ward River Bridge	To carry northbound Line of Metro North over the Ward River
Balheary Bridge	To carry southbound Line of Metro North over the Ward River
Estuary Viaduct	To carry Metro North over the Estuary and Seatown Roundabouts (R132)
Chapel Lane Footbridge	Replacement of existing simply supported concrete footbridge
Malahide South Footbridge	Replacement of existing simply supported concrete footbridge
Malahide Underpass	To carry Malahide Roundabout over Metro North.
Pinnock Hill Viaduct	To carry Metro North over the Pinnock Hill Roundabout (R132)
Fosterstown Footbridge	To carry pedestrian flow from Fosterstown Stop over the R132
Fosterstown Underpass	To carry the R132 and Airside Retail Park Road over Metro North
Fosterstown Accommodation Bridge	To carry existing access road over Metro North
Accommodation Underpass	To provide access between fields divided by metro north.
Culvert C03b	To carry Metro North over local stream
Culvert C04	To carry Metro North over Turnapin stream.
Dardistown	To carry existing access road over Metro North and provide

Name	Purpose
Bridge	access for future area development.
M50 Bridge	To carry Metro North over the M50 motorway
Santry Lodge Bridge	To carry Metro North over the Santry Lodge Road
Lissenhall Retaining Wall	80m long wall retaining the Metro North track between Lissenhall Bridge and Ward River Bridge (maximum height 3.7m)

3.11.5 Depot

Metro North shall have its own dedicated depot which will located north of Belinstown Stop and will provide accommodation for:

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

The LMV maintenance facilities shall provide capacity for the stabling and maintenance for the ultimate fleet size of 84 vehicles. Siding and shed lengths shall accommodate 2 x 45 m LMVs plus coupler lengths and allowance for splitting and coupling clearances. Stabling will initially be provided for 42 vehicles, the fleet required to accommodate a four minute peak headway. Space has been set aside to increase the stabling capacity if required in the future.

3.11.6 Control Room

The central control room will be located in the Belinstown depot complex and will have views overlooking the entry tracks to the depot and the stabling area.

The central control room is the central point where the systems and staff are located to control and regulate the service during normal and emergency operations, and respond / initiate communication to staff and passengers. It has command control over local control rooms located within stops.

The central control room will include space for Metro West so that Metro West operations may be controlled from the same site in the future. Systems for controlling train movements on Metro West infrastructure will need to be installed in the future as part of the Metro west project.

3.11.7 Control & Communication Systems

The control and communications system for Metro North will incorporate the following principal components:

- Network radio systems (including mobile and on-board radios)
- Passenger information displays
- Public address system
- Passenger help points
- Emergency help points on stops and LMVs

- CCTV system complete with Image and other recording on stops and LMVs
- PABX (Private automatic branch exchange) and telephones
- Clock system
- Power and ancillary SCADA (Supervisory control and data acquisition) systems
- Fibre optic transmission system
- Telecommunications UPS
- Local control rooms
- Fire panels
- Intruder alarm
- Payment mechanism system
- Building management systems

Emergency services radio coverage will be extended to all areas of Metro North, including tunnel areas, depot and all stops.

3.11.8 Signalling System

The signalling system will provide and maintain an operational headway between following trains of 120 seconds. In order to achieve this implementation of the following systems are envisaged:

- Between St. Stephen's Green and Fosterstown Stop a block signalling system with automatic train protection
- Between Fosterstown Stop and the Belinstown Depot "Line of Sight" operational principles with AVLS will be used

3.11.9 Traction Power Supply

The power supply for Metro North will be a 750V DC floating system, fed to the LMVs through an overhead catenary system via the LMV's pantograph. The maximum and minimum line voltages will be 900V DC and 500V DC respectively.

The incoming supply will be fed from two high voltage (20/22kV) ring mains arranged in a redundant configuration. The ring main cables will be connected to three electricity utility supply points at Belinstown Depot, Dardistown and St Stephen's Green. The incoming Electricity Supply Board (ESB) supplies will have their own protection under the control of ESB.

There will be 16 traction supply sub-stations. One sub-station will be located at each stop with the exception of Mater and one additional sub-station will be located at the Belinstown Depot complex to meet the requirements of the maintenance and stabling facilities, there will also be an additional traction sub-station at Lissenhall.

A safe earth system will provide the bonding of all structures, cabinets and metalwork to a secure earth point. Traction current return is to be via the running rails

A collection system is to be incorporated to collect and return any stray current to the sub-station supply.

3.11.10 Fare Collection System

Metro North will have an automatic fare collection system which shall be compatible with the Integrated Ticketing System comprising:

- Ticket vending machines (capable of accepting cash and credit card payments)
- Ticket control gates including smart card validators (at below grade stations)

- Smart card validators (at grade stations)
- Central accounting and management system
- Portable ticket vending machines
- Hand held validators

3.11.11 Emergency Ventilation System

Emergency fire/smoke ventilation will be provided for all running tunnels using fans located at the following locations:

- Below grade Stops
- Intervention shaft
- Airport tunnel portals
- Jet fans north of Ballymun Stop

3.12 DART Underground Interface at St. Stephen's Green

An important feature of the overall rail development plans is the development of an integrated network which will enable passengers to transfer between suburban rail, Metro and Luas at a number of interchange stations. St Stephen's Green will be a key interchange point enabling transfer between Luas, Metro and suburban rail.

RPA has worked closely with Irish Rail in order to design the Stop at St.Stephen's Green to achieve excellent integration. Metro North will construct the St. Stephen's Green combined Stop including escalator and lift access and a combined concourse level. These will be used by both Metro North and DART Underground.

The Metro North Metro project scope now includes the following for DART Underground infrastructure at St. Stephen's Green:

- Escape core at St. Stephen's Green North comprising of escape stairs and a combined passenger/fire fighter lift from DART Underground platform level to ground level;
- DART Underground platform level;
- Caverns that allow the construction of the DART Underground tunnel after the construction of Metro North tunnel;
- DART Underground ventilation shaft from DART Underground platform level to ground level at St. Stephen's Green West, including smoke ventilation duct at Metro platform level.
- DART Underground area at mezzanine level and Metro North platform level.

Discussions have taken place with Irish Rail and agreement has been reached on the quantum (€50 million plus VAT) of project budget that needs to be transferred to Metro North from DART Underground in recognition of the infrastructure that Metro North will build on behalf of Irish Rail as discussed in more detail in Chapter 8.

3.13 Conclusions

Following a request from Government in 2002, RPA prepared an outline business case for the proposed metro system identified in A Platform for Change. The OBC concluded that there was a strong case for metro overall and presented a range of options for phasing the implementation of metro. Following Government feedback, RPA submitted an updated Revised Proposal for metro in June 2003, recommending that Government approve a metro line from the city centre to the airport, as contained in An Agreed Programme for Government 2002, with an option to extend this to Swords. As part of this work, a number of project alternatives, including heavy rail,

light rail and bus options, were considered, but these did not meet the project objectives.

Transport 21 was announced in November 2005 and included provision for a Metro line, to be known as Metro North, running from St. Stephen's Green to Swords.

Three main route alternatives, and a range of local route alternatives, were identified, taking account of the 2002/2003 work, and these were evaluated against a number of objectives, including compliance with transport and land-use policy; environmental impact; social and economic benefits; transport integration; construction and operation costs; operational safety and efficiency and construction risk and efficiency.

RPA undertook an extensive public consultation process in order to inform the overall preferred route selection process which concluded in October 2006.

RPA applied for a Railway Order in September 2008 based on the selected route and system concept. It is anticipated that a decision will be made on the Railway Order application in mid August 2010.

The finalised route for Metro North is 18km long and runs between Belinstown, to the north of Swords, and St. Stephen's Green in the city centre. The route runs largely at ground level and on elevated viaducts from Belinstown to north of the Airport, in tunnel through the airport, and back to ground level through the lands south of the airport, crossing over the M50 and then going underground again from north of Ballymun to its terminus at St. Stephen's Green. The Metro North route at ground level will look similar to the existing Luas system, with extended platforms for the longer trainsets.

Central to the ethos of Metro North is its accessibility to all users, including those with disabilities. All forms of disability will be accommodated, ranging from wheelchair users to blind and partially sighted, deaf users and people with cognitive or learning disabilities

The route has been designed to safeguard the future possible extensions of the metro to the south, towards the Luas Green Line and to the north beyond Belinstown towards Donabate. Provision has also been made for an operating link with Metro West at Dardistown. In order to facilitate the development of interoperable systems in the future Metro North will be designed and constructed to comply with key standards and requirements which permit interoperability.

There are 17 stops along the route, 9 underground (below grade) and 8 at ground level (at grade). Underground stops will be provided at the Airport, Ballymun, Dublin City University, Griffith Avenue, Drumcondra, Mater, Parnell Square, O'Connell Bridge and St Stephen's Green.

At ground level stops will be provided at Belinstown, Estuary, Seatown, Swords, Fosterstown, Dardistown, and Northwood. Park & Ride facilities are provided at Dardistown, Fosterstown and Belinstown.

Metro North has been designed to accommodate 20,000 passenger per direction per hour (ppdph) ultimately. This high capacity can be achieved by running services at very frequent intervals. This would not be possible with an on-street system, particularly in the city centre, and so Metro North must have a dedicated route separated from the road network in these areas. This is achieved by running the Metro vehicles in tunnel or on elevated structures.

This segregated route also allows Metro to run at higher operational speeds than an on-street system. In the less congested outer suburban environment where less capacity is needed, Metro can operate at street level using light rail operating principles. This design philosophy, common in many European countries, permits the expansion of the metro network at an economic cost while maximising the utilisation of the more expensive tunnel infrastructure. Metro North will open with a capacity of 8,000. Capacity can be increased incrementally through the procurement of additional vehicles.

Metro North will build on the success of the Luas system in realising modal shift from private car to public transport by offering commuters in its catchment area a mode of transport of real choice. Metro North will offer extremely fast journey times to commuters along its catchment and to passengers arriving at Dublin Airport. The journey time between St. Stephen's Green and the Airport will be in the region of 20 minutes and from St. Stephen's Green to Belinstown it has been estimated to be in the region of 31.5 minutes. As noted in Chapter 2 the average journey times achieved by bus from Swords and Ballymun to the city centre are double the journey time that can be reliably and consistently be achieved on Metro North.

4. Transport Planning

4.1 Chapter Summary

- Metro North provides an important strategic linkage between key areas of the Greater Dublin Area (GDA), including Dublin City Centre, Dublin City University (DCU), Ballymun Town Centre, Dublin Airport and Swords and its environs.
- Three land use scenarios were tested as part of this analysis; No Growth, Moderate Growth and Local Authority (High) Growth.
- Within the Metro North catchment, population and particularly employment are forecast to grow significantly in both the Moderate Growth and Local Authority Growth land use scenarios.
- The Moderate Growth land use scenario is believed to be the most realistic forecast and has been used as the basis for the Base Case.
- In the Base Case scenario Metro North is forecast to have 36.3 million boardings annually. Furthermore, a considerable proportion of the new boardings on the system will come from the highway network. Using the Local Authority projected growth forecasts Metro North is forecast to carry over 48 million passengers each year.
- Both heavy rail and Luas are forecast to have an increase in patronage with the introduction of Metro North, while bus is forecast to have a decrease in patronage.
- Metro North patronage is also forecast to be higher than existing Luas patronage on a per kilometre basis. This is to be expected as metro provides higher average speeds than can be achieved on light rail and this, coupled with the reliability and frequency of service, makes metro more attractive over other modes including private car and bus.
- The 'Transport 21' sensitivity test indicates that Metro North will add 43.0 million passengers annually to the Metro Network.
- Including Luas Broombridge in the Base Case scenario marginally reduces Metro North annual boardings from 36.3 million to 35.1 million.
- The primary reason for this reduction is that, with the introduction of Luas Broombridge, individuals travelling to Dublin City Centre on the Green Line can now access areas further north than St. Stephen's Green without the need to transfer to Metro North to complete their journey.
- Including Metro West (running from Tallaght to Dardistown) in the Base Case scenario increases Metro North annual boardings from 36.3 million to 44.2 million.

4.2 Introduction

This chapter examines the effect of Metro North on the demand for public transport. In order to undertake this assessment, RPA has developed passenger demand forecasts for Metro North using the RPA multi-modal transport model. This model generates forecasts of future trips on Luas and Metro for a forecast year of 2025. The model takes as an input, forecast population and employment statistics to generate estimates for future trip demand by public transport. RPA has applied this forecast model to generate trips for Metro North for a 'Base Case' service pattern as well as further sensitivity tests reflecting different Transport 21 project phasing and land use scenarios. The Base Case test forecasts patronage for the future forecast year of 2025.

The resulting forecasts of passenger demand can then be used by RPA to identify required capacity, forecast revenues and service patterns for the proposed scheme.

4.3 Population and Employment Projections

Land use data for the proposed scheme's catchment area (taken as 1km in all directions from the proposed alignment) is used by RPA to develop an understanding of the likely demand for light rail or metro in that area. Population and employment

data taken from the 2006 Census carried out by the Central Statistics Office was used in the catchment analysis. In addition to these 2006 Census projections, land use forecasts have been supplied to RPA by the National Transport Authority (NTA), Dublin City Council (DCC) and Fingal County Council (FCC) for the lands in the vicinity of the proposed Metro North alignment. This demographic data is also used as an input to the RPA forecast demand model.

The walking catchment of Metro North has been taken as a 1km radius from the proposed stops as this is considered an acceptable walking distance to a stop. This is in keeping with the suggested acceptable walking distances for people without mobility impairment as stated in the IHT's (The Institute of Highways and Transportation) "Guidelines for Providing for Journeys on Foot". This guidance document states that a desirable walking distance for commuting is 500m (6.25 minute walk), and the acceptable walking distance is 1km (12.5 minute walk), with the maximum being 2km (25 minute walk).

An assessment of the total number of people in terms of population and employment that fall within the catchment of Metro North has been conducted using a GIS[2]-based zonal system. The zonal structure used is largely based on Electoral Divisions (EDs) with disaggregation of these EDs around the Metro North alignment and other public transport. Population and employment densities for each zone are then calculated. Population and employment are assumed to be equally distributed throughout the zone and thus, for any particular area the catchment in terms of people who live or work in the area can be calculated. Based on the walking catchment of Metro North and the population and employment densities, it was possible to determine the total population and employment within the catchment. Figure 4.1 illustrates the resulting 1km and 2km catchment area of Metro North.

[2] Geographical Information System

Figure 4.1 Catchment area of Metro North

Table 4. illustrates the population and employment numbers for the 1km catchment of Metro North for 2006[3] and for two future year forecasts called Moderate Growth and Local Authority growth.

The 2006 figures are taken directly from the CSO's 2006 census and are the most up-to-date census data available. The Moderate Growth scenario uses population and employment growth for 2025, which is based on Local Authorities' projections at an Electoral Division / zonal level. However, this growth is not allowed to exceed the CSO's M0F1[4] forecasts, which are defined at a county level. The second future year scenario uses Local Authorities' population and employment growth projections for 2025 without restricting this growth to conform with CSO forecasts. This is known as the Local Authority or LA Growth scenario.

Table 4.1 1Km Catchment area of Metro North

Alignment	2006 Pop*	2006 Emp*	Moderate Growth Pop**	Moderate Growth Emp**	LA Growth Pop**	LA Growth Emp**
Metro North	123,548	182,662	133,991	212,864	150,284	272,993

*Census figure

** Projected figure

Table 4.1 illustrates that in 2006 the proposed Metro North alignment has a catchment of approximately 183,000 jobs and approximately 124,000 people. The future year projections show significant growth in the Metro North catchment, with employment increasing to nearly 273,000 in the Local Authority scenario.

Due to the current economic situation these projections are unlikely to be fully realised within the stated timeframe. It is for this reason that RPA has produced additional demand forecasts, which assume that employment and population growth will not exceed levels forecast in the CSO's M0F1 scenario.

Under these assumptions, the total number of jobs in the Metro North catchment is forecast to be approximately 213,000. This level of employment growth is believed to be more realistic and achievable than the Local Authority projections.

Table 4. indicates that level of population growth will be less significant as it is forecast to increase from just under 124,000 to approximately 134,000 people in the Moderate Growth scenario and approximately 150,000 people in the Local Authority scenario. Again, given the current economic situation, the Moderate Growth scenario is believed to be more likely. For this reason it has been determined that the moderate growth scenario will be used for the Base Case test for forecasting demand.

4.4 Forecast Demand

4.4.1 Inputs and Assumptions

To assess the effect of Metro North the RPA multi-modal transport model has been applied to a number of specific tests. The principle test is called the Base Case. In addition to the Base Case a number of different sensitivities were also tested to provide a rigorous and robust appraisal of Metro North. These include:

[3] The most recent available census data
[4] This projection assumes zero net migration to Ireland over the period to 2026 and assumes a continuation of traditional migration patterns within Ireland.

- Land use sensitivity tests;
- T21 infrastructure test;
- Luas Broombridge test; and
- Metro West test.

For each test, two different scenarios are compared - the 'Do Minimum' scenario and a 'Do Something' scenario. The 'Do-Minimum' scenario assumes that the projected land use forecasts are realised without Metro North included while the 'Do Something' scenario includes Metro North. The difference between one scenario and the other indicates the effect that Metro North scheme implementation will have on mode choice.

Table 4.2 shows the transport inputs used for the Base Case.

For the purposes of forecast demand analysis and the economic and financial appraisal that follow for Metro North, a service pattern has been adopted and modelled that has all services travelling between St. Stephen's Green (SSG) and Belinstown in the 'Do Something' scenario. For modelling purposes these services run at a 4 minute headway in the AM peak and an 8 minute headway in the off-peak period.

Table 4.2 Transport Inputs for "Do Minimum" and "Do Something" scenarios

Inputs	"Do Minimum"	"Do Something"
Luas Tallaght to Connolly (Red Line)	Yes	Yes
Luas St Stephen's Green to Sandyford (Green Line)	Yes	Yes
Luas Connolly to The Point (Line C1)	Yes	Yes
Luas Sandyford to Bride's Glen (Line B1)	Yes	Yes
Luas Belgard to Saggart (Line A1)	Yes	Yes
Luas Bride's Glen to Bray/Fassaroe (Line B2)	No	No
Luas Stephen's Green to Broombridge (Line BXD)	No	No
Luas City-centre to Lucan (Line F)	No	No
Metro North	**No**	**Yes**
Metro West	No	No
Irish Rail Interconnector	Yes	Yes
Dublin Port Tunnel	Yes	Yes
Outer Ring Road	Yes	Yes
Luas P&R	Yes	Yes
DTO Quality Bus Network	Yes	Yes
Integrated Ticketing	Yes	Yes

Table 4. details the service pattern used in the do-something Base Case.

Table 4.3 Service Pattern for the "Do Something" Base Case scenario

Service Pattern	Headway (mins) Peak	Off peak
Interconnector	3.75	7.5
Luas: Tallaght – The Point	6	12
Luas: City West – Connolly	12	24
Luas: Heuston – Connolly	20	-
Luas: City West – Belgard	12	24
Luas: SSG – Sandyford	6	12
Luas: SSG – Bride's Glen	6	12
Metro North: Belinstown – SSG	4	8

4.4.2 Model Results

The demand forecasts for the Base Case service pattern described above are presented in Table 4.4. The demand forecasts indicate that the introduction of Metro North will add 36.3 million passenger boardings to the Metro network in the this scenario.

Table 4.4 Model Results Base Case Moderate Growth (per annum)

	Moderate Growth		
	Do Min	Do Something	Change from Do Min
Heavy Rail			
Boardings millions	93.2	96.3	3.04
Bus			
Boardings millions	232.5	218.5	-14.0
Luas			
Boardings millions	50.6	54.1	3.46
Metro			
Boardings millions	-	36.3	**36.3**
Total PT boardings (millions)	**376.4**	**405.1**	**28.7**

A considerable proportion of the new boardings on the system comes from the highway network. This will have a positive effect in terms of traffic decongestion in the city centre, i.e. taking cars off from the highway. For example, the implementation of Metro North is forecast to reduce the number of car trips by 11.8 million per annum in

this scenario. The data also demonstrates that part of these new Metro boardings come from other public transport modes where passengers have transferred due to the implementation of Metro North.

These results also show an increase in trips made on the Heavy Rail network when Metro North is introduced. This increase is due to the possibility of interchange between Metro and Heavy Rail at St Stephen's Green and Drumcondra stops.

The results show a decrease in trips made on the Bus network when Metro North is introduced. The decrease of 14 million passengers per annum is due primarily to bus users transferring to Metro North.

This transfer will be particularly evident for bus routes running parallel to the Metro North alignment as the faster journey time and higher frequency of the Metro service will encourage existing bus users to switch to Metro. However, the National Transport Authority (NTA Draft Policy Note 08 – Bus Network) is committed to reconfiguring the bus network to complement the Transport 21 network. With a complimentary bus network, the patronage on Metro North will increase, while patronage on the bus network may not decrease by the same amount.

The results also show an increase in annual Luas boardings of 3.5 million with the introduction of Metro North. This increase demonstrates the high level of integration and complementary nature of the Luas and Metro schemes.

4.4.3 Land Use Sensitivity Test

Two further land use scenarios are tested using the Base Case network and service patterns as set out above. The first assumes that future year population and employment levels will be the same as 2006. This is referred to as the No Growth Scenario. The second scenario uses Local Authorities' population and employment growth projections without restricting this growth to conform with CSO forecasts. This is known as the Local Authority or LA Growth scenario.

Table 4.4 Model Results Base Case No Growth and LA Growth (per annum)

	No Growth			LA Growth		
	Do Min	**Do Something**	**Change from Do Min**	**Do Min**	**Do Something**	**Change from Do Min**
Heavy Rail						
Boardings millions	77.2	79.0	1.8	106.1	109.7	3.6
Bus						
Boardings millions	199.7	189.8	-9.9	259.5	240.8	-18.7
Luas						
Boardings millions	37.5	39.4	1.9	69.6	75.2	5.6
Metro						
Boardings millions	-	25.1	**25.1**	-	48.6	48.6
Total PT boardings (millions)	**314.4**	**333.4**	**19.0**	**435.1**	**474.3**	**39.2**

Demand for Metro North in the No Growth and LA growth scenarios is 25.1 million and 48.6 million respectively. Again both of these scenarios also show an increase in trips made on the Heavy Rail network when Metro North is introduced.

The results again show a decrease in trips made on the Bus network when Metro North is introduced. The decrease ranges from 9.9 million trips in the No Growth scenario to 18.7 million trips in the LA Growth scenario and is again due primarily to bus users transferring to Metro North.

The results again show an increase in Luas boardings with the introduction of Metro North. This increase ranges from 1.9 million trips in the No Growth scenario to 5.6 million trips in the LA Growth scenario.

4.4.4 Comparison with existing Luas Patronage

Under the proposed service pattern set out in 4.4.1 above, the results of the modelling analysis show that Metro North is expected to perform extremely well in attracting passenger numbers that are in excess of those currently experienced on the existing Luas lines (Table 4.5 below).

Table 4.5 Metro North Patronage Comparison per annum with Current Luas

	Patronage (millions)	Length (km)	Patronage (millions/km)
Red Line (2009)	13.6	15.1	0.90
Green Line (2009)	11.8	8.9	1.33
Metro North Patronage (No Growth)	25.1	18.4	1.36
Metro North Patronage (Moderate Growth)	36.3	18.4	1.97
Metro North Patronage (LA Growth)	48.6	18.4	2.64

On a per kilometre basis Metro North is forecast to be more heavily used than either of the existing Red or Green lines in the No Growth, Moderate and LA growth scenarios. This is to be expected as metro provides higher average speeds than can be achieved on light rail and this, coupled with the reliability and frequency of service, makes metro more attractive over other modes including private car and bus.

4.4.5 Revenue

The output of the RPA model also forecasts revenues from fares for the proposed scheme. Table 4.6 shows the likely revenue generated as a result of Metro North implementation in the future year (2026).

Table 4.6 2026 Forecast Revenue per annum Base Case (2009 prices)

	Do Something
Revenue (2009 prices) No Growth	€54.62m
Revenue (2009 prices) Moderate Growth	€79.95m
Revenue (2009 prices) LA Growth	€109.62m

The revenue is based on an average fare per customer of approximately €2.20 in 2009 prices for the Moderate Growth scenario. The incremental revenue is higher than what is currently being achieved on the existing Luas system.

It should be noted that the higher yield on Metro North is due to forecast longer distance trips than on the existing Luas system and the assumption that a distance based fare system (similar to the existing Luas) is used on Metro North. This means that the longer the trip the higher the fare.

The forecasts presented above for demand and revenue have not been adjusted in Table 4.6 by a demand ramp up. A demand ramp up in the early years for the purpose of financial and economic modelling has been included in chapters 7 and 8.

4.5 Capacity of Metro North

Metro North will be designed and constructed so that it can provide adequate capacity in a cost effective manner for the projected levels of initial demand and also be capable of being expanded to provide additional capacity as demand increases over time.

Services will be regular and frequent to ensure that passengers will not have long waiting times at stops. Initially, at peak times, Metro North services will operate every five minutes. As each vehicle will have capacity for 670 passengers, this frequency will give an hourly capacity of approximately 8,000 passengers per direction per hour (ppdph). As demand grows, the frequency of services can be increased to every two minutes, which will give a ppdph capacity of approximately 20,000.

RPA has examined the potential for growth in peak hour demand including the possible effects of changes to transport policy and expansion of the public transport network in order to ascertain how they might affect the sizing of the system. Such changes include:

- Full public transport integration (fares and bus services) - The full integration of fares and the reorganisation of bus services would have a major impact on Metro North patronage, and this could help to optimise utilisation of the public transport network;
- Demand management measures (e.g. removal of free employee parking and cordon charging) - Demand management measures to deal with the severe traffic congestion in Dublin would result in a significant increase of patronage on Metro North;
- Development of the public transport network beyond Transport 21 (*A Platform for Change*); and
- Growth in peak trip demand per annum linked to economic factors and increasing population size.

In the Base Case 'LA Growth' scenario, an AM peak load of 6,700 passengers is forecast in the southbound direction between Northwood and Ballymun stops. The combined effect of the factors mentioned above will increase this number considerably, leading to a forecast peak hour demand of approximately 17,500 ppdph (Table 4.7).

Table 4.7 Metro North Demand Growth

	Opening Year 2017	Forecast Year 2025	30 Year Period 2047
Forecast peak directional flow with no policy implementation	5,150 →	6,700 ↓	
Forecast peak directional flow with potential policy implementation and growth		11,180	17,520

Metro North has been designed so that its capacity can be increased incrementally to 20,000 ppdph over time to meet this potential growth in demand without the need for any additional infrastructure.

4.6 Further Sensitivity Testing

To test the robustness of the transport case for Metro North and give rigour to the appraisal, a number of additional sensitivity tests were conducted. These sensitivity tests involve changes to the transport network and service patterns of various Transport 21 schemes. All sensitivity tests are based on the Moderate Growth land use scenario. As mentioned in Section 4.3 this is seen as the most realistic of the three scenarios available as growth in population and employment from 2006 levels is allowed at a zonal level, however this growth is not allowed to exceed the CSO's M0F1 forecasts at a county level.

The first sensitivity test examines the impact of Metro North when it is introduced after all of the public transport projects in the GDA in Transport 21 have been implemented. This is called the 'Transport 21' scenario. The transport inputs and service patterns for this test are detailed in Table 4.8 and Table 4.9 respectively.

Table 4.8 Transport Inputs for Transport 21 Sensitivity Tests

Inputs	Do Min	Do Som
Luas Tallaght to Connolly (Red Line)	Yes	Yes
Luas Sandyford to St Stephen's Green (Green Line)	Yes	Yes
Luas Connolly to The Point (Line C1)	Yes	Yes
Luas Sandyford to Bride's Glen (Line B1)	Yes	Yes
Luas Belgard to Saggart (Line A1)	Yes	Yes
Luas Bride's Glen to Bray/Fassaroe (Line B2)	Yes	Yes
Luas Stephen's Green to Broombridge (Line BXD)	Yes	Yes
Luas Lucan to City Centre (Line F)	Yes	Yes
Metro North	**No**	**Yes**

Metro West	Yes	Yes
Irish Rail Interconnector	Yes	Yes
Dublin Port Tunnel	Yes	Yes
Outer Ring Road	Yes	Yes
Luas P&R	Yes	Yes
DTO Quality Bus Network	Yes	Yes
Integrated Ticketing	Yes	Yes

Table 4.9 Service Pattern for the "Transport 21" Sensitivity Tests

Service Pattern	Headway (mins) Peak	Off peak
Interconnector	3.75	7.5
Luas: Tallaght – The Point	6	12
Luas: City West – Connolly	12	24
Luas: Heuston – Connolly	20	-
Luas: City West – Belgard	12	24
Luas: Broombridge – Fassaroe	7.5	15
Luas: Broombridge – Sandyford	7.5	15
Luas: Broombridge – Bray	7.5	15
Luas: Lucan – Connolly	4	8
Metro North: Belinstown – St Stephens Green	4	8
Metro West: Dardistown – Tallaght	4	8

The results are shown in Table 4.10. The addition of Metro North in the 'Do Something' scenario adds 43.0 million passenger boardings to the Metro network. This highlights the fact that when more of the projects of Transport 21 are in place prior to Metro North, the impact of Metro North is greater as the public transport network deficit is bigger prior to its implementation. As the public transport network expands the importance of Metro North will continue to grow.

Table 4.10 Model Results 2016 - Full Transport 21 Sensitivity Test (per annum)

	Do Min	Do Something	Change from Do Min
Heavy Rail			
Boardings millions	100.3	102.4	2.0
Bus			
Boardings millions	212.5	197.1	-15.4
Luas			
Boardings millions	91.4	94.4	3.0
Metro			

Boardings millions	22.1	65.1	43.0
Total Public Transport Boardings	**426.3**	**458.9**	**32.6**

The second sensitivity test is based on the same public transport network and service patterns as the Base Case scenario but with the addition of Luas Broombridge (see Table 4.11).

Table 4.11 Service Pattern for the "Base Case with BxD" Sensitivity Tests

	Headway (mins)	
Service Pattern	**Peak**	**Off peak**
Interconnector	3.75	7.5
Luas: Tallaght – The Point	6	12
Luas: City West – Connolly	12	24
Luas: Heuston – Connolly	20	-
Luas: City West – Belgard	12	24
Luas: Broombridge – Bride's Glen	6	12
Luas: Broombridge – Sandyford	6	12
Metro North: Belinstown – St Stephens Green	4	8

The results shown in Table 4.12 imply that there would still be strong demand for Metro North in this scenario with boardings on Metro North at 35.1 million. As expected, this is lower than the Base case forecast of 36.3 million. The primary reason is that, with the introduction of Luas Broombridge, individuals travelling to Dublin City Centre on the Green Line can now access areas further north than St. Stephen's Green without the need to transfer to Metro North to complete their journey.

Table 4.12 Model Results – Base Case with BxD Sensitivity Test (per annum)

	Do Min	Do Something	Change from Do Min
Heavy Rail			
Boardings millions	91.8	95.0	3.23
Bus			
Boardings millions	230.2	216.4	-13.7
Luas			
Boardings millions	56.8	61.6	2.8
Metro			
Boardings millions	-	35.1	35.1
Total Public Transport Boardings	**380.8**	**408.2**	**27.4**

The third sensitivity test is based on the same public transport network and service patterns as the Base Case scenario, with the further addition of Metro West in the Do Min scenario. In this case all Metro West services run to Dardistown at a 4 minute AM and 8 minute off-peak frequency (see Table 4.13).

Table 4.13 Service Pattern for the "Base Case with Metro West" scenario

Service Pattern	Headway (mins) Peak	Off peak
Interconnector	3.75	7.5
Luas: Tallaght – The Point	6	12
Luas: City West – Connolly	12	24
Luas: Heuston – Connolly	20	-
Luas: City West – Belgard	12	24
Luas: SSG – Sandyford	6	12
Luas: SSG – Bride's Glen	6	12
Metro West: Tallaght – Dardistown	4	8
Metro North: Belinstown – SSG	4	8

Table 4.14 shows that, in the Do Something A scenario, Metro North adds 44.2 million boardings to the Metro system. This is significantly higher than any of the previous scenarios. One of the reasons for this increase in boardings is that a large number of individuals transfer from Metro West to Metro North at Dardistown. This can be inferred from the increase in boardings on Metro North at the Dardistown stop (See Appendix 1 Table 6). These individuals are counted as boarding twice onto the Metro system.

Table 4.14 Model Results– Base Case with Metro West Sensitivity Test (per annum)

	Do Min - MW to Dardistown	Do Something A Add Metro North	Change from Do Min	Do Something B Add MW Full Service	Change from Do Something A
Heavy Rail					
Boardings millions	97.1	99.0	1.9	98.0	-1.0
Bus					
Boardings millions	228.2	212.8	-15.4	209.9	-2.9
Luas					
Boardings millions	51.7	54.7	3.0	54.5	-0.2
Metro					
Boardings millions	22.8	67.0	44.2	67.9	0.9
Total Public Transport Boardings	**399.8**	**433.4**	**33.6**	**430.4**	**-3.0**

In the Do Something B scenario Metro West has three services; Tallaght to the Belinstown, Tallaght to SSG and Tallaght to Dardistown, each of which runs at a 12 minute AM and 24 minute off-peak headway. The results, again depicted in Table 4.14 shows that the increase in metro boardings over the Do Something A scenario is quite small (0.9 million). The reason for this relatively small increase is that individuals who previously had to transfer at Dardistown can now remain on the Metro

West service and are now not counted as boarding twice. Overall however, the total number of boarders on the metro system (67.9 million) is the highest number of all the scenarios tested.

4.7 Conclusions

Metro North provides an important strategic linkage between key areas of the Greater Dublin Area (GDA), including Dublin City Centre, Dublin City University (DCU), Ballymun Town Centre, Dublin Airport and Swords and its environs. The results of this analysis demonstrate that there is significant demand for travel along this corridor, which can only be catered for by a high capacity metro system.

In the Base Case scenario Metro North is forecast to have 36.3 million boardings annually. Furthermore, a considerable proportion of the new boardings on the system will come from the highway network. Using the Local Authority projected growth forecasts Metro North is forecast to carry over 48 million passengers each year.

The introduction of Metro North will additionally lead to an increase in heavy rail boardings and Luas boardings. The increase in heavy rail boardings is due to the possibility of interchange with Metro North at St Stephen's Green and Drumcondra stops.

Bus boardings are forecast to decrease with the introduction of Metro North, however the National Transport Authority is committed to reconfiguring the bus network to complement the Transport 21 network. With a complimentary bus network, the patronage on Metro North will increase, while patronage on the bus network may not decrease by the same amount.

On a per kilometre basis Metro North is forecast to be more heavily used than either the existing Red or Green lines in the No Growth, Moderate and LA growth scenarios. This is to be expected as metro provides higher average speeds than can be achieved on light rail and this, coupled with the reliability and frequency of service, makes metro more attractive over other modes including private car and bus.

Further sensitivity tests also indicate a stronger demand with the introduction of additional transport infrastructure. In the Transport 21 scenario, the addition of Metro North adds 43.0 million passenger boardings to the Metro network. This significant increase in patronage highlights the fact that the other projects in Transport 21 cannot realise their full benefits without the integration effect of Metro North. Simply put, Metro North provides the backbone to Transport 21 linking all the other lines.

The introduction of Metro West into the Base Case scenario also leads to a stronger demand for Metro North, which highlights the complementary nature of the two schemes. The introduction of Luas Broombridge into the Base Case scenario leads to a slightly reduced demand for Metro North as existing Green Line passengers can now access areas further north than St. Stephen's Green without the need to transfer to Metro North to complete their journey.

Metro North's initial capacity, based on 5 minute headways in the AM peak, will be in the order of 8,000 ppdph. The ultimate capacity based on a 2 minute headway will be in the order of 20,000 ppdph. This capacity will be sufficient to meet the forecast demand of approximately 17,000 ppdph.

5. Capital Costing for Exchequer Funded Elements

5.1 Chapter Summary

- There are four capital cost elements of the Metro North project to be funded directly by the exchequer namely; advance enabling works, property acquisition, RPA project management and PPP capital contributions.
- The capital cost estimates for advance enabling works reflect the current pre-tender design stage of definition of those works.
- Wherever possible, estimates were prepared using cost information available from similar and relevant projects both domestically and internationally.
- Property acquisition estimates were prepared and separately and independently verified by Chartered Property Surveyors.
- The total capital cost of the exchequer funded elements of Metro North excluding PPP Capital Contributions is estimated to be €570 million (excluding VAT). This figure includes escalation.
- The accrued expenditure to the end May 2010 on these elements of the project is €135 million.
- The additional accrued expenditure forecast from June 2010 to the date for Financial Close in November 2011 is €96.4 million, at which point there would be an additional accrued liability of €17.5 million should the project not proceed.

5.2 Introduction

There are four capital cost elements of the project to be funded directly by the Exchequer namely; advance enabling works, property acquisition, RPA project management and PPP capital contributions. This chapter discusses the first three elements only. Capital contributions are discussed in Chapters 8 and 9. .

5.2.1 Advance Enabling Works

Advance enabling works consists of major utility diversion works at city centre locations and in the Ballymun area, elements of the Mater Stop box, resolution of archaeology at St. Stephen's Green and in and around the site of the proposed train depot at Belinstown, removal of heritage items in the city centre, construction of a temporary construction traffic bridge across the River Liffey, arboriculturalist (tree removal) works along the proposed route, various investigative works and surveys, design, construction supervision and management and various capital contributions towards works required at the Mater Campus and Rotunda Hospital. The scope of the enabling works is described in Chapter 9 section 9.4.

5.2.2 Property Acquisition

Property acquisition includes all temporary and permanent property acquisition necessary for both the advance enabling works and for the construction of Metro North itself including all associated property consultant's advice.

5.2.3 RPA Project Management

RPA project management includes the planning, design, PPP procurement and construction management of the project (excluding advance enabling works). This encompasses the cost of RPA staff and associated overheads, advisors, consultants and contractors.

5.3 Methodology

5.3.1 Overview

The exchequer funded capital cost estimates prepared for the purposes of this Detailed Business Case reflect the current stage of project definition and development and the specific pre-tender design information available for the advance enabling works elements of Metro North.

In the preparation of the capital cost estimates the following factors have been considered:

- International market conditions;
- Irish growth and labour rates;
- Industry norms and requirements; and
- Past experience of relevant projects both internationally and domestically.

5.3.2 Programme Assumptions

The estimates are under-pinned by certain programme assumptions, which are set out in Chapter 10. Changes to the programme and in particular delays could result in a significant increase in cost.

5.3.3 Procurement Assumptions

The capital cost estimates incorporating the calculation of risk allowances for advance enabling works contracts are based on the contractor risk transfer model inherent in the Public Works Contracts (GCCC). All significant enabling works contracts such as utility diversions will be tendered under the 'Public Works Contract for Civil Engineering Works designed by the Employer or the Contractor as appropriate.

With regard to Property Acquisition, it is assumed that all remaining properties to be purchased for Metro North are procured under the Compulsory Purchase Order (CPO) code. It is further assumed that the serving of Notices to Treat for all such properties will commence promptly once the Railway Order is operational.

5.3.4 Estimating Experience

The capital cost estimates for the advance enabling works were prepared by RPA's appointed consultants in conjunction with its own internal estimating department. A significant wealth of historical cost data from similar Luas contracts and relevant international projects were reviewed to establish the rates and appropriate percentage additions for overheads and profit, used in the estimates.

5.3.5 Peer Review

A series of internal and external peer reviews have been conducted on all estimates produced. This helps to improve accuracy and makes sure that the deliverables are of the highest possible standards. The peer review process is three tiered and briefly has the following characteristics:

Table 5.15: Peer Review Process

Tier	Methodology	Scope
Internal Peer Review Team	Review of each other's work by the team internally Bottom up detailed review	Review consistency of approach, rates, estimating methodology Coverage of the estimate Gap identification Review of input documents for estimate alignment
Management Staff Review Team	Presentation of estimate Top down sense check	Review of methodologies Review of process Review of broad areas of coverage
External Peer Review	Review of estimate by external parties Bottom up detailed review Query list and feedback produced	Review in detail elements and rates Benchmarking with similar schemes based on their knowledge for consistency and sense

5.3.6 Estimating Approach

In recognising the importance of robust estimates for works to be funded by the exchequer, a systematic approach to estimate preparation was employed. The key aspects of this approach included:

- Understanding the scope of the works;
- Identifying the main 'drivers' in terms of time, cost and quality;
- Identifying inconsistencies and opportunities for standardisation;
- Understanding practical implications through site visits;
- Understanding multi-stakeholder and third party requirements;
- Including other third party costs;
- making proper but controlled allowance for external factors such as access, working hours, adjacent developments/works;
- Obtaining and reviewing drawing/sketches, programme and standards;
- Clarifying outstanding queries/exclusions;
- Identifying scope activities, method statements, interface schedules and quantities together with the architects and engineers;
- Producing and populating a Cost Breakdown Structure by applying benchmarked and commercially reviewed costs for similar work;
- Identifying and estimating abnormal and construction methods;
- Estimating impact of procurement strategy;
- Identifying and assessing exclusions, assumptions, opportunities and risks; and
- Assessing confidence (risks and tolerances).

5.4 Basis of Capital Cost Estimates

5.4.1 Advance Enabling Works

Basis of Estimate reports have been prepared for all aspects of the Advance Enabling Works. In brief, the basis for the different types of activity are described in sections 5.4.2 to 5.4.9 below.

5.4.2 Utility Diversions

These estimates have been built-up from first principles based on a comprehensive schedule of individual utilities to be diverted or replaced e.g. drainage, water, electricity, gas, communications etc. A separate utilities schedule has been prepared at each location, which describes the type, size, depth and location of the utility works to be undertaken including reinstatement details. These schedules have been checked against the corresponding drawings for accuracy of quantities. The rates and percentage add-ons applied to each item on the schedule were derived from cost data from similar utility works in the Dublin area, particularly utility diversions on previous Luas projects. All Local Authority & Statutory Undertaker's charges were calculated based on agreed rates and the planned duration of works at each location.

5.4.3 Mater Stop Box

The estimate for these heavy civil engineering works has been independently prepared by RPA's cost consultants in accordance with RIAI stage 4/5 and based on the tender design.

5.4.4 Archaeological Resolution

The amount and nature of archaeology to be resolved at the two key locations of St. Stephen's Green and Belinstown has been informed by a series of investigative works at both locations. The estimate is based on rates recently tendered to RPA for similar works and encompasses all excavations, monitoring and subsequent reporting and logging of findings in accordance with DoEHLG best practice.

5.4.5 Heritage Works:

These works involve the removal, storage and subsequent replacement of several items of cultural significance in the city centre such as statues, monuments, railings and paving. Owing to the unique and delicate nature of the works, a preliminary appraisal of the construction methodology was undertaken by heritage specialists. The estimate is based on the conclusions of that report by applying the appropriate local rates for labour and plant.

5.4.6 Temporary Liffey Bridge

Due to the bespoke nature of this temporary bridge, a market consultation exercise was undertaken directly with suppliers of proprietary temporary bridge systems, based on a preliminary design. The estimate includes for all costs associated with detailed design, site preparation, erection, maintenance and subsequent removal of the temporary bridge, based on the outputs of that consultation.

5.4.7 Surveys & Investigations

The majority of survey and investigative contracts in relation to advance enabling works were awarded by the end of May 2010. Therefore, the estimates are based upon the projected outturn costs of these contracts or final accounts where the contracts were completed.

5.4.8 Design

The majority of design contracts for all aspects of advance enabling works were awarded by the end of May 2010. Therefore, the estimates are based upon the projected outturn costs of these contracts.

5.4.9 Construction Management/Supervision

This estimate was developed from first principles based on the construction programmes for each element of the advance enabling works and the resource levels commensurate with previous experience of contracts of a similar nature and value.

5.4.10 Property Acquisitions

The compensation to be paid for all temporary and permanent land or property acquisition has been assessed under the statutory code by Chartered Surveyors. Each individual property reference contained in the Railway Order has been valued separately in this assessment based on site inspections, market research and market conditions. The valuations include allowances for severance & injurious affection, disturbance and estimated re-investment costs.

Due to the property market instability currently being experienced in Ireland, RPA's surveyors recommended applying a robust contingency to offset any adverse market movements or isolated market transactions, which do not reflect current market sentiment. To this end, a contingency allowance has been added to the primary valuations.

In addition to the above primary valuation, a second independent valuation exercise was undertaken by different Chartered Surveyors on a select number of the referenced permanent lands, which accounted for over 75% of the total property take by value. This valuation exercise validated the valuations in the primary assessment.

The overall property estimate includes allowances (in addition to the above estimates) for compensation to land owners for cosmetic damage or disturbance where works are undertaken in the sub-stratum of their land. The fees payable to RPA's advisors for negotiating and processing property related transactions are also included based on their tendered fee percentages.

5.4.11 RPA Project Management

The estimate for RPA Project Management costs has been assessed under two broad headings distinguishing between the activities up to and including Financial Close and separately the activities relating to the management and supervision of the main PPP works and contract.

The RPA Project Management Pre-Financial Close estimate includes for all RPA staff, advisors, consultants and contractors engaged in the planning, design and procurement of the project since January 2006. The majority of these activities were complete at the time of writing and briefly encompass route selection and appraisal, public consultation, Railway Order preparation, oral hearing attendance, reference design, PPP tender document preparation and PPP tender assessment, amongst others. The actual costs incurred to date along with forecast of costs to complete these activities form the basis of this estimate.

RPA Project Management post-financial close in summary involves design and construction monitoring, public relations and stakeholder management, property acquisition, contract administration, testing & commissioning and the fees associated with the Independent Certifier as defined under the PPP contract. The estimate has been developed from first principles based on the indicative construction durations indicated by PPP bidders.

5.4.12 Risk

A detailed Quantitative Cost Risk Assessment (QCRA) has been undertaken for all aspects of the advance enabling works on a contract by contract basis. This has involved a rigorous process of:

- Initial risk identification through individual brainstorming workshops for each contract whereby risk registers and lessons learned from previous contracts were used as the starting point;
- Probability and Impact assessment of each risk identified;
- Draft Monte Carlo simulations run at 80% confidence (P80) to quantify risk allowances;
- Peer review of risk coverage and allowances by senior management; and
- Finalisation of risk reports on a contract by contract basis.

5.4.13 Inflation

Allowances for escalation have been included to recognise the impact of inflation on construction and other costs over the construction periods for enabling works and the main PPP works.

- Advance enabling works - reflecting the current economic climate and the recent deflation in the domestic construction industry, a realistic assessment of the rate of inflation at 0%, and 1.5% for 2010 and 2011 respectively has been adopted for each of the cost categories. A figure of 5% per annum thereafter has been applied.
- Property - given the recent deflation in the Irish Property Market, 0% inflation was applied to property valuations. It is expected that all Notices to Treat are served in late 2010 following the Railway Order becoming operational. Under the CPO code, the date for serving the Notice to Treat is the date used for valuation purposes.

5.5 Results

5.5.1 Total Exchequer Funded Capital Costs

The exchequer funded capital cost estimate for Metro North (excluding PPP Capital Contributions) is €570m (excl. VAT) and is presented in Table 5.2 below. The estimate includes allowances for risk and inflation and is based on the assumptions highlighted earlier in this chapter.

Table 5.2: Exchequer Funded Capital Cost Estimates (€ million nominal)

Cost Categories	Cost € million Nominal
Advance Enabling Works	€256.7
Land and Property Acquisition	€145.7
RPA Project Management Pre-Financial Close	€86.8
RPA Project Management Post-Financial Close	€80.8
Total Capital Cost (Excluding VAT)	**€570.0**

The four cost items above represent a summary of the more detailed elements used to build up the capital cost estimate.

5.5.2 Capital Costs Profile

RPA has estimated the future spend profile based on draft constructions programmes for the advance enabling works, PPP bidder's construction programmes for the main PPP works and an expected rate of CPO deal closure in line with the experience of previous Luas projects.

Table 5.3: Annual Capital Cost to Government (€ million nominal)

Annual Capital Expenditure (€ million nominal)									
Total	2006-2009	2010	2011	2012	2013	2014	2015	2016	2017
570.0	129.8	18.1	92.4	118.2	77.8	40.0	47.1	39.0	7.3

5.5.3 Accrued Expenditure to Date

The accrued expenditure to the end of May 2010 is €134.9 million (excl. VAT) and is presented in Table 5.4 below.

Table 5.4 Accrued Expenditure to end May 2010

Cost Categories	Cost (€ million)
Advance Enabling Works	42.6
Land and Property Acquisition	24.1
RPA Project Management Pre-Financial Close	68.2
Total Capital Cost (Excluding VAT)	**134.9**

The land and property purchased to date represents tangible assets that could be re-sold should the project not proceed. However, as the majority of these properties were purchased in 2008, the value of these properties will have diminished in line with the property deflation experienced in Ireland over the last two years. It is also possible that an additional negative impact on value would result from cancelling or postponing Metro North for properties adjacent to the proposed route, such as those purchased to date.

5.5.4 Additional Expenditure to Financial Close

The forecast additional expenditure from the start of June 2010 through to the end of November 2011 is €96.4 million (excl. VAT) and is presented in Table 5.5 below.

Table 5.5 Additional Expenditure to end November 2011

Cost Categories	Cost (€ million)
Advance Enabling Works	77.9
Land and Property Acquisition	0.0
RPA Project Management Pre-Financial Close	18.5
Total Capital Cost (Excluding VAT)	**96.4**

5.5.5 Accrued Liability at Financial Close

Should the PPP transaction fail to reach financial close in November 2011 and assuming that the Advance Enabling Works proceeded as planned throughout 2011, there would be a residual liability associated with terminating the Advance Enabling Works contracts at that point in time.

While the Public Works Contract does not allow for loss of profit payments to contractors due to early or discretionary termination by the Employer, it is nonetheless impractical to cease such a significant volume of work instantly without the need to complete certain open excavations and reinstate private land and public roads to their original condition.

In order to arrive at a reasonable estimate of the residual liability in November 2011, RPA has reviewed each Advance Enabling Works contract and taken the following considerations into account:

- Planned progress of the contract works to November 2011;
- What works would be more practical to complete rather than stop instantly;
- What steps would be required to make the works safe;
- What remedial works would be necessary to return private lands and public roads to an acceptable condition;
- Expected duration to resolve outstanding claims and agree final accounts with contractors;
- Contractual notice periods for termination; and
- Terms of Employment for RPA resources engaged directly in advance enabling works only.

In light of the above considerations, the residual liability forecast as a consequence of the employer terminating all active enabling contracts in November 2011 is presented in Table 5.6 below.

Table 5.6: Residual Liability in November 2011

Cost Categories	Cost (€million)
Advance Enabling Works	17.5
Land and Property Acquisition	TBC
RPA Project Management	TBC
Total Residual Liability	**17.5***

*The above forecast considers the impact on the portfolio of advance enabling works only and does not take account of the residual liabilities associated with terminating employment contracts for RPA resources engaged in the management of the wider project or disturbance cost claims from private landowners.

5.6 Conclusions

The capital cost estimates for the exchequer funded elements of Metro North (excluding PPP Capital Contributions) reflect the current pre-tender design stage of definition of those works. Wherever possible, estimates were prepared using cost information available from similar and relevant projects both domestically and internationally.

The total capital cost of the exchequer funded elements of Metro North (excluding PPP Capital Contributions) is estimated to be €570 million (excluding VAT). This figure includes escalation.

The accrued expenditure to the end May 2010 on these elements of the project is €135 million.

The additional accrued expenditure forecast from June 2010 to the date for Financial Close in November 2011 is €96.4 million, at which point there would be an additional accrued liability of €17.5 million should the project not proceed.

6. Risk

6.1 Chapter Summary

- RPA has undertaken detailed risk analysis, using a formalised risk management process, in developing the project to date. RPA is fully compliant with Department of Finance guidance in its approach to assessment of risk for the purposes of compilation of the Public Sector Benchmark.
- The PPP contract has been structured to achieve substantial transfer of construction and availability risk so as to ensure the privately finance element of the project can be treated as "off balance sheet" for government accounting purposes.
- In January 2008 Government approved funding of enabling works in the knowledge that significant expenditure on enabling works would take place in advance of reaching financial close and contract award on the Metro North PPP. The risk existed that money would be expended on enabling works prior to financial close, with a risk that the project may not reach financial close either due to affordability, value for money or other factors. The risk of not reaching financial close has however increased following the credit crisis and the risk of significant sunk costs being incurred on enabling works without certainty on financial close therefore needs to be addressed.
- RPA, with the assistance of KPMG and NDFA has assessed the PPP market in 2009/2010 and likely developments in that market over the next 18 months and RPA believe that financial close for Metro North in late 2011 is achievable. The terms and conditions on which financial close may be achieved are less favourable for the state than would have been possible prior to the credit crisis.
- Greater stability has returned to financial markets in 2010 and if recent trends continue, RPA is confident that the required debt funding would be available to achieve financial close for Metro North. However, there remains a small risk that the preferred bidder for Metro North would not be able to secure the full amount of the funding for the project. RPA has been exploring with NDFA options for managing this risk. Senior debt funding from the National Pensions Reserve Fund or the possibility of further EIB funding are possible ways of dealing with this.
- In order for Metro North to continue on programme and ensure PPP bidder confidence is retained in the project Enabling Works contracts need to be signed in October 2010. This requires a commitment by Government of approximately €76 million during 2011 - this is to cover RPA expenditure and enabling works capital expenditure.
- In the event that the project was unable to reach financial close and a decision was taken to cancel the project at the end of 2011 the net cost incurred on the project would be approximately €246 million. This includes an allowance for rectification costs and the cost of terminating enabling works contracts as well as the recovery to be made through sale of properties already acquired. Any development levies which had been remitted to RPA by the local authorities would need to be re-paid.

6.2 Background

The successful implementation of any major project requires formal risk and value management. Key project decisions should be supported by a comprehensive risk analysis. This analysis should be clear about what the significant project risks are;

what the potential impact of these risks could be on project objectives; who is best able to manage each category of risk; and what procurement strategy and risk mitigation strategy will deliver best value for money. Risks will also be managed and priced differently in a PPP and in traditional procurement - the basis upon which the Public Sector Benchmark is calculated.

Risk assessment is a key component of project appraisal. RPA project cost estimates are prepared on a risk adjusted basis, for the planning, construction and operational phases of the project. Programme risk is also considered as part of this process. RPA has a formal risk management process and uses quantitative risk analysis to help identify the top project risks and to quantify their likely impacts.

RPA has a dedicated health and safety team to manage health and safety risks in parallel with the commercial and contractual risks discussed above. Designer risk assessments are carried out at each design phase to ensure that the formal risk management methodology is applied.

As part of its Enterprise Risk Management (ERM) process, RPA maintains a formal Corporate Risk Register to help manage non-project specific risks.

Significant risk analysis has been undertaken in the development of the Metro North Project since the Outline Business Case (OBC) was developed in 2002. The contract structure and procurement strategy has been defined as set out in Chapter 9.

This chapter provides an overview of the Metro North:

- Project Risk Management process;
- Technical & Environmental risk management;
- Public Sector Benchmark;
- PPP contractual risk allocation including consideration of Eurostat accounting rules;
- Risk to Government of funding enabling works and project not successfully reaching financial close.

6.3 Project Risk Management

A risk management plan has been developed for the project and a project register is maintained which is the repository for all information that comes out of the risk process. The register is a live document which is an important management tool enabling the identification prioritisation and proactive management of all uncertainty on the project.

Quantified risk Analysis is a formal process used to quantify risks in terms of cost and time on a consistent basis and is validated by the project team. A Quantified Cost Risk Analysis “Model” (QCRA) is created to allow the calculation of potential cost impacts for each risk and for the range of total project risk exposure to be established. In a similar way to the cost model the impact of uncertainty within the project is considered in producing a Quantified Schedule Risk Analysis (QSRA). This quantified risk analysis is included within the RPA cost estimates as described in Chapter 5.

Risks continue to be reviewed, monitored and controlled by RPA using regular management meetings and workshops in accordance with the risk management plan. The purpose of these reviews is to assess and validate progress on mitigation actions and identify any new or increasing risk trends. RPA uses standard project dashboards and trend reports to alert management to areas of increasing risk and record progress on mitigating actions. These reports also include a list of the top risks that are most likely to affect both the project end date and the out-turn cost so that management can make informed decisions to mitigate the likelihood of delays and cost over-runs.

The risk register is reported regularly to the Metro North Project Board and the RPA Board.

6.4 Technical & Environmental Risk Management

6.4.1 Strategy

Metro North is a complex project comprising a large number of elements and disciplines. In particular there is a requirement for an extensive underground system involving tunnels, caverns and deep excavations in variable ground conditions. As such it is considered that a risk management strategy must be in place to ensure the safe and controlled execution of the project. The system employed by Metro North is based on the Code of Practice for Risk Management of Tunnel Works published by The International Tunnelling Insurance Group (ITIG).

In accordance with best practice and where applicable RPA will apply this code of practice to all other elements of the project that includes at-grade, elevated and short sections of sub-surface running (underpasses). The Infrastructure Contractor is obliged to adopt and apply this code of practice.

The Code of Practice for Risk Management of Tunnel Works was published in January 2006 and was based on the "Joint Code of Practice for Risk Management of Tunnel Works in the UK" which was prepared jointly by the British Tunnelling Society (BTS and the Association of British Insurers, and published by the British Tunnelling Society in September 2003. The code has been subsequently modified after discussions with the International Tunnelling Association and the International Association of Engineering Insurers, notably to recognise that some of the provisions in the original Joint Code would not be appropriate or legal in all nations, regions, or cities which would require specific amendments to the code.

The objective of the code is as follows:

"...to promote and secure best practice for the minimisation and management of risks associated with the design and construction of tunnels, caverns, shafts and associated underground structures… It sets out practice for the identification of risks, their allocation between parties to a contract and Contract Insurers, and the management and control of risks through the use of Risk Assessments and Risk Registers."

6.4.2 Technical and Environmental Risk Assessments

As part of the project management of technical and environmental risks it is necessary to carry out a series of risk assessments for the whole project and elements thereof. Risks can be identified through means outside a formal risk assessment process such as the result of studies undertaken, environmental assessments, technical workshops, and dialogue with third parties for example.

Risk assessments and risk workshops have been undertaken throughout the development of the reference design which was prepared by RPA to inform the Railway Order application and the development of the Metro North Construction & Maintenance Requirements. Risks, and proposed control measures and mitigations have been captured in the Technical and Environmental Risk Register, and are subject to regular review and updating.

The risks identified and scheduled by this risk register include coverage of the following aspects:

- Noise, including airborne noise;
- Vibration, including groundborne noise;
- Surface water;
- Traffic;

- Pollution of air and water;
- Geotechnical and geological including contaminated ground, rock and soil stability;
- Groundwater; and
- Ground movements.

The approach adopted by RPA is based on the process adopted on a number of large tunnelling projects in recent years.

A key objective of the Technical and Environmental Risk Register is to communicate RPA's knowledge of the technical and environmental risks held by RPA to the PPP bidders.

6.4.3 Preliminary Health & Safety Plan

As part of the health and safety management of the project, design risk assessments have been maintained throughout the project development stage of the project. These design risk assessments have been issued to the PPP bidders in the Preliminary Health & Safety Plan.

Relevant risks identified by these design risk assessments have also been included in the Technical and Environmental Risk Register.

6.4.4 Construction Stage Technical and Environmental Risk Register

The Technical and Environmental Risk Register will be maintained and updated by RPA throughout the procurement stage of the project in parallel with the bidders maintaining and updating the tender stage risk register (based on the bidders design) which are reviewed by RPA as part of the Health & Safety management of the project.

After appointment of the preferred bidder the Technical and Environmental Risk Register will be amalgamated with the tender stage technical and environmental risk register by the preferred bidder. The amalgamated risk register will become the Construction Stage Technical and Environmental Risk Register, and importantly the only risk register that contains the schedule of technical and environmental risks to be managed, updated and supplemented as the project moves forward from that point.

6.5 Public Sector Benchmark

6.5.1 Background

Department of Finance ("DoF") guidance requires the preparation of a Public Sector Benchmark ("PSB") prior to the issue of tender documentation for all projects to be procured as PPPs. The RPA, as Sponsoring Agency under the DoF guidance has responsibility for the preparation of the PSB for Metro North.

The PSB is an estimate of the cost to the public sector of procuring the services set out in the PPP Contract through traditional procurement. In the case of Metro North the tender(s) include both the Infrastructure Contract and the Operating Contract (please refer to chapter 9 for information on the contractual structure). The PSB is presented as a single monetary value that represents the full estimated cost, taking income and risks into account, to the RPA of delivering the project using traditional public sector procurement.

The PSB is used to consider whether the PPP procurement route chosen has the potential to deliver a value for money solution. It is also used, together with estimates for the non PPP elements of the Project such as permanent land acquisition and enabling works to assess whether the estimated capital cost is within the capital envelope allocation for the project.

The PSB for Metro North was prepared, approved and provided to the Department of Transport in March 2008 prior to issue of the PPP tender documents.

6.5.2 PSB Risk Workshop Approach

A key element of compilation of the PSB is the identification, assessment and quantification of risks which the RPA will seek to transfer to the private sector under the PPP contracts.

In the absence of detailed comparable statistics in relation to projects of a similar nature, RPA, in line with DoF guidance, assumed a best practice approach undertaking risk analysis through a series of risk workshops. These risk workshops provided a structured forum for identifying, discussing and allocating project specific risks. Attendees at the risk workshop sessions included relevant internal and external experts. The aim of each risk workshop session was to obtain consensus with respect to the allocation of the risks between PPP and PSB and the quantification of these risks in terms of the probability of each occurring and the likely financial impact of each, based on the experience of the experts at each session.

Due to the complexity of Metro North, RPA and its advisers undertook research into other large scale international rail projects (either procured on a traditional basis or through a PPP). International projects that RPA deemed comparable in parts to Metro North and therefore useful reference points in terms of the construction of the PSB included, Canada Line Rapid Transit Project in Vancouver, London Underground, West Coast Mainline, Nottingham Express Tram and other relevant projects.

In addition to international projects, RPA also utilised the experience gained from procuring the Luas Red and Green Lines and the Luas Line B1 and C1 projects currently being undertaken. Attention was also given to the experiences on the Dublin Port Tunnel and on Irish Rail projects.

6.5.3 PSB Risk Analysis

The following procedures were used for conducting risk analysis for the preparation of this PSB:

- A PSB risk register, which was based upon the project risk register, was prepared which identified, categorised and allocated the main project risks to either RPA or InfraCo/Operator depending on who would bear the risk under the PSB or PPP procurement;
- The risks were reviewed, prioritised and quantified through a series of risk workshops and reviews ; and
- The risks were modelled in order to calculate the expected financial impact of the risks over the concession period. This risk was then added to the base costs of the project to give the risk adjusted cost to the public sector.

The main categories of risks identified were:

1. Design Risks:
2. Construction Risks:
3. Rolling Stock Supply Risks;
4. Commissioning Risks:
5. Operating Risks:
6. Maintenance Risks;
7. Lifecycle Risks;
8. Other Risks including PR, commercial, insurance and legal

6.6 PPP Contractual Risk Allocation

The commercial structure for the PPP contracts and the rationale for the structure is set out in Chapter 9. PPP contractual risk allocation is a specialist area and RPA has retained specialist legal advisers with significant international PPP expertise to advise it in relation to the risk allocation for Metro North. The Metro North PPP contract (Project Agreement) is based on the principles set out in the standard NDFA PPP Project Agreement but amended to take account of issues that are specific to Metro North and the rail industry. Where appropriate RPAs contractual drafting takes cognisance of UK standard PPP drafting (SOPC 4 – issued by the UK Treasury) and the precedents established on other rail PPPs such as Docklands Light Rail where appropriate.

In developing the contractual risk allocation RPA has been mindful of the principles of PPP best practice and with the Department of Finance's PPP policy guidelines which states that "The underlying principle in risk transfer in PPPs is that responsibility for the risks should rest with the party best placed to manage them. When considering risk transfer to the private sector, State Authorities should keep this principle in mind and work towards the optimum level of risk transfer rather than the maximum level. The private sector will charge for each risk that they take on so there is a point at which risk transfer ceases to represent value for money."

In many key commercial areas, there will be significant negotiations with bidders during the Best and Final Offer stage of the PPP procurement process on key points. The final form of the Metro North contracts may differ slightly from the risk allocation set out in 6.6.1 and 6.6.2 below.

6.6.1 Infrastructure Contract

The risk matrix shown in Table 6.1 below shows the principal allocation of risk between RPA and the Infrastructure Contractor under the Infrastructure Contract.

Table 6.1 Infrastructure Contract – Principal Risk Allocation

Risk(s)	RPA	InfraCo	Shared
Land acquisition			✓
Ground Conditions / Land risk		✓	
Compliance with Output Specification		✓	
Design		✓	
Carrying out the Works		✓	
Construction Programme		✓	
Approvals / Consents			✓
Utilities			✓
Archaeology			✓
Enabling Works			✓

Risk(s)	RPA	InfraCo	Shared
Testing & Commissioning		✓	
Maintenance		✓	
Operational Response		✓	
Lifecycle Costs		✓	
Advertising	✓		
Security (policing, emergencies)		✓	
Changes in Law			✓
Force Majeure			✓
Quality Assurance		✓	
Relevant Authority Requirements		✓	
Third Party Agreements			✓
Inflation			✓

6.6.2 Operating Contract

The risk matrix shown in Table 6.2 below shows the principal allocation of risk between RPA and the Operator under the Operating Contract.

Table 6.2 Operating Contract – Principal Risk Allocation

Risk(s)	RPA	Operator	Shared
Trespassers and Protestors		✓	
Satisfaction with the System		✓	
Cross default of the Operating Contract as a result of an event of default under the Commissioning Contract		✓	
Compliance with Operating Requirements		✓	
Provision of the Operating Services		✓	
Provision of the Metro West operating Services (If RPA		✓	

Risk(s)	RPA	Operator	Shared
exercises its option)			
Approvals / Consents			✓
Health & Safety Issues		✓	
Timetable Flexibility shared with the Infrastructure Contractor		✓	
Additional Trips		✓	
Quality Assurance		✓	
Operating Plan		✓	
Operational Response shared with the Infrastructure Contractor		✓	
Policing and Emergency Exercises		✓	
Public Relations		✓	
Changes in Law		✓	
Force Majeure			✓
Relevant Authority Requirements		✓	
Third Party Agreements			✓
Inflation			✓

6.6.3 Eurostat – Risk Allocation - Impact on the General Government Balance

Eurostat issued a decision in February 2004 in relation to the accounting treatment of PPP projects in national accounts. The Eurostat decision says that an asset is off balance sheet, and therefore does not affect the General Government Balance (GGB) upfront over the construction period, provided the private sector partner carries the construction risk and carries either the availability or the demand risk (see below) Where the project is considered off the government balance sheet the cost of the project counted against the GGB may be spread over the life of the PPP agreement (rather than over the construction period). If the PPP is on the Government's balance sheet, then the full construction costs count against the GGB over the construction period. The capital element of the subsequent annual payments by Government does not affect the GGB but the interest and service charge element does.

The Eurostat 2004 rules state that "... it is not unusual that government takes part itself in the financing. This is different from a possible capital injection in a given structure in the form of equity stake. This may be justified by the fact that frequently a

private partner is not able to borrow at the same rate of interest as government, thus increasing the cost of the project. Therefore, government may offer a certain level of financing for the PPP project, to entice greater interest by private sector entities in the project and/or to reduce the total cost of financing." Eurostat rules indicate that if the capital cost is predominantly covered by government and therefore the government bears a majority of the risks this would indicate that for government accounting purposes the PPP project may require classification as being 'on balance sheet'.

The Central Statistics Office (CSO) is responsible for the classification of PPP projects in the national accounts in Ireland.

6.6.4 Construction Risk, Availability Risk and Demand Risk

Construction risk refers to the risk that PPP assets may, for example, become available later than the date fixed in the contract, or do not meet the specific standards or involve unexpected additional costs. In order to assess whether the public or private sector partner carries the construction risk of a PPP project, the main issues which will influence the consideration are who bears responsibility for late delivery, cost over runs, defective design or construction and site risk. As a general rule, if the PPP contract passes these risks to the private sector partner then that would indicate that construction risk has been transferred.

Availability risk is the risk that, following completion of construction, the private sector partner does not deliver the level of service or the quality of service agreed in the PPP contract. The key issue here is which party carries the loss, and the size and scope of penalties levied if the asset or part of the asset is not available for use due to a fault on the part of the private sector partner after any reasonable rectification period specified in the contract has elapsed. When part of an asset cannot be used, the penalties applied should be based on the proportion of the asset not available for use. Other considerations would be if the quality of services provided is below the standard specified in the contract and the issue of who bears cost overruns in relation to the running of the service. For availability risk to lie with the private sector partner, penalties should be significant and automatic.

Demand risk is the risk that the demand for PPP services may be significantly higher or lower than expected when the contract was signed. For example, the number of passengers using Metro North are higher or lower than was expected.

6.6.5 Metro North PPP - Construction Risk, Availability Risk and Demand Risk

RPA has been mindful in developing the contractual risk allocation for Metro North that there is sufficient transfer of construction risk and availability risk to the Infrastructure Contractor in order for the privately financed element of the PPP contract to be classified as off balance sheet for government accounting purposes.

Market consultation undertaken when the Outline Business Case (OBC) was developed in 2002 indicated that that patronage risk should be borne by the public sector. This was particularly the case as the public sector would retain control of fares policy, traffic demand management and parking regulation. Further market analysis was undertaken in finalisation of the contract structure (Chapter 9) and there was evidence that there remained a strong market dislike of rail revenue risk. Indeed at that time no major rail scheme had come forward in the PPP market since 2004 where significant revenue risk is linked with infrastructure finance. RPA has therefore not attempted to transfer demand risk to the Infrastructure Contractor.

In relation to construction risk under the Metro North Infrastructure Contract, responsibility for late delivery, cost over runs, defective design or construction and site risk lies with the Infrastructure Contractor. The Infrastructure Contractor will be responsible for carrying out and completing the works on time and for the price as bid. The Infrastructure Contract requires the Infrastructure Contractor to take all of the principal types of construction risks which might typically affect a major infrastructure project.

In relation to availability risk the Infrastructure Contractor will be remunerated for the performance of the works and the maintenance services through availability payments determined under a payment mechanism which measures both availability and performance quality indicators. The availability payment and deductions are structured as follows:

The majority of each availability payment shall be payable for the availability and performance of the infrastructure. During operating hours this shall be subject to deductions for:

- the non-availability of infrastructure (including instances where rolling stock has failed and is immovable on the tracks); and/or
- the non-availability of stops; and/or
- any speed restrictions on the infrastructure.

A significant proportion of the availability payment shall be payable for availability and performance of the rolling stock. During operating hours this shall be subject to deductions for the non-availability of vehicles when these are needed for services or the failure of rolling stock in service.

A small element of each availability payment shall be based on quality based performance measures. This will be subject to deductions for failing quality measures. These performance measures include assessing the availability and performance of key assets or services not directly linked to the availability of infrastructure and/or rolling stock necessary for passenger services.

100% of the availability payment for a particular operational period can be lost if no service is provided for that period.

6.6.6 Metro North PPP – Capital Contribution Payments

As noted in Chapter 9 RPA will be making capital contribution payments to the Infrastructure Contractor. However for Metro North, the level of capital contributions proposed, is of an order that is less than 50% of the estimated PPP capital cost, would therefore not be predominantly covered by government. This should therefore allow the private sector finance to be treated as off balance sheet for government debt purposes, provided construction and availability risk are transferred to the private sector as is proposed under the Metro North Infrastructure Contract.

6.6.7 RPA Engagement with the CSO

RPA has engaged with the CSO in preparing the contractual documentation for Metro North and has provided the contractual documentation to the CSO. CSO's preliminary informal view is that the Infrastructure Contract as structured contains sufficient transfer of construction and availability risk in order for the privately financed element to be classified as "off balance sheet". Clearly the enabling works and capital contribution which are to be funded by the exchequer are counted against the general government balance as they are incurred.

As noted above there will be significant negotiations with bidders during the Best and Final Offer stage of the PPP procurement process on contractual points. The final form of the Metro North Infrastructure Contract may differ from the risk allocation set out in 6.6.1 and 6.6.2 above. RPA will keep CSO informed of any material changes in the contractual risk allocation.

CSO has indicated that it may consult with Eurostat on the accounting treatment once the final form of the contract is certain, coinciding with the time that a preferred bidder is selected by the RPA.

6.7 Risk of funding enabling works and project not proceeding

In January 2008 Government approved funding of enabling works in the knowledge that significant expenditure on enabling works would take place in advance of reaching financial close and contract award on the Metro North PPP. The risk existed that money would be expended on enabling works prior to financial close, with a risk that the project may not reach financial close either due to affordability, value for money or other factors. The risk of not reaching financial close has however increased following the credit crisis and the risk of significant sunk costs being incurred on enabling works without certainty on financial close therefore needs to be addressed.

In light of this uncertainty RPA has considered whether, in the event that Metro North could not achieve financial close as a PPP, the project could revert to a fully exchequer funded project. It is considered that this would be a high risk approach from a procurement perspective. In this scenario the project may need to be retendered on an exchequer funded basis with possibly a different commercial structure rather than one single large contract. If the PPP approach fails it could in any case be difficult to attract market interest to a single large package and it may indeed be necessary to fund bid costs in order to attract bidders given the high levels of expenditure by the four Metro North bidders to date.

Indeed the failure of Metro North as a PPP procurement would also impact on the procurement strategies of Metro West, Luas Lucan and DART Underground. The discontinuation of the procurement for Metro in 2005 raised major concerns in the international market about the ability of Ireland to deliver a complex public transport project as a PPP. It is highly unlikely that if the Metro North PPP procurement was to fail that successful PPP competitions could be launched for other large scale public transport projects.

Another possibility is to put the enabling works back into the PPP contract. The rationale for RPA carrying out enabling works however remains and this is explained in Chapter 9. It is worth noting that any significant increase in the scope of the PPP would increase the risk that Metro North PPP could not reach financial close as it would exacerbate funding market capacity issues as well as making the risk transfer profile of the project less attractive. It would also carry a level of procurement risk as this would be a significant scope change from what was set out in the in the tender documents.

In order to reduce the risk of incurring expenditure on enabling works whose benefit would not be realised if PPP financial close was not achieved, RPA has examined options to delay the commencement of enabling works. Detailed analysis was undertaken in early 2010 to understand if other phasing options were possible. The resulting analysis which is summarised in Chapter 9 section 9.4.7 concluded no other phasing options were possible without a significant risk of the project failing. Even in the event the project did not fail the capital cost for the project would increase materially and it would no longer be deliverable within the capital envelope. Project delivery would also be significantly delayed with the earliest possible date for completion of construction being 2018 rather than 2016.

Greater stability has returned to financial markets in 2010 and if recent trends continue, RPA is confident that the required debt funding would be available to achieve financial close for Metro North. However, there remains a small risk that the preferred bidder for Metro North would not be able to secure the full amount of the funding for the project. Under this scenario, it is possible that the Exchequer would be called on to provide or underwrite some additional funding (subject to the consideration of balance sheet implications) either by increasing the exchequer capital contribution provided for in the proposed structure or the Exchequer providing some debt funding alongside commercial lenders. There is some international precedent for such an approach, particularly in the UK, where the commitment by the Treasury to provide senior debt alongside commercial lenders, up to a certain limit,

had the effect of facilitating financial close for projects without calling on the Treasury facility.

RPA will continue to explore with the NDFA how such arrangements could be put in place. This would be in the context of exploring a fallback position and is not something RPA would discuss with bidders or with any other third parties. The NDFA has indicated that one possible opportunity would be for the National Pensions Reserve Fund to provide senior debt to the project (via a funding competition) if a shortfall exists. Other options which can be considered will include further engagement with European Investment Bank (EIB) in terms of options for EIB to increase the quantum of funding it will lend to the project.

There is also a risk that the terms and conditions on which financial close can be achieved may require greater transfer of risk back to the state. In recent international PPPs risk positions have been negotiated more in favour of the debt providers and private sector sponsors than would have been the case prior to the credit crisis. On other large transactions indications are that the risk allocation in the following areas may have changed:

- Underpinning of the payment mechanism e.g. full availability payment not subject to performance deductions, with the amount underpinned varying between jurisdictions;
- Compensation on termination provisions e.g. minimum amount of compensation in the event of termination which effectively acts as a floor on the level of debt repayment that will be guaranteed in the event of default;
- Refinancing risk e.g. sharing of downside risk in the event that project cannot be successfully refinanced at a lower rate in the future;
- Caps on contractor liability or risk share for some risk categories.

The only definitive way to assess what the change in risk transfer on Metro North may be is through detailed discussions with the two shortlisted bidders during the BAFO process. These discussions are also necessary to assess whether any risk positions could affect the off-balance sheet treatment of the privately financed element of the project.

In considering the risk of the project not reaching financial close it is important to note that the PPP bids which have been shortlisted to proceed to the BAFO stage of the competition are within the capital envelope affordability limit and had significant headroom in the value for money test notwithstanding the high cost of finance incorporated into the bids. Further information on this is set out in Chapter 8. In preparation for the BAFO stage of the competition both bidders continue to express confidence in the project reaching financial close and neither have at this stage indicated a need for further government support in the form of additional capital contributions.

RPA, with the assistance of KPMG and NDFA has assessed the PPP market in 2009/2010 and likely developments in that market over the next 18 months and RPA believe that financial close for Metro North in late 2011 is achievable.

RPA (with KPMG and NDFA) engaged in a bank consultation process in June 2010 with the aims of getting an understanding of funding market capacity, market appetite for the funding of Metro North, current funding terms and conditions and an understanding of whether lending to an Irish project faced any particular difficulties because of concerns over sovereign credit risk. RPA met ten leading project finance banks in London and met four Irish based banks.

The key messages from that consultation are:

- Metro North is seen as a landmark transaction and will probably be the most significant PPP deal in the market in 2011 – the debt funding market capacity

exists to fund Metro North but will require all the leading banks to be involved as well as some less prominent market players;

- Metro North is perceived as a well structured project (commercial structure, risk profile – enabling works, planning, property and demand risk with state, capital contributions availability based) which is attractive to banks and will be a "must do" project for the leading banks;
- The project finance market has stabilised - long term lending is possible – some banks have the appetite and funding streams to lend for the term of the project – others will look for incentives to refinance within 10 years of construction completion predominantly through the use of cash sweeps and to a lesser extent margin ratchets;
- Individual ticket sizes for the leading banks would be of the order of €100 to €150 million;
- Pricing has stabilised all be it at a high level and it is unlikely that there will be any significant reduction over the next 18 months – the margins indicated by banks for the project are not significantly out of line with what was included in the Metro North bids in February 2009;
- Sponsor relationships are an important factor in lending decisions. The sponsors in both Metro North bidders are seen as being strong experienced market players and have existing relationships with many of the banks;
- The EIB support for the project is important – also for the non-Irish banks it was indicated that it will be an important signal for the two main Irish banks to be part of the final funding package;
- Funding a major Irish PPP deal is not a problem and market concerns about Ireland's credit risk have eased. It is worth noting however that the banks which have significant property exposures in Ireland may have difficulty in getting approval to lend to a project in Ireland.

Clearly should further market disruption occur or Eurozone uncertainty (such as that arising out of the Greek crisis) that may impact on the funding market and availability of funding.

In the event that the project was cancelled at the end of 2010 €148 million in costs will have been incurred as shown in Table 6.3 below. While approximately €12 million could be recovered through the sale of property it is likely that RPA would incur further costs in early termination of contracts and in disposing of office space. PPP bidders would be entitled to recovery of €2 million of their costs [text deleted]

Table 6.3 – Projected Sunk Costs to End 2010 (€ million nominal)

Metro North – Projected Sunk Costs to End 2010 € million Nominal						
	Total	**2006**	**2007**	**2008**	**2009**	**2010**
RPA Costs – Pre Financial Close	74.2	8.1	26.3	20.3	10.9	8.6
Property Costs	24.1	0.0	0.0	21.4	2.6	0.0
Enabling Works	49.6	0.0	0.0	23.8	16.4	9.4
Projected Sunk Costs	**147.9**	**8.1**	**26.3**	**65.6**	**29.9**	**18.1**

In order for Metro North to continue on programme and ensure PPP bidder confidence is retained in the project enabling works contracts need to be signed in

October 2010. This requires a commitment by Government of approximately €76 million during 2011, this is to cover RPA expenditure and enabling works capital expenditure.

In the event that the project was unable to reach financial close and a decision was taken to cancel the project at the end of 2011 the net cost incurred on the project would be approximately €246 million as shown in Table 6.4 below. This includes an allowance for rectification costs and the cost of terminating enabling works contracts as well as the recovery to be made through sale of properties already acquired. Any development levies which had been remitted to RPA by the local authorities would need to be re-paid.

Table 6.4 – Sunk Costs to End 2011 and Rectification Costs (€ million nominal)

Metro North - Exchequer Cash-flows to End of 2011 & Rectification Costs/Recovery € million Nominal								
	Total	2006	2007	2008	2009	2010	2011	Recovery/ Rectification
RPA Costs - Pre Financial Close	86.8	8.1	26.3	20.3	10.9	8.6	12.5	0.0
Property Costs	12.0	0.0	0.0	21.4	2.6	0.0	0.0	-12.0
Enabling Works	147.0	0.0	0.0	23.8	16.4	9.4	79.9	17.5
Sub-Total	**245.8**	**8.1**	**26.3**	**65.6**	**29.9**	**18.1**	**92.4**	**5.5**
Less S 49 Development levies	0.0	0.0	0.0	0.0	0.0	0.0	16.4	-16.4
Sunk Costs	**245.8**	**8.1**	**26.3**	**65.6**	**29.9**	**18.1**	**76.1**	**21.9**

6.8 Conclusions

RPA has undertaken detailed risk analysis, using a formalised risk management process, in developing the project to date. RPA is fully compliant with Department of Finance guidance in its approach to assessment of risk for the purposes of compilation of the Public Sector Benchmark.

Metro North is a complex project comprising a large number of elements and disciplines. In particular there is a requirement for an extensive underground system involving tunnels, caverns and deep excavations in variable ground conditions. RPA's risk management strategy recognises this and consequently RPA has adopted the Code of Practice for Risk Management of Tunnel Works.

The PPP contract has been structured to achieve substantial transfer of construction and availability risk so as to ensure the privately finance element of the project can be treated as "off balance sheet" for government accounting purposes.

In January 2008 Government approved funding of enabling works in the knowledge that significant expenditure on enabling works would take place in advance of reaching financial close and contract award on the Metro North PPP. The risk existed that money would be expended on enabling works prior to financial close, with a risk that the project may not reach financial close either due to affordability, value for money or other factors. The risk of not reaching financial close has however increased following the credit crisis and the risk of significant sunk costs being incurred on enabling works without certainty on financial close therefore needs to be addressed.

RPA, with the assistance of KPMG and NDFA has assessed the PPP market in 2009/2010 and likely developments in that market over the next 18 months and RPA believe that financial close for Metro North in late 2011 is achievable. The terms and conditions on which financial close may be achieved are less favourable for the state than would have been the case prior to the credit crisis.

Greater stability has returned to financial markets in 2010 and if recent trends continue, RPA is confident that the required debt funding would be available to achieve financial close for Metro North. However, there remains a small risk that the preferred bidder for Metro North would not be able to secure the full amount of the funding for the project. RPA has been exploring with the NDFA an option for managing this risk. The provision of senior debt to the project by the National Pensions Reserve Fund or EIB providing further debt funding are possible ways of dealing with this.

In order for Metro North to continue on programme and ensure PPP bidder confidence is retained in the project Enabling Works contracts need to be signed in October 2010. This requires a commitment by Government of approximately €76 million during 2011. This is to cover RPA expenditure and Enabling Works capital expenditure.

In the event that the project was unable to reach financial close and a decision was taken to cancel the project at the end of 2011 the net cost incurred on the project would be approximately €246 million. This includes an allowance for rectification costs and the cost of terminating enabling works contracts as well as the recovery to be made through sale of properties already acquired. Any development levies which had been remitted to RPA by the local authorities would need to be re-paid.

7. Economic Appraisal

7.1 Chapter Summary

- There is a strong economic case for the implementation of Metro North under a range of different scenarios. The benefit to cost ratio of the project is 2:1 when taking account of wider economic benefits and in excess of 1.5:1 using traditional economic appraisal methods. The scheme is therefore of substantial societal worth, with benefits well in excess of costs.
- The economic benefit of the scheme is substantially greater than the costs, with the project displaying a benefit to cost ratio (BCR) of 1.55:1 in the Base Case.
- Economic appraisal demonstrates that the business case for the project is resilient and retains its economic value-for-money under a range of different scenarios, even assuming the most pessimistic demographic scenario of no growth in population or employment between 2006 and the forecast year of 2026.
- Sensitivity testing also indicates that the benefits of the scheme will be enhanced following extension of the public transport network as planned under Transport 21; the inclusion of Luas Broombridge in the do minimum does only has a marginal impact on the the economic value of the scheme.
- The majority of these benefits are enjoyed by the scheme users, and in particular Metro North travellers achieving quicker and more convenient journeys without the need for multi-interchange.
- Non-users of the scheme also experience benefits as the scheme results in the removal of a significant number of car trips.
- Metro North is a critical investment in the competitiveness and productivity of the Dublin economy, and by extension, the Irish economy. By positively impacting on the quality of life, sustainability, attractiveness and connectivity of Dublin, Metro North will provide Dublin with a significant competitive edge in the challenge to attract internationally-mobile human capital and investment.
- Traditional transport cost-benefit analysis does not take account of Wider Impacts (WIs) which are known to exist; these wider economic benefits are likely to be particularly significant for Metro North due to the project's high agglomeration potential location serving Dublin city centre and other areas of high employment. A preliminary assessment of these impacts for Metro North indicates their inclusion could increase the BCR to 2:1.
- Metro North has significant positive non-monetisable benefits in the areas of economy, safety, integration and accessibility and social inclusion, and has few negative impacts post-mitigation in the area of environment.

7.2 Approach

The RPA multi-modal transport model has been applied to develop forecasts of patronage, user and non-user time benefits and revenue for 2026 as a result of Metro North. These outputs were then monetised, discounted and summarised according to the economic appraisal methodology and compared with the full discounted costs of the scheme over a thirty year appraisal period to assess the economic worth of the project.

The approach taken to the economic appraisal of the project follows that set out in the Common Appraisal Framework (CAF) published by the Department of Transport. The CAF is the statutory guidance on the economic appraisal of capital investment in transport. The CAF is complementary to the Department of Finance Capital Appraisal Guidelines (CAG) for the appraisal and management of capital expenditure.

The CAF is an objectives-led framework that employs both multi-criteria and cost-benefit approaches. A key element of the approach is the cost-benefit analysis (CBA). The CAF provides parameter values for the conduct of CBA and these are provided in Appendix 3. In addition to the CBA a Project Appraisal Balance Sheet (PABS) provides a framework within which the various benefits and costs of the project are brought together.

Additionally, RPA has included a preliminary assessment of Wider Impacts. Wider Impacts are economic effects which traditional cost-benefit analysis does not capture, such as agglomeration and productivity impacts. The CAF does not require these impacts to be quantified, merely that they be considered qualitatively. However recent developments in appraisal methodology, in the UK particularly, allow these benefits to be quantified and monetised. As these impacts are known to be particularly important for schemes such as Metro North, RPA has prepared a preliminary assessment of Wider Impacts for the project. A 'Wider CBA' for Metro North is therefore also presented which takes into account these impacts.

The 2026 forecasts of additional Metro patronage and revenue are outlined in Chapter 4. The transport and modelling assumptions which have been used in calculating the economic impacts of the project are summarised below in Table 7.1.

Table 7.1 Transport and Modelling Inputs

Input	Do minimum	Do Something
Luas Tallaght to Connolly (Red Line)	Yes	Yes
Luas St Stephen's Green to Sandyford (Green Line)	Yes	Yes
Luas Connolly to The Point (Line C1)	Yes	Yes
Luas Sandyford to Bride's Glen (Line B1)	Yes	Yes
Luas Belgard to Saggart (Line A1)	Yes	Yes
Luas Bride's Glen to Bray/Fassaroe (Line B2)	No	No
Luas Stephen's Green to Broombridge (BXD)	No	No
Luas City-centre to Lucan (Line F)	No	No
Metro North	**No**	**Yes**
Metro West	No	No
Irish Rail Interconnector (DART Underground)	Yes	Yes
Dublin Port Tunnel	Yes	Yes
Outer Ring Road	Yes	Yes
Luas P&R	Yes	Yes
NTA Quality Bus Network	Yes	Yes
Integrated Ticketing	Yes	Yes

In keeping with the RPA approach to project appraisal, only projects that are committed or highly likely to proceed are included in the assumptions for the project. Generally a scheme that performs well under such conservative assumptions is likely to do at least as well in reality.

7.3 Economic Appraisal

RPA carried out an economic appraisal of Metro North based on the results of the model scenarios and tender information from the two shortlisted [5]PPP bidders. To simplify the presentation of the appraisal results, rather than presenting cost-benefit analysis results for each bidder the results are presented for the cost benefit analysis which yielded the lowest benefit to cost ratio. The cost-benefit analysis is based on the following tendered costs:

- Exchequer capital contributions to the PPP Co over the construction period;
- Availability payments (over 25 years from passenger service commencement);
- Energy payments; and
- Operations costs.

In addition, the following exchequer funded costs are included which are based on RPA's own cost estimates and these are common to both tenders:

- Enabling works
- Property costs
- RPA planning, design and supervision costs

As the appraisal is conducted over a 30-year operational period, there was a requirement to adjust the bidders' costs to cover the 30 year period. The procurement model being adopted specifies availability payments will be paid over 25 years of operations; to estimate maintenance and renewal cost over 30 years an assumption has been made based on the element of availability payments which is estimated to relate to the renewal and maintenance costs.

Regarding operating costs over 30 years, the initial operating contract is for 5 years. Operating costs over the remaining 25 years appraisal period have been estimated based on what RPA believes is achievable in the market under competitive tendering. This view is informed by RPA's experience of operating contracts and the tenderers' operating bids.

The Final Business Case for the project, which will be prepared once a preferred bidder has been selected, will be prepared on the basis of the preferred bidder's pricing.

For the economic appraisal it has been assumed that:

- The scheme opens in January 2017
- The evaluation period is 30 years
- The discount rate is 4%

The capital, maintenance and renewal costs of the project, as reflected in the tendered availability payments, capital contributions, enabling works and property costs, over the appraisal period have been calculated by RPA and are summarised below. Operating costs have similarly been estimated. These costs are expressed in 2002 prices and are in present value terms. As discussed in Chapter 6 (Risk), appropriate provision for risk and contingency is included in RPA's own cost estimates and the PPP price bid reflects the risk allocation between the public and private sector under the PPP structure.

[5] As described in Chapter 8 it would not be appropriate to include bidder pricing details in the Updated Detailed Business Case. However, it is important that the economic appraisal of the project is carried out using the most reliable cost estimates available. In the case of the PPP element of Metro North this is the bidders numbers. In line with RPA's prudent approach to the CBA the results presented in this chapter are on the basis of the lowest BCR calculated using the two bidders' numbers. Non-PPP costs in the CBA are based on RPA's own estimates as set out in Chapter 5.

[6]Table 7.2 Metro North Costs (€2002m, PV)

	Discounted to 2002 (€m)
Capital, Maintenance and Renewal Costs	
Operating Costs	
Total	

7.3.1 Base Case – Moderate Growth

The Base Case includes the infrastructure outlined above in Table 7.1. As described in Chapter 4, the Base Case assumes future population and employment growth consistent with the CSO's M0F1 demographic projections.

The parameters and assumptions used to develop the economic evaluation are presented in Appendix 2. All parameters and the methodology applied are consistent with the Department of Transport guidelines on parameter values for use in the appraisal of transport projects. All costs and benefits in the evaluation have been expressed in 2002 prices and discounted to the current base year of 2002 (financial and funding projections take account of escalation in values over time). In accordance with the CAF a residual value has also been included in the economic appraisal.

The future year forecasts of additional patronage and revenue are outlined in Chapter 4. The transport assumptions and service pattern are also outlined in Chapter 4.

The results of the economic appraisal for the base case under the Moderate Growth scenario are presented in Table 7.3. All property costs are included in the economic appraisal at their market value as required by the CAF.

[7]Table 7.3 Metro North Economic Appraisal Results Base Case (€2002m, Present Value)

	Discounted to 2002 (€m) Base Case
User Time Savings	
Non User Time Savings	
Revenues	
Residual value	
Vehicle Operating Cost Savings	
Accident Savings	
Air emissions Savings	
Total Benefits	
Operating Costs	
Renewals Costs	
Capital Costs	

[6] Cost information not disclosed as it is commercially sensitive for the reasons outlined in Chapter 8.
[7] Benefit information not disclosed as the BCR is presented and that would permit the calculation of the cost information which is commercially sensitive for the reasons outlined in Chapter 8.

Total Costs	
Economic Net Present Value (NPV)	
Benefit to Cost Ratio (BCR)	**1.55**
Internal Rate of Return (IRR)	**9.1%**

The scheme generates significant user benefits through achievement of quicker, more frequent and more reliable public transport journeys. The scheme also generates significant non-user benefits through the removal of 11.8 million car trips per annum from the highway network, thus reducing congestion levels. As a result of this mode transfer, the scheme also generates positive environmental benefits and accident reduction benefits.

The CAF requires that an assessment of the disbenefits arising during the construction phase be carried out. In discussions at the Transport 21 Contingency Planning Sub-Group (Meeting No. 15) Dublin Bus provided the [8]following inputs to the Contingency Plan relating to impacts on their operations during the construction period:

- Traffic management measures to reduce cars requiring 12 additional buses - annual cost €3m;
- Delays, diversions and slower buses etc. requiring 18 buses - annual cost €4.5m

In this appraisal, no re-configuration of the Dublin Bus network has been assumed in response to Metro North, although changes in other public transport operator revenues as a result of the scheme have been included in the appraisal.

In addition it should be pointed out that there is currently no mechanism for incorporating the impacts on other public transport operators either, such as private bus operators and taxis.

The increase in operating costs identified by Dublin Bus is estimated at €7.5m (2010 prices). RPA has assumed that this cost will be incurred in each year from 2012-2016, inclusive, in the cost-benefit analysis.

In the Base Case, moderate growth scenario, inclusion of these costs only reduces the BCR marginally from 1.55:1 to 1.53:1.

7.4 Sensitivity Testing

In order to test the robustness of the results of the economic appraisal of the scheme a number of sensitivities have been tested. The sensitivity tests have been designed to reflect the main risks to the demand and economic benefits forecast for the scheme and have been discussed in Chapter 4.

The following sensitivities were tested in the economic appraisal:

- Land use sensitivity tests;
- Transport 21 infrastructure test; and
- Luas Broombridge test.

[8] Information is not available to RPA to verify the accuracy and reasonableness of these estimates.

7.4.1 Land Use Sensitivity Tests

As discussed in Chapter 4, two further land use scenarios are tested using the Base Case network and service patterns as set out above. The first assumes that future year population and employment levels will be the same as 2006. This is referred to as the No Growth Scenario. The second scenario uses Local Authorities' population and employment growth projections without restricting this growth to conform with CSO projections. This is known as the Local Authority or LA Growth scenario.

The results of these tests are presented in Table 7.4 below.

Table 7.4 Metro North Economic Appraisal Results No Growth and LA Growth Scenarios – (€2002m, Present Value)

	Discounted to 2002 (€m)	
	No Growth	LA Growth
User Time Savings		
Non User Time Savings		
Revenues		
Residual value		
Vehicle Operating Cost Savings		
Accident Savings		
Air emissions Savings		
Total Benefits		
Operating Costs		
Renewals Costs		
Capital Costs		
Total Costs		
Economic Net Present Value (NPV)		
Benefit to Cost Ratio (BCR)	**1.03**	**2.15**
Internal Rate of Return (IRR)	**4.3%**	**13.2%**

As the results demonstrate, the economic case for the scheme is significantly strengthened under the LA Growth scenario. Under the No Growth scenario the economic case for the scheme remains positive despite this being an extremely conservative assumption.

7.4.2 Transport 21 Infrastructure Test

In this sensitivity it was assumed that the entire public transport element for the Greater Dublin Area of the Transport 21 programme was in place in the do minimum, and then Metro North services were added for the do something. This increases the benefits of the project relative to the base case, as there is a more developed public transport network in place which allows a greater number of public transport interchange journeys to be made by using Metro North. The BCR in this scenario is 1.59:1 and the IRR is 9.5%.

Table 7.5 Metro North Economic Appraisal Results – T21 Network (€2002m, Present Value)

User Time Savings	
Non User Time Savings	
Revenues	
Residual value	
Vehicle Operating Cost Savings	
Accident Savings	
Air emissions Savings	
Total Benefits	
Operating Costs	
Renewals Costs	
Capital Costs	
Total Costs	
Economic Net Present Value (NPV)	
Benefit to Cost Ratio (BCR)	**1.59:1**
Internal Rate of Return (IRR)	**9.5%**

7.4.3 Current Infrastructure with Luas Broombridge Test

In this sensitivity it was assumed that, in addition to the projects included in the base case (see Table 7.1), i.e. projects currently under construction or already committed, Luas Broombridge is also in place in the do minimum. The alignments of Metro North and Luas Broombridge overlap to some extent in the city centre, although they serve distinct transport functions. In addition to linking the Red and Green Lines Luas Broombridge continues northwards to serve the north west of the city. Assuming Luas Broombridge is in place in the do minimum reduces the BCR from 1.55 to 1.47:1, as Luas Broombridge abstracts some short-distance city centre trips from Metro North.

Table 7.6 Metro North Economic Appraisal Results – Current Infrastructure with Luas BXD (€2002m, Present Value)

User Time Savings	
Non User Time Savings	
Revenues	
Residual value	
Vehicle Operating Cost Savings	
Accident Savings	
Air emissions Savings	
Total Benefits	
Operating Costs	

Renewals Costs	
Capital Costs	
Total Costs	
Economic Net Present Value (NPV)	
Benefit to Cost Ratio (BCR)	**1.47:1**
Internal Rate of Return (IRR)	**8.5%**

7.5 Economic Benefits of Metro North

7.5.1 Developing the Dublin City Region

Cities are increasingly identified as the focal points for the next phase of global economic development, which will be characterised by increasing reliance on innovation and creativity as the generator of economic growth, as opposed to natural resources or manufacturing prowess as in the past. Indeed research indicates that the importance of cities in generating economic growth will increase over time. Cities contain an ever increasing share of the world's highly skilled and entrepreneurial population, and they support the large-scale business and investment networks that create economies of scale in absorbing and extending innovation.

In this new economic growth paradigm, cities and larger urban-centred regions compete for highly mobile and diversified human capital. This role of cities in fostering economic growth is reflected in an increasing focus on the subject in the economics literature. A number of reports published in Ireland recently have emphasised the role of transport in affecting the performance of cities in many different ways.

A National Competitiveness Council (NCC)[9] report highlighted the role of cities in delivering national competitiveness in the emerging new economy:

"*Cities play an increasingly crucial role in the development of national competitiveness in modern knowledge-based economies. As people become more mobile and firms more selective about where they locate, competitive cities have emerged as magnets for talent and investment. For example, 66 out of 78 cities studied in an OECD review have a higher GDP per capita than their national average; hence they improve the economic performance of their country*."

The report identified 4 key elements in how cities perform:

- Enterprise;
- Connectivity;
- Sustainability; and
- Attractiveness and inclusiveness.

Public transport has a role to play in each of these elements, as described briefly in Table 7.7 below.

[9] *Our Cities: Drivers of National Competitiveness*, 2009, National Competitiveness Council

Table 7.7

Enterprise
An entrepreneurial culture is affected by, among other things, the availability of a skilled workforce and the cost of doing business. Good public transport makes it easier to attract workers to cities and allows labour markets to work more efficiently –there is a better chance of matching the right person with the right job. Efficient transport systems reduce the cost of doing business.
Connectivity
This relates to both physical and electronic infrastructure, and to internal and external linkages. Transport clearly is a key aspect of achieving high levels of physical connectivity.
Sustainability
A sustainable urban environment enhances the competitive performance of cities by improving quality of life, maximising land use potential, attracting overseas talent and tourists, and reducing environmental costs. High quality public transport helps achieve a sustainable urban environment by reducing the emissions associated with highway congestion and private cars use, by achieving integrated land use and transport planning, and by making more efficient use of scarce land resources.
Attractiveness and inclusiveness
Competitive cities are cities which are attractive and inclusive. Vibrant recreational, entertainment, cultural and sporting infrastructures are key to enhancing city attractiveness. High quality public transport enhances a city's attractiveness and inclusiveness by making the city's attractions and resources easily accessible to all residents, not just those with a car. Well designed public transport that integrates a city's major sporting, cultural and entertainment attractions (sports stadia, museums, tourist areas etc) will maximise the contribution of these attractions to the city. Accessible public transport with high quality information and way-finding enhances the inclusiveness of cities, by being easy to negotiate and follow. This is of particular benefit to people with disabilities and visitors unfamiliar with the city. Strong and consistent public transport branding consolidates these effects.

It is clear from Table 7.7 that high quality public transport has a positive contribution to make under each of the four elements of city competitiveness, and is particularly critical to the connectivity, sustainability, and attractiveness and inclusiveness elements.

Metro North is a high quality, well designed public transport scheme which will connect the traditional tourist, cultural, educational and business areas of Dublin with the airport and commuting areas beyond, and which will remove 11.8 million car trips per annum from Dublin's roads. In this way the scheme will make a significant contribution to the quality of life, sustainability, and attractiveness of Dublin.

A report from IBM's Global Centre for Economic Development[10] similarly identifies the 'battle for talent' among cities, as highly educated, innovative people choose where to live from many possible locations. The report concludes that, while wages are an

[10] *Smarter Cities for Smarter Growth –how cities can optimise their systems for the talent-based economy*, 2010, IBM Institute for Business Value.

important consideration in such decisions, so too are other considerations which are influenced by the quality of public transport, such as quality of public-service delivery, natural amenities, cultural options and the environmental quality. The report concludes that "*quality of life and the attractiveness of a city are profoundly influenced by the core systems of a city: transport, government services and education, public safety and health.*"

A recent report by Engineers Ireland[11] focussed on the need to invest in physical infrastructure to develop Ireland's cities. The report concluded that a more concentrated population increases the range of economic, social and cultural services available and creates economies of scale, thereby reducing the cost of provision. The report identifies the following advantages of higher densities:

- Cost savings in land, infrastructure and energy;
- Reduced economic costs of time spent travelling;
- Reduced cost of doing business in the public and private sectors;
- Increased financial sustainability of specialist services like tertiary hospital services, retail offerings and visitor attractions;
- Concentration of knowledge and innovation activity encouraging specialisation of skills and markets;
- Provision of public spaces and amenities within walking distance
- Potential for reduced air emissions by increased use of public transport;
- Sustainable living environment and promotion of social connectedness; and
- Encouragement of greater physical activity with consequent health benefits.

Metro North has been designed in close integration with land-use planning in Fingal so as to allow a new, more concentrated form of settlement to emerge in future in Dublin for the first time. This will allow greater densities to be achieved in a sustainable manner along the alignment, which in turn will generate the economic and social benefits mentioned above. In this way Metro North will enhance the long-run productive capacity of the Dublin economy, and as a result, the Irish economy.

Through transforming the public transport landscape of Dublin, Metro North will improve the quality of life, sustainability and attractiveness of the city, which is critical to the challenge of attracting and retaining the most highly educated, creative internationally-mobile talent. Allowing Dublin to attract and retain the best international talent will assist in fostering important innovation networks, and will encourage the development of a critical mass of knowledge-based industries. Metro North will also increase the productive capacity of the city through allowing a more concentrated pattern of development to emerge in Dublin, with all the associated economies of scale, the so-called 'density dividend'.

The global economy is increasingly dominated by competition between city regions for internationally mobile talent and investment. As the only city on the island of Ireland with the critical mass to develop into a truly competitive city-region, it is critical that investment in public transport in Dublin is of sufficient scale and is appropriately targeted. The successful emergence of Dublin as a competitive city region within Europe, which is attractive to foreign investment and foreign workers, is critical to the growth of the overall Irish economy, and Metro North is key to achieving this.

[11] *Infrastructure for an Island Population of 8 million*, 2010, Engineers Ireland.

7.5.2 Measuring Wider Economic Impacts

Traditional transport cost benefit analysis fails to include some important economic benefits of new or improved transport services. These impacts derive from the presence of imperfect competition and economies of scale in production, and reflect the role of transport in increasing productivity in urban areas discussed in Section 7.5 above. These impacts, known as Wider Impacts (WIs), are:

- Agglomeration economies (increased productivity through agglomeration and the facilitation of jobs moving to more productive areas)
- Labour market effects (increased labour supply and more productive jobs)
- Increased output in imperfectly competitive markets (relates to business travel)

A good example of the importance of considering such effects is the case of the Jubilee Line Extension in London. This project was initially approved with a benefit cost ratio of 0.95 with an expectation that there would be substantial, though unquantified, benefits from the regeneration of the South Bank and the creation of new jobs in Canary Wharf. Using the new UK Department for Transport (DfT) guided methods of transport appraisal, it is now estimated that the JLE delivers a benefit cost ratio of 1.75, even after accounting for the cost over-runs experienced on the project.

Until comparatively recently there has been little agreement on the definition of these effects and the extent to which they are already picked up in conventionally measured transport benefits. However, in recent years the DfT has led a programme of research which has resulted in a sound theoretical and methodological basis for measuring and valuing these effects in a rigorous manner. The DfT guidance on the assessment of these impacts is available on the DfT's transport appraisal guidance website, WebTAG.

Wider Impacts are described below.

7.5.3 Agglomeration Impacts

Agglomeration simply means the geographic clustering of firms and workers. Cities are one type of agglomeration. In cities it is often found that wages, rents, transport costs and other prices are higher than elsewhere. The explanation for the desire to locate in cities must be that firms in a wide range of economic sectors are more productive when they are clustered.

Typically, firms are more productive when near other firms because they have access to a large variety of inputs to their activities. It is also often argued that proximity to other similar firms increases the chance of acquiring new knowledge and of building connections and networks which support or increase productivity. Research shows, for instance, that face to face contact is very important for some types of business environments.

Many firms are also more productive when they have access to a large labour market since this makes recruitment quicker and it is easier to find workers with the exact skills match that they require. Evidence supports all of this by showing that, as a city grows and becomes denser, its firms become more productive.

When we talk about density of a city in these terms, we really mean the number of firms or workers that are accessible. Rather than number of jobs or workers per square km, it is more natural to consider the number of jobs or workers located within X minutes of travel time. In other words, the role of transport in supporting accessibility, and therefore agglomeration, is important. If transport is made cheaper or quicker, more firms and workers will be located within reach and, according to the

literature on agglomeration, productivity will increase. Importantly, these agglomeration benefits are additional to those already captured in appraisal.

The UK DfT guidance outlines how agglomeration benefits of a transport scheme can be calculated. The methodology uses detailed transport model outputs, economic data (such as employment and productivity) and specific evidence on agglomeration derived for this purpose.

Agglomeration, for the purposes of transport appraisal, is measured using the concept of effective density. Effective density is a measurement of employment density that takes into account not only employment within an area but also employment in surrounding areas, where jobs further away (in terms of travel time or 'generalised' cost of travel) are given less weight than jobs nearby. Since the relevant measure of distance is based on the quality of the transport network, the role of transport improvement in increasing agglomeration is intuitive.

The actual responsiveness (in terms of productivity increase) of areas to changes in agglomeration differs depending on the mix of economic activities taking place there.

7.5.4 Increased Output in Imperfectly Competitive Markets

When an individual saves one hour travelling whilst in work, traditional appraisal techniques value this time at the gross cost to the firm of the worker's time (i.e. hourly wages plus national insurance contributions and other labour related costs). Identifying the productivity gains from business cost savings is therefore simple – they are equivalent to the user benefits ascribed to people travelling in the course of business in the conventional CBA.

What we really seek to measure by business cost savings is the additional value to society of the activity the worker now can undertake instead of being in traffic. However, under the assumption of perfect competition these two values are identical so using labour costs is a good approximation.

In reality this is not true. On average, firms are able to charge more for their products and services than what they cost to produce. This means that the value society places on the worker's output from one hour's work (i.e. the price of whatever the worker makes in one hour) is higher than the cost of the worker's time to the firm.

By valuing workers' saved time at the level of costs to the firm rather than the value to society, current transport appraisal underestimates the benefits of in-work travel time savings. It can be shown that these 'missing' benefits equal about 10% of conventionally measured user benefits to freight and business travel.

7.5.5 More People Working (productivity gains from commuting cost reductions)

In addition there are wider economic impacts arising from changes in the labour market, although these impacts are typically minor relative to the agglomeration impact.

7.5.6 Summary of Wider Economic Benefit Analysis

RPA has adapted the UK DfT guidance on WIs to prepare a preliminary assessment of these impacts for Metro North. The assessment of such impacts is not yet a formal requirement of Irish transport appraisal and therefore there is no guidance on assessing these impacts for Ireland. However, the UK guidance provides a basis for the assessment of these impacts in the general form, with some adaptations necessary in cases where data or parameters are not available for Ireland.

In total, Wider Impacts (WIs) add €1,223 million (2002 prices) in present value terms over the appraisal period. WIs amount to 37% of conventional benefits. The evidence to date demonstrates that WIs can increase conventionally measured benefits by between 10%-40%, depending on the nature and location of the scheme. Experience

in the UK and elsewhere is that WIs are proportionately more important for schemes which:

- Increase accessibility in urban areas;
- serve areas of high productivity and high employment density; and
- serve areas with high levels of employment in financial and business services sectors.

There is also evidence that schemes which improve access to major international airports can deliver proportionately some of the highest levels of wider economic benefits (see the AirTrack (Heathrow) Wider Economic Benefits Assessment).

The estimated WIs, 37% of conventionally measured benefits, reflect the fact that the Metro North scheme meets all these criteria.

The addition of WIs increases the BCR from 1.55:1 to 2:1.

7.5.7 Employment Impacts During Construction

RPA has conducted an analysis of the employment generation of light rail and metro projects in Dublin. The analysis is based on examination of employment generated by the construction of the original Luas Red and Green lines (2004), the extension of the Red line to the Docklands (2009), and the extensions currently under construction, i.e. B1 (Cherrywood) and A1 (Saggart).

The analysis suggests that during pre-Railway Order phase, i.e. planning and design activities, approximately 10 jobs per €m expenditure are created for a typical light rail or metro scheme. The type of employment generated during this phase is of high quality with highly skilled technical and professional persons dominating the employment mix. In planning and design activities Metro North generates approximately 2,000 employment years.

RPA's analysis indicates Metro North will generate approximately 19,000 employment years directly during construction. Direct employment on Metro North will be approximately 4,000 per year during construction.

In addition, the construction of Metro North will generate approximately 9,000 indirect and induced employment years, giving a total employment year generation of 28,000. Total employment, including indirect and induced effects, will be in excess of 5,500 per year during construction.

7.6 Project Appraisal Balance Sheet

The Common Appraisal Framework (CAF) requires that a Project Appraisal Balance Sheet (PABS) be drawn up summarising the principle results of the project appraisal. The PABS reports the scoring of the project against the five criteria of Economy, Safety, Environment, Accessibility and Social Inclusion and Integration. A seven point scaling system is used. Table 7.7 reports the Project Appraisal Balance Sheet for Metro North.

Table 7.7 Metro North Project Appraisal Balance Sheet (PABS)

Criteria	Metro North		
	Qualitative Statement	**Quantitative Statement**	**Scaling Statement**
Economy			
Transport efficiency and effectiveness	Improves public transport generalised journey times through quicker, more frequent and more reliable journeys	BCR: 1.55:1 IRR 9.1% NPV: €m PV	
Other economic impacts	Wider economic benefits will be generated through increased productivity benefits and agglomeration benefits; urban realm improvements;		Highly positive
Safety			
Safety	Reduction in road traffic accidents as a result of mode switching	Reduction in accidents: €5.4m PV	
Environment			
Air quality	Reduced car emissions from modal shift.	Reduction in air emissions: €69m PV	
Noise and vibration	Some residual noise impacts during construction and operations which will be minimised through design and mitigation measures. Some vibration impacts during construction post-mitigation. No significant vibration impacts during operations post-mitigation.	Removal of 11.8 million car trips per annum	
Landscape & visual quality	Some impacts from construction compounds, hoarding and removal of landscape features. Mitigation measures will be applied. Some high or very high significance impacts during operation, where a special view has been blocked or new obtrusive element has been introduced. Mitigation measures will be implemented		Slight negative
Biodiversity	Some temporary loss of habitat of low nature conservation value during construction. Some permanent loss of semi-natural habitat which is deemed insignificant due to the low species diversity it supports. When operational the proposed scheme will have no significant impacts on habitats and surrounding wildlife.		Slight negative
Cultural, archaeological and architectural heritage	Temporary removal or relocation of monuments during construction. Removal of cartilage of some buildings with architectural merit. Some Sites of Archaeological Potential affected. Some residual impact from the visual impact of above ground structures on existing environment.		Slight negative

Table 7.7 Metro North Project Appraisal Balance Sheet (PABS) (continued)

Criteria	Metro North		
	Qualitative Statement	**Quantitative Statement**	**Scaling Statement**
Land use, soils and geology	Residual impacts (construction and operations) low or very low as majority of scheme is through areas already paved or are of low sensitivity or importance.		Neutral
Water resources	Residual impacts (construction and operations) on groundwater are of low significance. Residual impacts (construction and operations) on surface water are of low magnitude with negligible to low significance.		Neutral
Accessibility & Social Inclusion			
Vulnerable groups	Fully accessible scheme for people with disabilities or mobility or sensory impairments; Significant increase in accessibility to education and employment opportunities for people from deprived areas		Highly positive
Deprived geographic areas	Significant impact on deprived social area. Serves 4 RAPID areas and 4 IAPs and Ballymun, the state's largest regeneration project.		Highly positive
Integration			
Transport integration	Provides high quality interchange opportunities with Luas and DART Underground at St.Stephen's Green; with heavy rail services at Drumcondra; and with air services at Dublin Airport. In addition surface stops will be equipped with high quality bus and taxi interchange facilities, 'Kiss and Ride' lay-bys and cycle storage facilities. There are also 3 P&Rs		Highly positive
Land use integration	Fully aligned with local and regional planning policy and underpins entire land use strategy for Fingal County for next 25 years.		Highly positive
Geographical integration	Provides direct Metro link to Dublin International Airport. Facilitates connectivity in the Dublin/Belfast corridor through P&R at Belinstown.		Moderately positive
Other Govt. policy integration	The NSS recognises the importance of Dublin to the overall Irish economy, and commits to protecting the international competitiveness of the Dublin region, which will be facilitated by Metro North. Consistent with other Government policies in the area of sustainable travel and climate change.		Moderately positive

7.7 Conclusions

There is a strong economic case for the implementation of Metro North under a range of different scenarios. The benefit to cost ratio of the project is 2:1 when taking account of wider economic benefits and in excess of 1.5:1 using traditional economic appraisal methods. The scheme is therefore of substantial societal worth, with benefits well in excess of costs.

Sensitivity testing demonstrates that the economic case for the scheme is resilient and retains its economic value for money even when adopting the most pessimistic demographic assumption of no growth in population and employment beyond 2006. Sensitivity testing also indicates that the benefits of the scheme will be enhanced following extension of the Luas network as planned under Transport 21. Assuming that Luas Broombridge is in place in advance of Metro North reduces the economic value of the scheme very slightly, although the case for the scheme remains extremely robust.

The strong economic outcome is a result of the high user benefits of the scheme which are generated from journey time improvements, increased reliability and frequency, as well as the availability of new public transport journeys through interchange. There are also significant non-user benefits which reflect the reduction in highway congestion as a result of the scheme.

Metro North is a critical investment in the competitiveness and productivity of the Dublin economy, and by extension, the Irish economy. Increasingly economic growth is being driven by city regions which compete with each other to attract and retain the best human capital, in terms of education levels, creativity and entrepreneurship. By positively impacting on the quality of life, sustainability, attractiveness and connectivity of Dublin, Metro North will provide Dublin with a significant competitive edge in the challenge to attract internationally mobile human capital and investment.

Traditional cost benefit analysis fails to include many additional benefits which are known to exist as a result of investment in transport projects such as Metro North. Many of these impacts are related to the role of Metro North in creating a more connected, efficient city, the so called ‘density dividend’ or agglomeration economies. It is likely that these wider economic impacts generated by Metro North will be significant, as a result of its significant journey time savings, its location serving Dublin city centre with its mix of relatively high productivity jobs, and its connection to Dublin Airport. A preliminary assessment of the Wider Impacts associated with Metro North indicates that that including such impacts would increase the BCR of the scheme to 2:1

RPAs analysis indicates Metro North will generate approximately 19,000 employment years directly during construction. Direct employment on Metro North will be approximately 4,000 per year during construction.

In addition, the construction of Metro North will generate approximately 9,000 indirect and induced employment years, giving a total employment year generation of 28,000. Total employment, including indirect and induced effects, will be in excess of 5,500 per year during construction.

A multi-criteria analysis which assesses the scheme on the five criteria set out in the CAF, and reported in the PABS, indicates the scheme has substantial positive non-monetisable benefits, with few negative impacts after mitigation.

8. Project Finance

8.1 Chapter Summary

- The estimated net Exchequer funding requirement (in nominal terms) for Metro North over the construction period is estimated to be €1,586 million. This is within the January 2008 approved Exchequer construction period funding for Metro North which is €1,628 million. The funding requirement covers RPA project development and supervision costs, property acquisition costs, enabling works and a capital contribution to the PPP contractor during construction of up to €1,050 million.
- In excess of 50% of the capital cost of the project will be funded by the PPP contractor.
- RPA is confident that the level of operating revenue will be sufficient to cover the operating fee and the operational power costs and there are no indications from the bidding process that this will not be achieved.
- Operating surpluses and development levies will make a contribution towards the availability payment to the PPP contractor.
- In order to protect the integrity of the Metro North PPP procurement process and to ensure that RPA complies with regulatory obligations with respect to confidentiality of information it has been agreed with the Metro North Process Auditor that it would not be appropriate to included bidder information or pricing in this Updated Detailed Business Case. Information will be included in the Final Business Case.
- Following completion of the tender evaluation, analysis was undertaken which demonstrated the shortlisted bidders provided value for money solutions and that the PPP costs as bid together with the non-PPP costs (RPA costs and retained risks, property and enabling works) were within the capital envelope for the project. It is worth noting that the value for money test was passed by both bidders with significant headroom.

8.2 Background

The Metro North Project is being procured as a PPP. As set out in Chapter 9 the financial structure for Metro North was approved by Government in January 2008. In summary the following cash-flows will be funded by the Exchequer:

- RPA costs in developing the project prior to financial close and in monitoring and managing the contracts post financial close;
- Property acquisition costs;
- Enabling works;
- Capital contribution payments to the PPP contractor during the construction phase;
- Capital costs for any residual risk to be borne by RPA under the PPP contract; and
- Availability payments to the PPP contractor over the 25 year term of the project once passenger services have commenced.

It is envisaged that the operating revenues to be generated once passenger services commence will be sufficient to cover the following costs:

- Operating fee to be paid to the Operator; and
- Energy costs to be paid to the PPP contractor for running of the system.

In addition supplementary development contribution schemes for Metro North have been put in place in Dublin City and in Fingal County which will also make a contribution so as to reduce the net cost to the Exchequer of Metro North.

The above cash flows are described in further detail in paragraphs 8.4 to 8.10 below.

8.3 Metro North PPP Procurement

As noted in Chapter 10 the Metro North PPP procurement is at an advanced stage. RPA received detailed bids of high quality from the four pre-qualified bidders in February 2009 and following a comprehensive tender evaluation process, shortlisted two bidders in June 2009 to proceed to the Best and Final Offer stage of the procurement. The bids included fully priced proposals for the full scope of the PPP contract and the Operator contract. The key elements of the bid price to be funded by the Exchequer are:

- Capital contribution payments to the PPP contractor during the construction phase; and
- Availability payments to the PPP contractor over the 25 year term of the project once passenger services have commenced.

As noted above it is anticipated that that operating revenue will be sufficient to cover t he following elements of the bid price:

- Energy costs to be paid to the PPP contractor for running of the system; and
- Operating fee to be paid to the Operator.

Following completion of the tender evaluation, analysis was undertaken which demonstrated the shortlisted bidders provided value for money solutions and that the PPP costs as bid together with the non-PPP costs (RPA costs and retained risks, property and enabling works) were within the capital envelope for the project. Both of these tests were carried out in accordance with Department of Finance guidance and further information is included in section 8.4 and 8.5 below.

RPA now has three sets of estimates for the capital contributions, availability payments, power costs and the operating fee – RPA's [12]own estimates and the two sets of prices bid by the two shortlisted bidders. Clearly the bidders estimates currently provide the most realistic estimates of projected Exchequer flows related to the PPP and Operator element of the project.

- 13[text deleted]

For the reasons noted above it was considered that it might be appropriate to include both bidders' numbers in the Updated Detailed Business Case so as to avoid a possible misunderstanding of the information which would be the case if either RPA's own estimates were provided or some form of combination of RPA's numbers and

[12] In advance of issue of the tender documents for Metro North RPA had undertaken significant analysis of the cost of the project if it were to be procured on a traditional basis (the Public Sector Benchmark) and a financial model was developed to estimate the costs of the project if it were to be procured on a PPP basis (shadow bid). The shadow bid estimated the total cost of the PPP contract (including financing costs - both equity and debt) and the Operator contract. The shadow bid estimated the key elements of the bid price as noted above i.e. capital contributions, availability payments, power costs and the operating fee.

[13] [text deleted]

bidders number were used. However, RPA has a regulatory obligation[14] to maintain the confidentiality of tender information. In consultation with the [15]Process Auditor it was considered that RPA could not be adequately confident of being able to comply with its regulatory obligation if bidder numbers were included in the Updated Detailed Business Case. This is particularly a concern as the procurement competition is at a critical stage and any inadvertent or deliberate disclosure of information could result in the cancellation of the competition. This would result in significant costs to the state and would probably mean the project could never be delivered as well as exposing the state to legal claims by the bidders. There was also a concern that the tender evaluation process could be seen to be compromised even if there was no disclosure.

For these reasons in consultation with the Process Auditor it was decided that bidder information should not be included within the Updated Detailed Business Case and that no confidential bidder pricing information should be disclosed to any party outside of RPA and its advisors.

It was agreed that it would be appropriate to include an indicative combined availability payment, operator fee payment and power cost not based on an individual bidder numbers and to include details of capital contributions at a generic level.

It is intended to seek best and final offers from the two shortlisted bidders as soon as practicable after An Bord Pleanála makes a decision on the Railway Order. Following an evaluation of the best and final offers, a preferred bidder will be selected. It is envisaged that the Final Business Case will be prepared shortly after selection of the preferred bidder and it is intended that the preferred bidder's pricing will be incorporated within the Final Business Case. Clearly appropriate confidentiality protocols will need to be put in place for the Final Business Case so as to ensure that RPA's and the states commercial position is not compromised in any way.

8.4 PPP Value For Money Test

As noted in Chapter 6, RPA compiled a Public Sector Benchmark for Metro North in accordance with Department Of Finance Guidance.

Section 1.13 of the Department of Finance Guidance document *Technical Note on the compilation of a Public Sector Benchmark for a Public Private Partnership Project* states that: "In the Value for Money Comparison exercise the highest ranking bid is compared to the PSB to assess, from a quantitative perspective, whether a value for money outcome could be achieved by awarding the tender to the highest ranking bidder." If the highest ranking bid equals or beats the PSB it is deemed to offer value for money.

Following completion of the tender evaluation in June 2009 RPA conducted the value for money test as required. The value for money test was conducted for both of the shortlisted bidders rather than just the highest ranking bid as required by the guidance. The results of the value for money test were presented to the Metro North Project Board which includes a senior representative of the National Development Finance Agency as a member. Both of the bidders beat the PSB with significant headroom and it was therefore confirmed that the PPP procurement had the potential to offer a value for money solution.

[14] Article 13 (2) of the Utilities Directive requires that *"Without prejudice to the provisions of this Directive, in particular those concerning the obligations relating to the advertising of awarded contracts and to the information to candidates and tenderers set out in Articles 43 and 49, and in accordance with the national law to which the contracting entity is subject, the contracting authority shall not disclose information forwarded to it by economic operators which they have designated as confidential; such information includes, in particular, technical or trade secrets and the confidential aspects of tenders."*

[15] In accordance with Department of Finance PPP guidance a Process Auditor has been appointed to oversee the PPP procurement process and ensure it is carried out in accordance with relevant regulations and guidance.

The value for money test will be re-performed based on the BAFO bid at the time of selection of a preferred bidder and details of the results will be included in the Final Business Case. The test will be performed again prior to financial close in order to ensure that value for money has not been eroded in the period between preferred bidder appointment and financial close.

8.5 Affordability Test

On completion of the tender evaluation RPA also conducted the affordability test as envisaged in the PPP guidelines which is to ensure the capital costs of the project including both PPP and non-PPP elements of the project are within the overall project capital budget as set out in the capital envelope. This test was conducted in accordance with relevant guidance including consideration of Department of Finance Circular 4/2007[16] . The test was conducted on both a VAT inclusive and a VAT exclusive basis.

The capital envelope for Metro North was approved by Government in January 2008. As noted in Chapter 3 section 3.11 certain works in respect of the DART Underground project are to be constructed as part of Metro North. The scope of this work had not been defined or confirmed as being required to be constructed as part of Metro North when the capital budget was approved by Government. Significant analysis has been undertaken by RPA and Irish Rail and it has been agreed by Irish Rail that €50 million plus VAT of the capital envelope and budget for DART Underground should be transferred to Metro North. This transfer is subject to the approval of the National Transport Authority. The proposed capital envelope for Metro North is set out in **Table 8.1** below.

Table 8.1 Total Capital Envelope € million Nominal

Capital Envelope - Nominal	€ million Excluding VAT	€ million Including VAT
Approved by Government - January 2008	3,748	4,284
DART Underground - transfer from Irish Rail	50	57
Total Revised Capital Envelope	**3,798**	**4,341**

The affordability tests conducted by RPA confirmed that the project including both PPP and non PPP elements can be delivered within the capital envelope. RPA is confident that there will be no material changes that will impact on the affordability analysis which will be re-performed on selection of a preferred PPP bidder subject to a level of stability being maintained in global markets.

[16] *Accounting for Public Private Partnership (PPP) Projects in the 2007 and subsequent years' Appropriation Accounts* - this requires that "the total capital cost (i.e. excluding Operation and Maintenance costs) of the project.....should represent all the costs associated with the construction of the physical asset to the point of becoming available for use and included in the winning bidder's financial model:

i. Actual capital construction costs (including "fit out" services and equipment costs)
ii. Administration arrangement overheads for consortium that would be factored into commercial pricing of the built asset (e.g. bank fees, SPC operating costs insurance, etc.)
iii. Short term funding costs to point of delivery of the built asset (i.e. arrangement and commitment fees, capitalised interest, etc.) "

8.6 Exchequer Funded Capital Contribution

As noted in Chapter 9 section 9.5 in January 2008 the Government approved a capital contribution to the PPP Co of up to €1 billion during construction and the parameters around which PPP bidders may bid for capital contribution payments are also set out in that chapter. The capital contribution payments in any one calendar year (exclusive of VAT) may not exceed limits[17] of €150 million for 2010 and €300 million for each calendar year thereafter. It should be noted that the 2010 and 2011 limits are no longer applicable as the PPP contract will not be awarded until Q3/Q4 2011. However, it is proposed that that limit for 2010 now be applied in 2012.

As noted in Chapter 9 there has been reduction in scope of the exchequer funded enabling works and resultant increase in scope for the PPP Co. This could result in an increased private sector funding requirement for the PPP Co. Given the constrained capacity in the debt funding markets it does not necessarily make sense to increase the debt funding requirement further. It is therefore recommended that a transfer of €50 million should be made from the enabling works exchequer funded budget to the capital contributions exchequer funded budget, so that the PPP bidders can bid a higher level of capital contributions and therefore not increase the debt funding requirement. It is not envisaged that this would impact on the balance sheet treatment of the project and would not require any additional funding over and above the €1,628 million approved in January 2008.

[text deleted] The maximum possible exchequer funding requirement in respect of capital contributions is shown in **Table 8.2** below

Table 8.2 Maximum Exchequer Funded Capital Contribution (€ million nominal)

	€ million nominal excluding VAT						
	Total	2012	2013	2014	2015	2016	2017
Approved by Government - January 2008	1,000						
Adjustment	50						
Total Adjusted	<=1,050	<=150	<=300	<=300	<=300	<=300	<=300

<= less than or equal to

Full details of the proposed capital contribution profile of the preferred bidder will be included in the Final Business Case. The cash-flows shown above assume that the PPP contract reaches financial close in the timescale set out in the programme in Chapter 10.

8.7 Other Exchequer Funded Capital Costs

The financial structure for the project approved by Government in January 2008 included funding for enabling works, land and property costs and RPA's cost in developing the project. RPA's costs include the design and environmental work necessary to procure the Railway Order and the management, procurement and supervision of the PPP contracts. Full details of the basis of estimate for these

[17] These annual limits were agreed with the Department of Transport prior to the tender documents being issued in May 2008.

elements of the capital cost are set out in Chapter 5. The associated exchequer cash flows are shown in **Table 8.3** below.

Table 8.3 Exchequer Funded Property, Enabling Works & RPA Costs

(€ million nominal)

€ million nominal excluding VAT								
Total	2006 To 2010	2011	2012	2013	2014	2015	2016	2017
570	148	92	118	78	40	47	39	7

The above cash-flows assume that funding approval to proceed with enabling works is granted in the timescale set out in the programme in Chapter 10. The cash-flows include allowances for inflation as described in Chapter 5.

8.8 Total Exchequer Funded Capital Costs

In addition to the items described in 8.6 and 8.7 above RPA also needs to ensure that funding is set aside for risks which occur during the PPP Co construction but which are the responsibility of RPA under the PPP contract. Such risks include the costs and delays that arise in the event of the discovery of an archaeological object which is declared a national monument or in the event that change in law occurs for which the PPP Co is not responsible under the contract such as a discriminatory change in law. An [19]estimate of €25m excluding VAT has been set aside for such risks.

The total forecast Exchequer capital funding required for the project is set out in **Table 8.4** below.

Table 8.4 Total Exchequer Funded Capital Costs – (€ million nominal)

€ million nominal excluding VAT								
Total	2006 to 2010	2011	2012	2013	2014	2015	2016	2017
<=1,645	148	92	<=268	<=383	<=345	<=352	<=344	<=312

8.9 PPP Funded Capital Costs

Other than the capital contribution noted in 8.6 above, and the RPA costs, enabling works and property to be funded by the Exchequer as noted in 8.7 above the remainder of the capital cost of the project will be funded by the PPP Co.

The capital envelope for Metro North is set out in Table 8.5 below and shows the split between the elements to be funded by the Exchequer and the elements to be funded by the PPP Co in nominal terms.

Table 8.5 Split of Capital Envelope Funding between the Exchequer and the Private Sector (€ million nominal)

Capital Envelope (Nominal)	€ million Excluding VAT Exchequer Funded	€ million Excluding VAT Private Sector Funded	€ million Excluding VAT Total
RPA Costs Pre-Financial Close	87	0	87
RPA Costs Post-Financial Close	81	0	81
Property Costs	146	0	146
Enabling Works	256	0	256
PPP Costs	0	2,153	2,153
Capital Contributions during construction	1,050	0	1,050
RPA Retained Risk	25	0	25
Total Capital Envelope Excluding VAT	**1,645**	**2,153**	**3,798**
	43%	**57%**	**100%**

The elements of the capital costs to be funded by the PPP Co include the insurance costs, the financing costs in bringing the asset to operational use such as arrangement fees, commitment fees, and capitalised interest during construction in addition to the direct design and construction costs. The PPP Co needs to fully allow for the costs based on the risk allocation set out in Chapter 6. This includes full responsibility for construction period inflation.

8.9.1 PPP Funding Structure

The PPP Co funding structure will ultimately be dependent on the structure incorporated in the successful bid. It is however anticipated that financing structure will be a bank debt funding solution which will incorporate senior bank debt, and may include equity bridge and equity/subordinated debt loans and may also incorporate facilities for VAT and change in law. In RPA's own estimates for the project a level of gearing of circa 85% had been assumed. Given current market conditions it is not anticipated that any type of bond structure will form part of the financing structure. However, this has not been precluded. The structure will incorporate full hedging of the interest rate exposure by the PPP Co entering into interest rate swaps at financial close.

The European Investment Bank (EIB) has indicated that it is willing to provide up to €500 million in debt funding for the project, subject to credit due diligence. [text deleted]

Details on the funding structure and funding costs will be included in the Final Business Case.

8.10 Operational Period Revenues and Costs

The two PPP bidders have different programmes for design and construction including testing and commissioning. For the purposes of this section of the Updated Detailed Business Case it has been assumed that there will be a full year of passenger services in 2017.

8.10.1 Fare Revenue

Demand and revenue forecasts for Metro North are based on RPA's transport model and average yield per boarding assumptions. The demand assumptions are set out in Chapter 4. Revenue is assumed to be equal to demand multiplied by the average yield. The average yield per boarding has been estimated using the actual average yield per boarding on Luas which was grown based on assumptions regarding changes in fares, preferences for ticket products, average length of journeys and other related factors.

In line with European Central Bank policy on long term price stability targets a long term inflation rate of 2% has been assumed and fare increases equivalent to the inflation rate are also assumed.

Demand is assumed to ramp up over the first 3 years of operations as shown in Table 8.6 below.

Table 8.6 Demand Ramp Up

	Year 1	Year 2	Year 3	Year 4 onwards
Demand (as a percentage of steady state)	80%	85%	90%	100%

8.10.2 Park & Ride Revenue

As noted in Chapter 3 three Park & Ride sites will be provided on Metro North. It has been assumed that the pricing structure will be similar to that currently in use on Luas and the demand forecasts as set out in Chapter 4 have been utilised to generate the forecast park & ride revenues.

8.10.3 Advertising and Other Commercial Revenue

Extensive opportunities for advertising will exist on Metro North once it is operational, in particular at underground stops. RPA has retained the advertising and commercial exploitation rights under the PPP contract. RPA will pursue such arrangements subject to there being a positive financial business case and will use competitive tendering to maximise return.

Further analysis will be done for the Final Business Case however for the purposes of the Updated Detailed Business Case it has been assumed that the net yield per kilometre will be the equivalent of what is achieved on Luas.

Table 8.7 below sets out the gross anticipated revenues for the first five years of operations.

Table 8.7 Projected Operations Revenue – First Five Year of Operations (€ millions, Nominal)

Metro North - Operational Revenue - 2017 to 2021 € million Nominal					
	2017	2018	2019	2020	2021
Gross Revenue	60	66	73	84	87

Table 8.8 below sets out the grass anticipated revenues for the first 30 years of operations in nominal and NPV terms.

Table 8.8 Projected Operations Revenue – 30 Years of Operations (€ millions)

Metro North - Operational Revenue - 2017 to 2047 € million		
	Nominal	NPV @ 5.93%
Gross Revenue	3,890	1,097

8.10.4 PPP Contract and Operating Contract

Payments to the PPP contractor and the Operating contractor only commence once the system is open for passenger service. Payments will be made in advance based on a 4 weekly operating period. The payments comprise:

- Availability payments to the PPP contractor over the 25 year term of the project once passenger services have commenced;
- Energy costs to be paid to the PPP contractor for running the system; and
- Operating fee to be paid to the Operator.

Within certain parameters the level of service required (e.g. number of trips) can be flexed from the opening timetable. This flexibility has been pre-priced for both the PPP contract and the Operating contract. The availability payment to the PPP Co and the operating fee for the Operator are subject to performance deductions to the extent that the performance does not meet the availability, performance criteria and requirements set out in the contracts.

The availability payment remunerates the PPP Co for the design, build, finance, maintenance and renewal of the system to the extent not already remunerated through the capital contribution payments. The PPP contract requires that at the expiry of the contract the assets must be handed back to RPA with certain residual lives. The PPP Co has to carry out sufficient maintenance and renewal of assets in order that contractual hand-back requirements can be achieved. The availability payment covers the re-payment of the original debt and equity capital invested in the project to fund the construction and the return to the debt and equity providers in the form of interest and distributions respectively.

The operating fee and a portion of the availability payment are subject to inflation in line with the consumer price index (all items).

As noted in section 8.3 above the estimates for availability payments, energy costs and operating fees are commercially sensitive both on an individual and combined basis. For the purposes of this analysis a combined cost of [text deleted] per annum should be assumed. Therefore after taking account of the operating revenue the net ongoing funding requirement in 2009 prices for the duration of the PPP contract will be [text deleted] per annum.

Based on its experience with Luas as discussed in section 8.2 above RPA is confident that the level of operating revenue will be sufficient to cover the operating fee and power costs and there are no indications that this will not be achieved through the bidding process. As noted in Chapter 7 the Cost Benefit Analysis results demonstrate that there is a strong economic case for the project. This coupled with the fact that the project does not need an operational subvention justifies the overall capital investment in the project.

Details of the availability payments, power costs and operating fee of the preferred bidder will be included in the Final Business Case and analysis of the operational cash-flows.

8.11 Development Levies

Section 49 of the Planning and Development Act 2000 permits local authorities to make Supplementary Development Contribution Schemes (SDCS) to support public transport infrastructure.

Projects such as Metro North enhance local development potential and promote property development and property value increases along its corridor. Section 49 SDCS allow the project to capture some of this increased value, and thereby provide a source of funding to the project. Dublin City Council (DCC) and Fingal County Council (FCC) have adopted S49 SDCS for Metro North. Prior to adopting the schemes both local authorities commissioned reports by a firm of economic consultants to assist in the assessment of the potential for such schemes and to advics on the formulation of the schemes. The FCC Metro North SDCS was adopted on 12 February 2007 and the DCC Metro North SDCS was adopted on 6 March 2007. Both schemes will apply from their effective date until the 30th anniversary of that date and both allow for annual increase in the levy rates of 5% per annum compound.

8.11.1 Development Levy Rates

The current SDCS rates are for the different categories of development are set out in Table 8.9 below.

Table 8.9 – Metro North Levy Rates 2010 in €

Metro North Levy Rates 2010	€
Dublin City Council	
Residential (per unit)	€2,940
Commercial (per metre squared)	€25.87
Retail (per metre squared)	€37.28
Fingal County Council	
Residential (per hectare)	€335,711
Commercial (per hectare)	€764,032
Retail (per hectare)	€1,041,863

FCC has decided not to apply the 5% annual increase to the levy rates for the FCC scheme in 2010 as a result of the problems currently being experienced in the property market.

8.11.2 Levies Collected to Date

The levies collected to the end of May 2010 for both of the local authorities are set out in Table 8.10 below.

Table 8.10 – Metro North Levies Collected to End May 2010 (€ million)

€ million nominal	Total	2007	2008	2009	2010 to 31 May
Fingal County Council	12.6	0.1	3.8	0.5	8.3
Dublin City Council	1.7	0.1	0.4	0.8	0.4
Total	**14.3**	**0.2**	**4.2**	**1.3**	**8.7**

In addition to the levies collected a further €14 million has been invoiced by FCC but not yet collected. Of the total €29 invoiced to date by FCC €15m relates to DAA developments and €8 m relates to the IKEA development.

8.11.3 Local Authority Levy Yield Projections

The levy projections estimated in advance of the SDCS being established by the local authorities in 2007 are set out in Table 8.11 below. The original levy projections assumed that development would take place on an even basis over the 30 year life of the SDCS and that the levy rates would inflate at 5% per annum.

Table 8.11 – Metro North Original Local Authority Projections (€ million)

Original Local Authority Projections € million	Annual Yield 2007 Prices	Total 30 Years 2007 Prices	Total 30 Years Nominal
Fingal County Council	17.5	525	1,221
Dublin City Council	3.8	113	251
Total	21.3	638	1,472

Based on these projections it would have been assumed that the combined schemes would have generated circa €70m in development levies to the end of May 2010.

In light of the collapse in property development since the SDCS were established RPA requested that local authorities review the levy forecasts to consider the deliverability of the level of development previously forecast. The current view of the local authorities is that the same quantum of development will take place over the life of the schemes but that the development will take place later.

RPA has reforecast the local authority projections assuming that;

- [text deleted] and
- Only 25% of the original projected development will take place for the next three years with 50% of the original projected development for 2014 and the remaining projected development for the 30 year period taking place on an even basis over the remaining 22 years of the scheme.

The overall projected levy yield in 2007 prices remains the same however the nominal value of the levies will reduce [text deleted] for a period as shown in Table 8.12 below.

Table 8.12 – Revised Local Authority Projections (€ million)

Revised Local Authority Projections € million	Total 30 Years	Total 30 Years

	2007 Prices	Nominal
Fingal County Council	525	987
Dublin City Council	113	213
Total	638	1,200

Based on these projections the forecast levy yield in nominal terms over the period of the construction is set out in Table 8.13 below.

Table 8.13 – Revised Local Authority Levy Forecast during Construction Period (€ million nominal)

€ million nominal								
Total	2007 to 2010	2011	2012	2013	2014	2015	2016	2017
137.3	14.3	5.4	5.5	5.6	11.5	30.1	31.6	33.2

There would need to be a substantial and sustained property boom from 2015 onwards for the level of levies forecast by the local authorities to be achieved. The levy projections up to 2014 may be reasonable however given the quantum of levies invoiced to date.

8.11.4 Risks to Levy Yield Projections

There is considerable uncertainty at present in relation to the quantum and type of property development that will take place in the short, medium and long term in Ireland generally and in the DCC and FCC areas. The impact of the National Asset Management Agency (NAMA) on development is unknown. The NAMA business plan was published on 30 June 2010 however it will be some time before the effect of NAMA on property development and local authority land use and development projections is known.

RPA has carried out its own high level of analysis of what the quantum of development would be using the population and employment forecasts for moderate growth up to 2025 as described in Chapter 4. RPA estimates that the quantum of levies to be generated would reduce by over 70% and that the total levy yield would be €323 million in nominal terms as shown in Table 8.14 below.

Table 8.14 – RPA Adjusted Projections (€ million)

RPA Adjusted Projections € million	Annual Yield 2007 Prices	Total 30 Years 2007 Prices	Total 30 Years Nominal
Fingal County Council	5.6	168	226
Dublin City Council	2.4	72	97
Total	8.0	240	323

Based on these projections the forecast levy yield in nominal terms over the period of the construction is set out in Table 8.15 below.

Table 8.15 – Revised Local Authority Levy Forecast Construction Period (€ million nominal)

€ million nominal								
Total	2007 to 2010	2011	2012	2013	2014	2015	2016	2017
58.3	14.3	2.0	2.1	2.1	4.3	10.9	11.1	11.4

[text deleted]

8.11.5 Further Levy Analysis

As outlined above considerable uncertainty exists in relation to the quantum of funding which can be generated from the both the FCC and DCC Metro North SDCS. This however could be an important source of funding for Metro North and any funding generated reduces the Exchequer funding requirement over the lives of the schemes. In preparation for the Final Business Case next year RPA with the assistance of the local authorities will commission independent advice on the yield from development levies. Such work will need to be undertaken in early 2011 in order to ensure that it is at least reflective of the initial impact of NAMA on property development.

For the remainder of this chapter it is considered prudent to use the RPA adjusted estimates for development levies as shown in section 8.11.4 above.

8.12 Value Added Tax (VAT)

The Revenue Commissioners confirmed RPA's VAT status in November 2002 and it has been subsequently reconfirmed. RPA is a taxable person making taxable supplies and, therefore, is entitled to deductibility in respect of VAT on input costs associated with taxable supplies. In order to ensure that this status was not affected by virtue of Metro North being undertaken as a PPP RPA sought confirmation from the Revenue Commissioners in this regard. The Revenue Commissioners confirmed this in September 2007 and reconfirmed the status following the Revenue Commissioner's review of the Metro North contractual documentation in February 2009.

Cash-flows in this chapter are therefore shown exclusive of VAT. In carrying out the value for money and affordability tests as noted in 8.4 and 8.5 these have been done on both a VAT exclusive and VAT inclusive basis where required by the relevant guidance.

It is worth noting that the Operator contractor will provide passenger transport (services) which is a VAT exempt activity. The Operator will not charge VAT to RPA on the operating fee and the Operator will not be entitled to recover associated input VAT. This irrecoverable VAT is taken into account in the operating fee bid by the bidders and is therefore incorporated in the price. To the extent that the passenger revenues exceed the operating fee the Operator will pass the operating surplus on to RPA and RPA must invoice the Operator for the surplus. As RPA is a taxable body it must charge VAT at the standard rate on this invoice and account to the Revenue Commissioner for the VAT. This has the effect of reducing the surplus available to RPA for reducing the requirement for Exchequer funding to re-pay the capital cost of the project.

8.13 Summary of Construction Period Exchequer Cash Flows

The estimated Exchequer funding requirement as described in 8.6 to 8.8 above is set out in Table 8.17 below in nominal terms. The projected developed levies based on RPA's adjusted estimates as set out in 8.11.4 above are netted against the gross Exchequer funding estimate to provide the net Exchequer funding requirement. The net Exchequer funding requirement in nominal terms is €1,587 million which is within the approved Exchequer funding of €1,628 million which is set out in Table 8.16 below.

Table 8.16 – Approved Exchequer Funding (€ million nominal excluding VAT)

Current Approved Exchequer Funding	€ million Excluding VAT
Pre January 2008 Funding	28
Government Decision January 2008	1,600
Total Approved Exchequer Funding	**1,628**

For illustrative purposes the Net Present Value of the Net Exchequer Funding requirement is €1,313 million as shown in Table 8.18 using a discount rate of 5.93%.

Table 8.17 – Net Exchequer Funding Requirement to end of Construction Period (€ million nominal)

Metro North - Exchequer Cash-flows to Completion of Construction € million Nominal	Total	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
RPA Costs - Pre Financial Close	86.8	8.1	26.3	20.3	10.9	8.6	12.5	0.0	0.0	0.0	0.0	0.0	0.0
RPA Costs - Post Financial Close	80.8	0.0	0.0	0.0	0.0	0.0	0.0	14.7	14.7	14.7	14.7	14.7	7.3
Property Costs	145.7	0.0	0.0	21.4	2.6	0.0	0.0	24.3	24.3	24.3	24.3	24.3	0.0
Enabling Works	256.7	0.0	0.0	23.8	16.4	9.4	79.9	79.2	38.8	1.0	8.1	0.0	0.0
[18]RPA - Retained Risks	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	5.0	5.0	5.0	5.0
Sub-Total	**594.9**	**8.1**	**26.3**	**65.6**	**29.9**	**18.1**	**92.4**	**118.2**	**82.8**	**45.0**	**52.1**	**44.0**	**12.3**
PPP Capital Contribution	<=1,050	0.0	0.0	0.0	0.0	0.0	0.0	<=150	<=300	<=300	<=300	<=300	<=300
Gross Exchequer Requirement	**<=1,645**	**8.1**	**26.3**	**65.6**	**29.9**	**18.1**	**92.4**	**<=268**	**<=383**	**<=345**	**<=352**	**<=344**	**<=312**
Less S 49 Development levies	58.3	0.0	0.0	0.0	0.0	0.0	16.4	2.1	2.1	4.3	10.9	11.1	11.4
Net Exchequer Requirement	**<=1587**	**8.1**	**26.3**	**65.6**	**29.9**	**18.1**	**76.1**	**<=266**	**<=381**	**<=341**	**<=341**	**<=333**	**<=301**

[18] The RPA retained risk number was calculated based on the risk allocation incorporated in the initial PPP tender documents. This will need to be reviewed when PPP contract negotiations are complete to ensure that it is reflective of any risks being retained by RPA.

Table 8.18 – Net Exchequer Funding Requirement to end of Construction Period (€ million Net Present Value)

Metro North - Exchequer Cash-flows to Completion of Construction € million Net Present Value - Discount Rate 5.93%													
	Total	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
[19]Net Exchequer Requirement	1,313	10.2	31.2	73.6	31.7	18.1	71.8	192.6	257.2	211.0	199.6	182.5	34.1

[19] For the purposes of calculating a net present value it has been assumed that the capital contribution profile will be as follows 2012:€100m,2013-2016 €225m per annum 2017:€50m.

8.14 Financial Model Assumptions

A number of assumptions have been made in the financial model:

Project Timing

In line with the programme set out in Chapter 10 the cash-flows shown in this chapter assumes that RPA will get approval to proceed with enabling works in October 2010 and the PPP contract will be awarded in Q4 2011. It is assumed that passenger services will commence at the beginning of 2017. [text deleted] The final capital contribution payment is linked to the commencement of passenger services.

Inflation

Development Levies: [text deleted]

Fare Revenue & Other Revenues		2%
Enabling Works & RPA Costs	2010	0%
	2011	1.5%
	2012	5%
Property		0%
PPP Availability Payments (element subject to inflation)		2%
Operating Fees		2%
Power		2%
RPA Operational Costs		2%

Discount Rate

For the purposes of this chapter, cash-flows have been discounted at a rate of 5.93 %. This is the rate at which the PSB was discounted and the rate at which PPP tenders were evaluated based on the advice of the NDFA. Indications are that this rate is not materially different from what the current rate is. The rate will be revisited and updated by the NDFA prior to receipt of the BAFO Tenders in line with Department of Finance PPP guidance.

VAT

All VAT is excluded from the cash-flows which reflects the VAT status of RPA as described in 8.12 above.

Capital Costs

The capital costs for the Exchequer funded element of the project reflect the capital costs discussed in Chapter 5 *Capital Costing.*

8.15 Conclusions

RPA received detailed bids from the four pre-qualified bidders in February 2009 and following a comprehensive tender evaluation process, shortlisted two bidders in June 2009 to proceed to the Best and Final Offer stage of the procurement.

Following completion of the tender evaluation, analysis was undertaken which demonstrated the shortlisted bidders provided value for money solutions and that the PPP costs as bid together with the non-PPP costs (RPA costs and retained risks, property and enabling works) were within the capital envelope for the project. It is worth noting that the value for money test was passed by both bidders with significant headroom.

The Metro North PPP procurement is at a critical stage and the therefore this Updated Detailed Business case does not contain confidential bidder pricing information so as to ensure that the integrity of the procurement process is not compromised in any way.

It is intended to seek best and final offers from the two shortlisted bidders as soon as practicable after An Bord Pleanála makes a decision on the Railway Order. Following an evaluation of the best and final offers, a preferred bidder will be selected. It is envisaged that the Final Business Case will be prepared shortly after selection of the preferred bidder and it is intended that the preferred bidder's pricing will be incorporated within the Final Business Case. Clearly appropriate confidentiality protocols will need to be put in place for the Final Business Case so as to ensure that RPA's and the states commercial position is not compromised in any way.

The Capital Envelope for Metro North was approved by Government in January 2008. Since that in order to provide an integrated solution at St. Stephen's Green for both Metro North and DART Underground RPA will carry out certain works for Irish Rail in return for a budget transfer from the DART Underground Capital Envelope to the Metro North Capital Envelope subject to the approval of the National Transport Authority and Government.

The proposed capital envelope for Metro North is set out in Table 8.21 below.

Table 8.21 Total Capital Envelope € million Nominal

Capital Envelope - Nominal	€ million Excluding VAT
Approved by Government - January 2008	3,748
DART Underground - transfer from Irish Rail	50
Total Revised Capital Envelope	**3,798**

The estimated net Exchequer funding requirement (in nominal terms) for Metro North over the construction period is estimated to be €1,586 million. This is within the January 2008 approved Exchequer construction period funding for Metro North which is €1,628 million. The funding requirement covers RPA project development and supervision costs, property acquisition costs, enabling works and a capital contribution to the PPP contractor during construction of up to €1,050 million. The balance of the capital cost of the project (>50%) will be funded by the private sector.

Development levy schemes have also been put in place by both DCC and FCC which reduce the overall funding required from the Exchequer. The levy estimates have

been adjusted to take account of the collapse in the property market. This will be revisited prior to the Final Business Case being submitted.

RPA is confident that the projected operating revenue will be sufficient to cover the ongoing cost of operating Metro North and will make a contribution to the availability payment. Development levies will also reduce the Exchequer funding requirement.

9. Commercial Structure & Procurement Strategy

9.1 Chapter Summary

- RPA has carried out extensive work on the commercial structure and procurement strategy for Metro North since the OBC was developed in 2002.
- The PPP commercial structure and procurement strategy adopted is a Design, Build, Finance & Maintain contract with a separate Operations Contract.
- The structure has been designed specifically for Metro North and has been tailored to give the long term flexibility required recognising that Metro North is just one element of a light rail and metro network.
- Specific provision has been made in contractual structure through priced options for the purchase of additional rolling stock should demand justify reducing the peak headway from five minutes to four minutes and extension of the Operators scope to include the operation of Metro West.
- The adopted strategy and contract structure was accepted by the market and the procurement competition attracted a strong list of candidates. RPA pre-qualified a strong panel of bidders who participated in the tendering stage of the process. RPA shortlisted to two bidders in June 2009 and those two bidders will be invited to submit Best and Final Offers as soon as a decision is made on the Railway Order application.
- RPA will require the bidders to price options at the BAFO stage of the competition for certain Luas Broombridge works and Metro West infrastructure in the vicinity of Dardistown. These options if exercised will be exchequer funded and approved within the context of approval of those projects. The value for money of procuring these elements of infrastructure through Metro North can only be tested and evaluated once the final bids for Metro North have been received.
- There is significant precedent for advance works for PPP projects being completed by separate contracts ahead of PPP contract award. The Government approved exchequer funding for the acquisition of property and carrying out enabling works in January 2008. There remains a very strong rationale for carrying out each of the enabling works packages for Metro North.
- Enabling works to be undertaken on Metro North can be broken down into the following broad categories: Utility diversions and associated civil works; Mater Stop Box advance works; Heritage Works; Archaeological excavation and resolution; Liffey Temporary Bridge; St Patrick's College Retaining Wall; and Surveys and investigations.
- RPA has carried out detailed analysis of the phasing of enabling works. RPA must proceed with enabling works as soon as the Railway Order is operational if the date for Metro North delivery in the Revised Programme for Government is to be achieved. Any significant delay in proceeding with enabling works as planned could result in collapse of the project.
- In relation to the exchequer financing structure of Metro North, Government approved a capital contribution of up to €1 billion during construction. There is an argument, given the constraints in debt market capacity, for increasing the available capital contribution by €50 million and reducing the exchequer funded enabling works by an equivalent amount due to a switch in scope from enabling works to the PPP contract. This would not result in an increase in the Government approved Exchequer funding requirement for the project.

9.2 Introduction

RPA was asked by the Government in 2002 to explore the case for the Dublin Metro project and to examine how it might be progressed as a Public Private Partnership

("PPP"). RPA submitted an Outline Business Case ("OBC") in 2002 which defined the physical project, provided initial capital costs and financial analysis and explored risk transfer, PPP commercial structures and the procurement process. This analysis was further refined in 2003 in the Revised Metro Proposal

In developing the OBC, RPA had explored the need to balance the policy objective of on the one hand, transferring to the private sector appropriate risks for delivery, integration, performance quality and commercial viability with, on the other hand, questions of policy and strategic flexibility. This included for example consideration of the Government wishing to retain a measure of discretion over ticketing integration and the setting of fares or to postpone decisions on procurement of subsequent stages of metro until after the first project is in operation.

Following the OBC RPA prepared a Revised Proposal in 2003 focusing on capital cost and programme savings and consideration was given to whether the project would be treated as on or off balance sheet from a government accounting perspective based on Eurostat rules in relation to the treatment of privately financed infrastructure projects.

9.2.1 PPP Structure

The OBC considered that the best commercial structure for the Metro project would achieve a balance between competing objectives with regard to risk transfer; flexibility – both for phasing of the development of the project and making adjustments to infrastructure or service levels; and price. The contract structure developed in the OBC in 2002 and the Revised Proposal involved a separation between an infrastructure PPP and an Operations contract. It was called a Design Build Finance and Maintain plus Operation structure ("DBFM plus O"). The OBC did not decide on the relationship between infrastructure and operation, nor how those two fitted with the third element, rolling stock. The OBC did, however, identify commissioning risk as a key area that RPA would seek to transfer in a PPP.

DBFM was considered preferable to DBM (Design, Build, Maintain) because:

- Availability payments only commence when passenger service begins and its costs are capped;
- The providers of private finance have an incentive to ensure that the Metro is built and opened within budget and schedule; and
- The PPP Co has a strong incentive to provide a high quality infrastructure in order to minimise whole life cost.

The DBFM contract could have a length of approximately 30 years, of which five would be for construction and 25 for operations. The term of the contract is largely determined by a balance between the tenor available from senior lenders (a longer tenor, or debt term, generally improves affordability, subject to pricing) and the profile of major renewals works. Approximately thirty years was at that time the longest term project contract which is likely to be achieved in the project finance market.

9.2.2 Planning Risk and Property Acquisition

The OBC also identified that there was little private sector appetite for planning risk and that responsibility for the Railway Order process could be best managed by RPA as private sector developers will only take planning risk at an unacceptably high cost. The OBC and the Revised Proposal had also put forward an argument for RPA acquiring the land based on the fact that this is a risk best managed in the public sector and one unlikely to be acceptable to bidders. It is also wholly consistent with other PPP projects both in Ireland and other jurisdictions where the state provides access to land for the execution and operation of the project. The case remains valid today and indeed successful project delivery requires RPA funding of land acquisition.

The principle of RPA funding the purchase of land and payment of compensation for expropriation was approved in principle by Government in January 2008.

9.2.3 Financing Structure

The OBC had also identified that the private sector debt financing required for the Metro PPP structure was at the high end of market precedent for transactions of that type. In the Revised Proposal RPA considered further whether there should be an additional capital contribution to the project. It was identified that capital contribution from the Exchequer would reduce the quantum of higher cost private capital required by the private sector special purpose vehicle (SPV), achieve a more optimal mix of private and public capital but not necessarily reduce the value of risks transferred to the [20]PPP Co. given the quantum of private capital still committed to the project. It was identified that the appropriate level of contribution would be in the range of 25%-50% of the construction costs.

9.2.4 Transport 21

Transport 21 confirmed that Metro North, from St Stephen's Green to Swords, should be developed as a PPP as the first element of the Dublin Metro system. The development of Metro West was also included in *Transport 21* and it was recognised that the contract structure must be able to accommodate Metro West as well as future Metro/Luas network expansion.

The remainder of this chapter deals with the development of the commercial and financing structure of Metro North since Transport 21 was announced and the procurement strategy adopted to deliver the structure.

9.3 PPP Structure

9.3.1 Introduction

The Metro North project is a large new rail system, with substantial underground sections, and so it is complex in a number of ways. Experience has shown and market consultations confirmed that there is no single standard structure for delivery of a project of this nature, but rather many variations on a theme.

As outlined above the OBC envisaged a DBFM plus O structure with an InfraCo raising capital, and entering into subcontracts for the design, build and maintenance of Metro North. RPA would also enter into a contract with a private entity to operate Metro North for a specified time period, not necessarily the same as that of the DBFM contract.

The OBC did not consider the detailed relationship between infrastructure, rolling stock and operation and how those relationships might change over time. This paper looks first at rolling stock and then at operation. The next paragraphs summarise the main options which were considered prior to finalisation of the commercial structure for Metro North towards the end of 2006.

9.3.2 Rolling Stock - Background

Rolling stock costs form a much lower proportion of a tunnelled Metro North project costs than they do for an on street light rail project. Because of the high cost of the tunnels and stations, rolling stock costs are only a relatively small percentage of the total costs of Metro North. However, as the public face of the system the vehicles take on a wider importance from an RPA perspective. RPA has accumulated significant rolling stock procurement expertise on Luas, including an in-depth

[20] The terms SPV, PPP Co and InfraCo can be considered interchangeable in this context. For the remainder of this chapter the term InfraCo will be used as this is the term that has been adopted in the contractual documentation for Metro North.

understanding of specifications. RPA therefore wanted to have a role in specifying the type of vehicles being procured.

Given the potential for future changes on the network, flexibility was also important in relation to rolling stock – both in terms of additional capacity on Metro North and new lines.

RPA considered the following options in relation to Rolling Stock in establishing the appropriate procurement and commercial strategy:

- Rolling Stock Option 1 - RPA to retain responsibility for rolling stock

Under this option RPA would have dealt with a rolling stock provider directly in a similar manner that to what has been done on Luas. RPA would have had the option of transferring some of its maintenance responsibilities either to the Operator or the rolling stock supplier, but would, nevertheless, have had to retain the long term maintenance risk.

- Rolling Stock Option 2 – InfraCo to retain responsibility for rolling stock

In this option the rolling stock manufacturer has its contractual relationship with the InfraCo. The manufacturer may or may not take an equity stake in the InfraCo. There is then a further issue as to which party would bear the maintenance risk on the rolling stock provided.

9.3.3 Rolling Stock - Preferred Option

Both rolling stock options had their strengths and weaknesses in relation to risk, price and flexibility. Rolling Stock Option 2 however was deemed to be the preferable option because it dealt more effectively with the wheel/rail interface by transferring the integration risk to the InfraCo. Under Rolling Stock Option 1 RPA would have retained that risk. If the infrastructure or rolling stock is late, RPA will not have to pay for one without having access to the other.

In order to mitigate the disadvantages of the preferred option RPA had to ensure an influence in the rolling stock choice and has limited the power of the manufacturers in the InfraCo consortia by prequalifying rolling stock providers separately. Infrastructure bidders have chosen the rolling stock manufacturer/supplier from the prequalified list knowing that they were, prima facie, acceptable to RPA.

The bidders for Metro North have been required to size the initial fleet to be sufficient to cater for a peak headway of 5 minutes with a passenger carrying capacity of 8,000 ppdph (passenger per direction per hour).

RPA has also required the bidders to price a contractual option to provide additional vehicles sufficient to cater for a peak headway of 4 minutes with a passenger carrying capacity of 10,000 ppdph. There is a limited time frame within which suppliers can hold pricing for rolling stock supply and therefore this option will be time limited and must be exercised within four years of passenger service commencement on Metro North. If Metro West proceeds in the short to medium term it is highly unlikely that additional vehicles will be required on Metro North within a 10 year time frame of opening.

9.3.4 Operations - Background

Long-term contractual arrangements between the public and private sectors pose complications for later change. In the case of the Metro project, there are a number of areas of potential change: the pace of development of the network, changing service requirements over time and transport policy.

Given the evolving state of transport policy, future adjustments to service levels, patterns, and quality are inevitable. Both of these points argue for a flexible commercial/financing structure with respect to funding arrangements for infrastructure

development; and with respect to the operating contract. There may also be a case for a single operating contract across the entire light rail network (Luas and Metro) at some stage in the future.

In the OBC it was recognised that a DBFOM is the least flexible commercial/financing structure. Under the DBFOM structure the private parties and funders contract for/invest in a fully defined project for a specified term. Changes of the kind that are likely to occur in the life of the Metro project might require the recasting of key commercial arrangements, particularly with regard to debt funding. Such recasting could involve the payment of costly compensation by RPA. DBFM with separate Operations was deemed to be more flexible as the separated shorter operating arrangements permitted under this structure coincide with a more realistic policy timeframe. Service changes can be made with a new operating contract that leave infrastructure financing arrangements untouched.

The OBC had identified that a separate DBFM and operate contracts was the optimal structure for Metro North. Following the announcement of Transport 21 it was clear that Metro West would be developed within the concession term of Metro North and this confirmed that flexibility of arrangements in relation to operations was a necessity. As Metro West vehicles would be running on Metro North infrastructure it was considered important from a safety perspective that a single operator control all vehicle movements operating on the same piece of infrastructure. In finalising the commercial structure for Metro North RPA identified three possible options for dealing with the infrastructure (including rolling stock) - operations interface which arise in the "DBFM" plus "O" structure.

- Option 1: Under this option, RPA would have separate contracts for infrastructure and operation. RPA would retain the interface risk itself. As part of their contracts, the InfraCo and Operator must sign a cooperation agreement between them. This option, and its benefits and risks, is developed in more detail in 9.3.3.2 below.
- Option 2: Under this option the InfraCo has the Operator legally subordinated to them through a subcontract for the construction and commissioning phase. This option is discussed in more detail in 9.3.3.3 below.
- Option 3: Under this option there is a single consortium, but with a planned break at a known point; in essence, the parties are tied during commissioning but the ties loosen during operation. This option is explored further in 9.3.3.4 below.

9.3.4.1 Operations Option 1

Under this option, two concessions would have been awarded from the outset, with two separate competitions. The first competition would have been to develop, finance and maintain the infrastructure (including rolling stock) and the second to select the Operator.

In this model, DBFM and O would both have been procured individually by RPA. The InfraCo and the Operator would have to share commissioning risk and the responsibility for attaining the operational safety case for the system.

In summary under this option it is likely that RPA would have been exposed to substantial commissioning risk with the result being payment of availability payments for the infrastructure and rolling stock when there is no operational railway. The potential exposure of RPA to this issue and the cost of having interface risk substantially remaining with RPA were considered unlikely to represent best value for money.

9.3.4.2 Operations Option 2

Under option 2 there would have been two separate competitions, one for the DBFM contract and another for the O contract. The chosen Operator would have been

required to enter into a subcontract with the InfraCo to cover the construction and commissioning phase. The InfraCo (with the Operator as its subcontractor) would then assume all commissioning and testing risk until the service was fully operational including obtaining the operational safety case for the system. It would offset some of this risk through transfer of operational risk down to the Operator.

Upon completion of the infrastructure, the InfraCo would remain responsible for the availability and maintenance of both infrastructure and rolling stock for the remainder of the concession period. The Operator's separate O contract with RPA would commence post commissioning and continue as before hence still providing flexibility for future changes. The Operator would be responsible for the provision of the Metro North service and would assume responsibility for management of fare evasion.

Under this option the Operator would need to be appointed and the operations contract finalised with RPA before the preferred InfraCo bidder was selected. This would have been necessary because requesting the preferred InfraCo to negotiate with and accept an Operator in an uncompetitive situation would probably adversely affect value for money.

The major advantage of Option 2 was that it reduces RPA's exposure to commissioning risk and ensures no payments are made until the service is fully operational. The disadvantage is that as it involves greater risk transfer to the private sector, it does introduce more complexity into the structure. It also, unless a prequalified panel route is selected as discussed in Section 9.3.3.5, requires the InfraCo to take full commissioning risk on an Operator not of its choosing.

9.3.4.3 Operations Option 3

Option 3 looked at whether the competition for infrastructure (with rolling stock) and operation could be integrated, with the contracts separating some time (say, anything from 3 months to 5 years) post commissioning. The InfraCo and the Operator would be responsible together for getting to that point (and would have to have private arrangements between themselves). In practice, given the relative financial strengths, the InfraCo would be the lead partner. The Operator would continue post commissioning on a separate operate contract with RPA as before.

This principle suggests that the incentives for infrastructure (with rolling stock) and operation should be aligned during the construction and commissioning. They only need to be separable some time after operation starts but before extensions become topical.

On this basis there would be one competition and two contracts. The parties would form into consortia in the normal way for a DBFOM. At the end of the tender, RPA would select a single consortium. The two consortium members (the InfraCo and the Operator) would sign separate, but linked contracts with the Operator being a party to the InfraCo contract until some point post commissioning. The contracts would specify that there would be no payments until the system was operational, which would be the same day for all, but that from that day the separate payment mechanisms would start up. There would also be, as in other options, a linked performance regime based on a single methodology and attribution mechanism. The infrastructure performance mechanism could be availability based; and the operation could be one of operating performance including fare evasion management incentivisation.

Option 3 had largely the same advantages as Option 2 with commissioning risk transfer and single point responsibility. It addressed the disadvantage in Option 2 in that it allowed InfraCos to select the party that they would be taking the risk on. However this in itself introduces a disadvantage to RPA in that it does not get to influence the choice of Operator and a better mitigation measure to this disadvantage was the use of a prequalified panel of Operators as discussed in the next section.

Option 3 however, was an untested solution that has had no marketplace precedent or exposure previously.

9.3.4.4 Operations - Preferred Option

Three main options for the infrastructure – operation interaction on Metro North as outlined above were considered. Market consultations confirmed that there was no single standard structure for delivery of a project of this nature but rather many variations on a theme. Each of the options has strengths and weaknesses relative to the other options considered. There were and are a number of advantages and disadvantages under each structure and this section now considers if there are ways to mitigate the most obvious disadvantages of the better options.

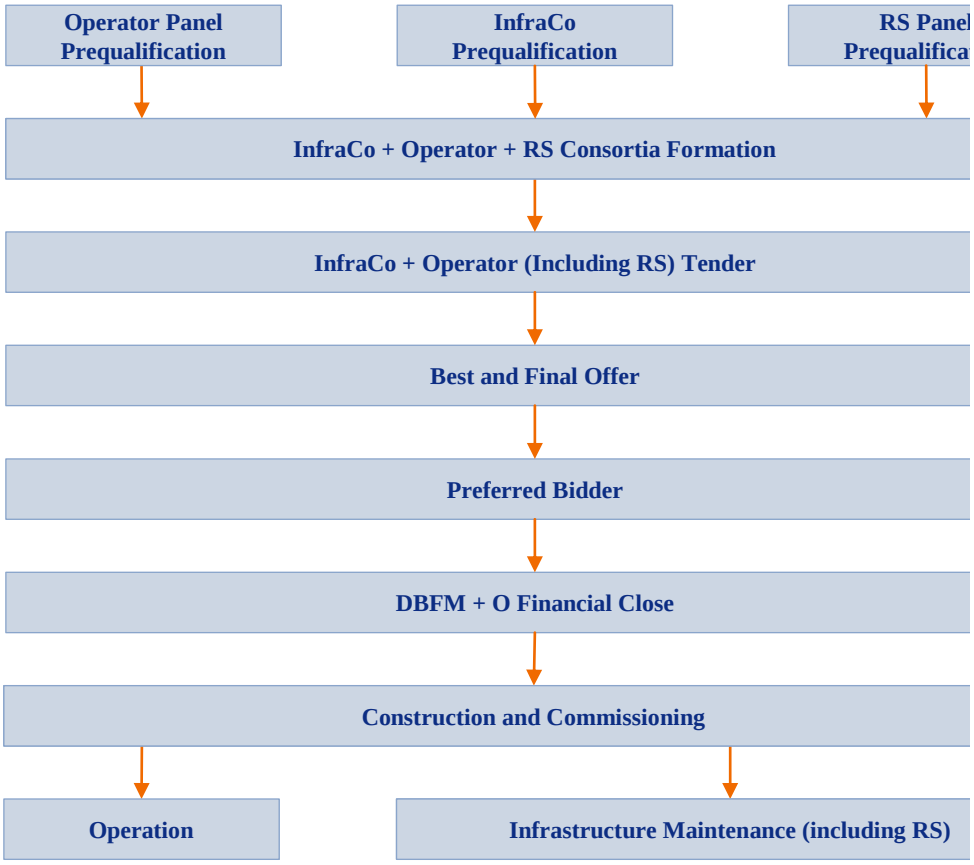
The market would have preferred Option 1 as it transferred least risk to them. This option would however have left RPA subject to considerable commissioning risk and the risk of making significant payments for infrastructure with no service available. This was considered unlikely to represent best value for money to RPA.

Option 3 in which there was “One Competition, Two Contracts” would allow RPA to transfer most of the commissioning risk to the private sector. But the structure was largely untested and the reaction towards it during market soundings was not overly positive. It was considered that it would be a significant risk for RPA to proceed to the market with an untested contractual structure as it could compromise the appetite for the project and thus the intensity of the bidding competition and ultimate value for money.

Option 2 which lay between the other two options considered was deemed to be the best option as it enabled RPA to transfer commissioning risk to the private sector. The key disadvatage to Option 2 from a private sector perspective centred around requiring InfraCo to contract with and take risk on an Operator not of their choosing. To address this it was decided that RPA would select a panel of pre-qualified Operators, who would then form part of the bidding team of InfraCo, similarly to the panel envisaged for rolling stock. This solution would address all of the concerns in that InfraCo would be taking risk on an Operator largely of their own choosing – this would allow greater transfer of risk from RPA to the InfraCo. It would also allow for easier and less contentious subcontract negotiations between InfraCo and Operator. It was also less likely that the InfraCo would have commercial difficulties with all parties on the panel.

From RPA’s perspective this had the advantage of RPA still retaining control to a large degree on the Operator selected. It also facilitated a single tender and single evaluation process. The downside is that the final result may be the most economically advantageous price for infrastructure but not necessarily for operations. However as outlined previously, the cost of the infrastructure will far outweigh the cost of operations. The O contract will be re-tendered in any event in a relatively short period hence it is more imperative to focus on the lower long term infrastructure cost.

The figure below presents how the contractual structure has developed in the procurement process.



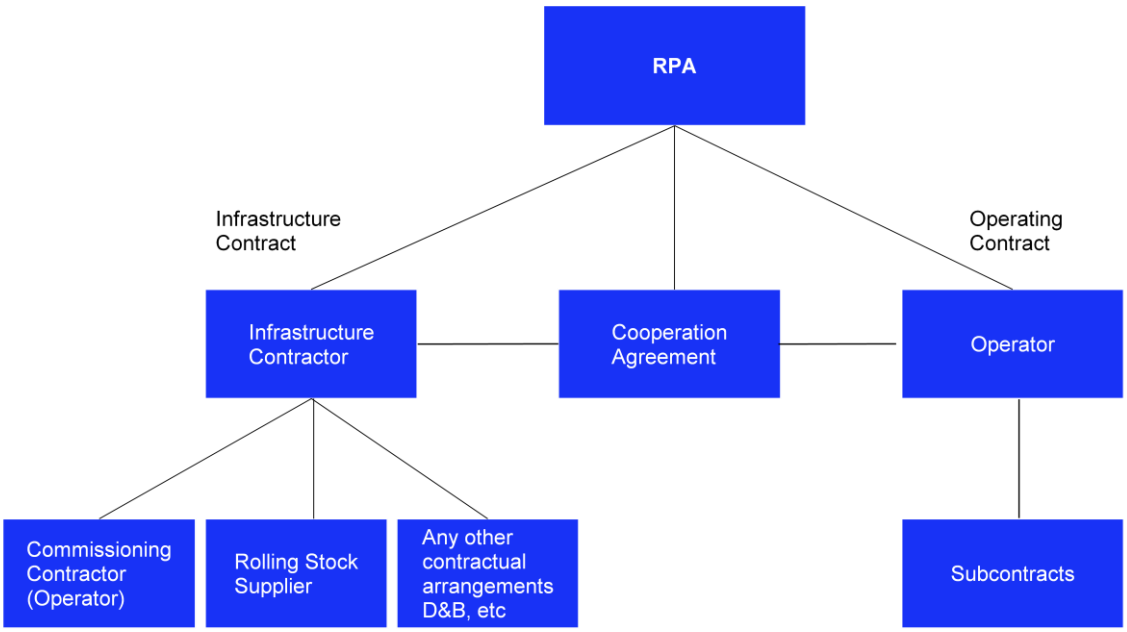
9.3.4.5 Operations – Metro West Option

A key aspect of the Operating Contract is that it can accommodate extending the Operators remit to Metro West should passenger services commence during the term of the Metro North Operating contract. This shall be achieved by including within the Operating Contract a priced option allowing RPA to extend the Operator's remit to Metro West. This option also envisages the Metro North Operator assisting the Metro West InfaCo in its commissioning of Metro West.

9.3.5 PPP Contract Structure

The finalised contract structure for Metro North is shown in the diagram below.

PPP Contract Structure



The contractual structure selected by RPA envisages that:

- the Infrastructure Contractor will enter into the Infrastructure Contract for the design, construction, financing and maintenance of Metro North;
- the Operator will enter into the Operating Contract for the operation of passenger services on Metro North; and
- RPA, the Operator and the Infrastructure Contractor will enter into the Cooperation Agreement.

It is also recognised that the Infrastructure Contractor and/or its Construction Contractor will need to enter into a number of different contractual arrangements with its principal sub-contractors. The exact form of such arrangements (for instance whether a sub-contract or an alternative contractual arrangement) is left at the bidders discretion but is examined by RPA as part of the tender evaluation process. However, the Infrastructure Contractor is required (under the Infrastructure Contract) to enter into some form of arrangement with the Operator (in its capacity as the Commissioning Contractor), in respect of the testing, commissioning and bringing the system into passenger service.

The following Sections give a brief outline of the contractual structure for the Project.

9.3.5.1 Infrastructure Contract

In general terms, the Infrastructure Contractor shall be responsible for the performance of the works and the maintenance services which includes the following specific services as well as any related works / services:

- the design and construction of the project, including the provision of rolling stock;
- commissioning, testing and bringing the project into passenger service, (including obtaining the safety case for the Infrastructure Contractor and separately for the Operator under Section 46(1) of the Railway Safety Act 2005);

- the maintenance and renewal of both infrastructure (including for example track, signalling and stations) and rolling stock and for ensuring that they are available to the Operator for passenger service;
- financing the Project, subject to any capital contributions made by RPA; and
- permitting rolling stock from Metro West to operate on Metro North infrastructure.

The Infrastructure Contractor will be remunerated for the performance of the works and the maintenance services through availability payments determined under the Infrastructure Contract payment mechanism which measures both availability and performance quality indicators.

The Infrastructure Contract will commence once the contract is signed and will expire 25 years from the date passenger service starts on the System unless terminated any earlier.

The infrastructure provided by the Infrastructure Contractor must always have the capability of ultimately running at a 2 minute headway, however initially a 5 minute peak headway is required. The Infrastructure Contract contains an option exercisable by RPA to procure additional vehicles in order to decrease the peak headway from every 5 minutes to every 4 minutes.

9.3.5.2 Operating Contract

In general terms, the scope of the operating services to be provided by the Operator to RPA under the Operating Contract includes the following specific services as well as any related services:

- operation of Metro North (including stations, rolling stock, the control centre and car parks);
- responsibility for strategies for combating fare evasion;
- ticketing services (including revenue and fare collection) and the provision and training of personnel in relation to ticketing; and
- customer services.

The Operator will be remunerated for the performance of the operating Services through payments determined through the Operating Contract payment mechanism which measures service reliability, punctuality and certain qualitative indicators. The Operating Contract will be effective from the same date as the Infrastructure Contract and will expire 5 years from the commencement of passenger services (unless terminated any earlier).

The Operating Contract contains options exercisable by RPA, to extend the term of the Operating Contract for a further 5 years and to require the Operator to undertake the performance of the operating services in respect of Metro West.

The Operator will enter into separate contractual arrangements with the Infrastructure Contractor to assist in the commissioning and completion of the system.

9.3.5.3 Cooperation Agreement

RPA, the Operator and the Infrastructure Contractor will enter into the Cooperation Agreement. The term of the Cooperation Agreement will mirror the period for which the Infrastructure Contract and the Operating Contract are in place, commencing at the same time, and coming to an end at the expiry (or earlier termination) of the earliest of the Infrastructure Contract and the Operating Contract. If any successor Infrastructure Contractor or successor Operator is appointed there is a requirement for that party together with RPA and the Infrastructure Contractor / Operator (as the

case may be) to enter into equivalent terms and conditions as the form of the Cooperation Agreement (amended to take account of the new party).
The Cooperation Agreement is a procedural document which aims to bring together certain interfaces between the three parties to it. Where, for example, performance of obligations under the Infrastructure Contract might impact on the Operator (or vice versa) the Cooperation Agreement provides a mechanism for ensuring that such effects are considered and managed effectively.
The main areas which the Cooperation Agreement seeks to address are:

- possessions and use of the site or system;
- liaison between the parties;
- the design review procedure;
- contributions to contract variations ;
- defects;
- interrelationship between the application of the payment mechanisms under each of the Infrastructure Contract and the Operating Contracts;
- testing and commissioning; and
- response to emergencies.

The Cooperation Agreement provides a framework within which a series of protocols will be placed. These protocols are to be developed by the Infrastructure Contractor and the Operator in conjunction with RPA, to suit the needs of all of the parties.

9.3.5.4 Commissioning Contract

As noted above, RPA will require the Infrastructure Contractor to enter into a contractual arrangement with the Operator in respect of the commissioning, testing and bringing into service of the System. In this context the Operator will be known as the Commissioning Contractor. For clarity, the Operator and the Commissioning Contractor are required to be the same legal entity.

RPA through the tendering process has approval rights over this contractual arrangement and it is envisaged the following features will be addressed:

- Operator consideration and input into the Infrastructure Contractor's design (from an operational and maintenance perspective);
- Operator input into safety assurance processes undertaken by Infrastructure Contractor with the Railway Safety Commission in order to obtain the Operator's Safety Case;
- training of Operator and personnel and drivers;
- compilation of manuals; and
- provision of drivers and personnel by the Operator to assist in the undertaking of tests and commissioning demonstrations.

9.3.5.5 PPP Procurement

RPA has proceeded with the Metro North PPP procurement with the pre-qualification and contracting strategy as outlined above. The adopted strategy and contract structure was accepted by the market and the procurement competition attracted a strong list of candidates. RPA pre-qualified a strong panel of bidders who participated in the tendering stage of the process. RPA shortlisted to two bidders in June 2009 and those two bidders will be invited to submit Best and Final Offers as soon as a decision is made on the Railway Order application.

9.3.5.6 PPP Contract - Other Contractual Options

9.3.5.6.1 Metro West Infrastructure Option in the vicinity of Dardistown

The preferred route corridor for Metro West, the proposed orbital line linking Tallaght with Metro North in the vicinity of Dardistown, was selected in November 2008. It is currently envisaged that a Railway Order application for Metro West will be submitted to An Bord Pleanála in September 2010. Infrastructure to facilitate the connection between Metro North and Metro West in the vicinity of Dardistown is required. In order to minimise negative impacts on either the Metro North works or maintenance services RPA is seeking a priced option at the Best and Final Offer stage of the Metro North PPP procurement competition for the provision of this additional infrastructure, as well as testing, trial running, commissioning and maintenance of the same, required to facilitate the connection between Metro North and Metro West in the vicinity of Dardistown.

It is envisaged that if this option were to be exercised that the capital costs will be exchequer funded. The budget for this infrastructure is included within the scope of the Metro West project and approval of the final business case for Metro West may be required in order to exercise this option. There will be a very limited time frame after financial close on Metro North for this option to be exercised in order not to adversely impact on the Metro North programme. The Railway Order for Metro West will also need to be operational for the option to be exercised. The long term maintenance responsibility for these works will rest with the Metro North Infrastructure Contractor and there will be an increment to the Metro North availability payment to compensate the Metro North Infrastructure Contractor for this.

9.3.5.6.2 Luas Broombridge Option

The preferred route corridor for Luas Broombridge (Line BXD), the proposed line from St Stephen's Green to Broombridge which links the existing Luas Red and Green lines, was selected in December 2008. The Railway Order application for Luas Broombridge was submitted to An Bord Pleanála in June 2010. The construction strategy for Luas Broombridge may for technical, stakeholder interface and programme reasons, require simultaneous construction of parts of Luas Broombridge and Metro North. In this event, it is envisaged that those parts of Luas Broombridge infrastructure requiring simultaneous construction and which are adjacent to or within the Metro North site may be included in the scope of Metro North.

It is envisaged that the Metro North bidders will be required to provide a priced option for this Luas Broombridge infrastructure at the Best and Final Offer stage of the Metro North PPP procurement competition. It is envisaged that if this option were to be exercised that it will be exchequer funded. The budget for this infrastructure is included within the scope of the Luas Broombridge project and approval of the final business case for Luas Broombridge may be required in order to exercise this option. There will be a very limited time frame after financial close on Metro North for this option to be exercised in order not to adversely impact on the Metro North programme as these works are in the vicinity of areas of the Metro North site for which design and construction activities will be on the critical path. Clearly the Railway Order for Luas Broombridge will also need to be operational for the option to be exercised. The long term maintenance responsibility for these works will revert to RPA once construction is complete.

9.3.5.6.3 Commercial Impact of Options

The inclusion of these contractual options in the scope of the Best and Final Offer stage of the Metro North competition is necessary in the interests of having an integrated approach to transport network development and stakeholder management. It should be noted however that these options bring additional commercial and technical complexity to what is already a large and complex project and procurement. It is likely that Metro North funders will seek protection and compensation in the event

that the exercise of these options adversely affects the delivery of Metro North. The value for money of procuring these elements of infrastructure through Metro North can only be tested and evaluated once the final bids for Metro North have been received.

9.4 Enabling Works

9.4.1 Background

The decision that Metro North works would be delivered by a PPP structure was confirmed when Transport 21 was announced in November 2005. During 2006 RPA finalised the DBFM plus O contract structure as set out in 9.3.3 and 9.3.4 above. At that time it was acknowledged that the successful PPP bidder (InfraCo) would be seeking to commence construction in an environment as free from complex interfaces as possible in order to reach commissioning and hence revenue generation in timescales that would minimise the finance costs generated within the construction period. It was recognised the PPP bidders and their funders may simply not be in a position to accept some of the complex third party risks which would arise in the construction of Metro North. In the likely event that the DBFM Contract is negotiated so that some of these risks are borne by RPA, RPA could be liable for significant penalties if InfraCo were to be delayed by these risks (including the actions and omissions of third parties for whom RPA would be responsible) during the PPP construction period.

There is ample precedent for advance works for PPP projects completed by separate contracts ahead of time and this encourages a keener more focused competition for the main contract with a longer more committed tender list. For example, the National Roads Authority carry out advanced archaeology works ahead of the main PPP contracts and utility diversions were carried out ahead of the M50 upgrade. In a UK context the majority of light rail PPP projects and many other major infrastructure projects brought to market in the last decade have included publicly funded advanced works such as land acquisition and utilities diversions where applied risk premiums have proved prohibitive. In the Dutch HSL project a significant amount of the railway infrastructure was funded and managed by the state in advance of the rail PPP project. This included the state acquiring and funding all land and property; managing the complex interfaces, particularly with public sector stakeholders; and taking responsibility for a large proportion of the environmentally sensitive work.

RPA has also pursued a programme of enabling works on all previous Luas lines and on current projects under construction. Advanced works were successfully carried out ahead of the main design and build contract on the Luas Red and Green lines including property demolition; extensive utility diversions; Red Cow depot construction; refurbishment of Sean Heuston Bridge; and the construction of Taney Bridge in Dundrum. These were all completed successfully and provided a clear working site for the main works. The RPA strategy on Lines B1 and C1 has built on this success and advanced packages were undertaken for the diversion of all major utilities; the construction of all structures (bridges and viaducts) on Line B1 and the refurbishment of the Mayor Street Bridge on Line C1.

9.4.2 Objectives in Pursuing Enabling Works

In developing its strategy for enabling works in 2007 RPA identified five key objectives which potential enabling works must seek to meet. The objectives may not all be met by a single works package but each enabling works package proposed should contribute significantly to the achievement of these objectives. The objectives identified can be summarised as follows:

- Reducing timescale risk thereby providing greater certainty to the achievement of critical milestones (ensuring timely delivery of the overall project);

- Reducing cost risk and offer better value for money by carrying out works in advance of the main works and hence reduction in pricing premiums by PPP bidders;
- Reducing stakeholder interface issues by carrying out stakeholder intensive works outside the DBFM contract, in particular public sector stakeholders such as Local Authorities, Mater Hospital and Utility providers;
- Ensuring the current scope of the project can be delivered, in particular a Stop at Mater Hospital; and
- Fostering an integrated approach to the delivery of transport infrastructure and developments of national importance in the vicinity of Metro North[21].

9.4.3 Government Approval in 2008

The advance works recommended by the RPA in 2007 included early construction of the station boxes at Dublin Airport[21] and under the Mater, advance utility diversion, advance work on access to the stations at St. Stephens Green and O'Connell St, contamination testing and advance archaeology works.

The exchequer funding of these works and the principle of these works commencing in advance of final overall approval of the project was approved in principle by Government in January 2008.

9.4.4 Enabling Works Strategy Development since 2008

Since development of the enabling works strategy in 2007 significant further engagement has taken place with key stakeholders along the route including:

- Dublin City Council;
- Fingal County Council;
- Ballymun Regeneration Limited;
- Dublin Airport Authority;
- Office of Public Works;
- Department of Environment Heritage and Local Government;
- Mater Public Hospital and the New Adult Hospital;
- Mater Private Hospital;
- National Paediatric Hospital;
- Rotunda Hospital;
- Irish Rail;
- Utility Companies (including ESB, Bord Gais, local authorities; eircom; Chorus NTL, BT); and
- Private individuals; residents groups and business associations.

This engagement and consultation has informed the Railway Order process and the finalisation of the enabling works strategy. The rationale for carrying out enabling works remains and further detailed work has been undertaken on the procurement strategy for those enabling works including the development of tender documentation.

[21] At the time of the original development of the enabling works strategy in 2007 it was considered that early construction works at Dublin Airport may be required in order to have an integrated approach to the delivery of Terminal 2 and Metro North, thus avoiding the commencement of construction works in a neighbourhood immediately after the completion of another major project. However, due to delays in securing the Railway Order for Metro North this strategy was revisited and all Metro North works at Dublin Airport will now be in the PPP contract.

9.4.5 Enabling Works Strategy June 2010

Enabling works to be undertaken can be broken down into the following broad categories;

- Utility diversions and associated civil works;
- Mater Stop Box advance works;
- Heritage Works;
- Archaeological excavation and resolution;
- Liffey Temporary Bridge;
- St Patrick's College Retaining Wall; and
- Surveys and investigations.

The following sections sets out at a high level the rational for carrying out these packages.

9.4.5.1 Utility Diversions

With Luas projects to date, the RPA has taken a lead role in designing, procuring and executing advanced utility diversions for projects. This has proved successful in the past and as a consequence RPA has built up a very good working relationship with the various utility providers. It was considered unlikely that the international bidding community, with little or no experience of dealing with utility companies in Ireland, would be willing to accept the risk of diverting utilities and thus having to deal with the various utility providers with no guarantees of timely delivery. Similarly, utility companies have been reluctant in the past to deal with the private sector on these matters and it is unlikely these companies will change their position in any meaningful way in respect of Metro North. The overall timescales envisaged for delivery of Metro North are contingent on timely advanced utility diversions. There will be a significant delay in project delivery if RPA does not commence these diversion works on a timely basis once the Railway Order is operational. RPA has engaged extensively with the various utility companies identifying all existing apparatus along the Metro North route. Some localised utility diversion works will remain within the scope of the Metro North PPP contract.

The following surveys have been undertaken to support the design of the utility diversions which is being undertaken by RPA:

- Topographical survey;
- Silt Trenching survey;
- CCTV survey; and
- Ground Probing Radar survey.

The scope of utility diversions to be undertaken as advance works are:

- St. Stephen's Green (SSG) - utilities to be moved to a corridor to west and north sides of SSG West and SSG North and around junction of Grafton Street including relocation of deep sewer;
- O'Connell Bridge South - the south box shall extend down Westmoreland Street. This requires utility diversions into narrow corridors on both sides of the street;
- O'Connell Bridge North - utilities to be moved to corridors adjacent to properties on West and East sides of O'Connell Street from the GPO south to the Quays

including provision of services to/from new Luas and ESB sub-stations which will be constructed in the median of O'Connell Street to the north of Abbey Street;

- Parnell Square - utilities to be moved to a corridor on east side of Parnell Square and diversion of NTL ducts and cabling around Parnell Square North and West to Parnell Street; and
- Ballymun - The cut and cover section of the Metro North tunnel follows the line of Ballymun Road from Collins Avenue to north of Santry Avenue. This will require all services in Ballymun Road to be diverted into narrow corridors on both sides of the road (predominantly to the east side) for the full length. The largest services (water main and pumped sewers) are to be diverted to the east around the proposed development in that area. At Dublin City University / Collins Avenue the diversion of public lighting and drainage and major diversions North and South of Collins Avenue of the 800mm water main, Wad Culvert, and transverse services at junction are required.

9.4.5.2 Mater Stop Box Diaphragm Wall

The site where the Metro North Mater Stop will be constructed is a constrained site. The existing Mater Public Hospital and Mater Private Hospital are adjacent to the site. Construction of the new Mater Adult Hospital is well underway at the site and the new National Paediatric Hospital is also planned to be constructed at the site. RPA has consulted in detail with the various stakeholders at that site. RPA has a limited window to construct the Mater Stop Box prior to the Mater Adult Hospital being completed and commissioned. If RPA cannot commence the Mater Stop Box works in early 2011 there will be a direct knock on impact on the opening date for the new adult hospital which is scheduled for January 2012. This is due to the environmental impacts caused when constructing the Stop box in relation to noise and vibration. In summary, the operational hospital would not be able to withstand the environmental impacts from Stop box construction and would be forced to open and immediately close operating theatres and wards until the Stop box works were complete.

Originally it was envisaged that the entire construction of the Mater Stop Box (excluding 'fit out') would be awarded as a single design and build (D&B) contract with this contract to be novated to InfraCo at financial close. At the time this strategy was originally developed it was envisaged that a Railway Order would be granted in April 2009 and that it would be possible to commence the Mater Stop Box enabling works shortly thereafter. It was envisaged that the shortlisted PPP tenderers would have been able to do due diligence on the Mater Stop enabling works D&B contract and contractor prior to submission of the BAFO and that works at the Mater would be well progressed pre-financial close which at that time was envisaged would be in May 2010.

As a result of in depth discussions with the Mater campus stakeholders including the local residents, the Mater Private Hospital, the new Adult hospital and the proposed National Paediatric Hospital the Mater stop design has changed including the provision of a second entrance which will directly link to the proposed National Paediatric Hospital. The resulting redesign of the box structure together with the delays to the Railway Order process has resulted in a shorter window being available for construction in advance of financial close. Furthermore, it is not now possible to award a D&B contract or indeed be in receipt of tenders for the Mater Stop box prior to the PPP bidders submitting their BAFOs. It is therefore not possible to provide the PPP bidders with sufficient information to do due diligence or price any future novation and indeed the risk of the successful PPP bidder refusing to accept a novation at financial close on terms acceptable to RPA has greatly increased.

Notwithstanding the above the diaphragm walls of the Mater Stop need to be constructed prior to the time when InfraCo would be able to construct them. This is necessary so as to ensure the opening and safe operation of the Mater Adult

Hospital, currently scheduled for Jan 2012. It is envisaged that the earliest that InfraCo would commence construction is midway through 2012.

RPA commissioned a study in preparation for the Railway Order oral hearing which has shown that it would not be possible to construct the diaphragm walls if the Adult Hospital was operational, short of carrying out the works on weekends which would compromise the overall construction programme and add significant cost to the project. Otherwise closing parts of the new hospital would be necessary to allow construction to progress.

It has therefore been decided to reduce the scope of the works to be carried out by RPA prior to handing the site over to InfraCo. Reducing the scope of construction to the diaphragm wall elements not only enables RPA to mitigate the risk to the operational Adult Hospital and to meet obligations under its agreement with Mater but enables RPA to move the detailed redesign of the internal elements of the stop back into the Metro North Infrastructure Contract which mitigates the design risk to RPA, whilst affording maximum flexibility to the winning PPP bidder. It is no longer intended to novate the D&B contract to InfraCo but to hand over the completed diaphragm wall at an agreed date post financial close. InfraCo will be required to carry out the necessary design and construction due diligence and accept responsibility for the construction and future maintenance of the walls. It is envisaged that RPA will endeavour to procure a collateral warranty from the D&B contractor for the diaphragm wall in favour of InfraCo. While this approach is not without risk the risks are considered more manageable. For example, the risk of InfraCo not accepting the infrastructure is reduced as InfaCo will have been in a position to carry out the necessary design due diligence and indeed will be able to witness the construction works during the preferred bidder phase of the PPP procurement.

Exchequer funding for the full construction of the Mater Stop Box (excluding “fit out”) had been included in the enabling works exchequer funded budget approved in principle by Government in January 2008. The reduction in scope of the enabling works and resultant increase in scope for InfraCo results in an increased funding requirement for InfraCo. Given the constrained capacity in the debt funding markets it does not necessarily make sense to increase the debt funding requirement further. It is therefore envisaged that the National Transport Authority will be approached with a view to making a transfer from the enabling works exchequer funded budget to the capital contributions exchequer funded budget, to the extent of the increased InfraCo scope, so that the PPP bidders can bid a higher level of capital contributions and therefore not increase the debt funding requirement as set out in Chapter 8 section 8.6.

9.4.5.3 Heritage Works

The Metro North works will impact on a significant number of important architectural heritage items which are considered to be of national importance. These include the following:

- At St. Stephen’s Green - the piers, railings and gates to either side of the Fusilier's Arch, the railings, bollards and paving to the northwest perimeter of the Green, the Pulhamite rockwork to the Island and adjacent promontory, Garden of the Blind, Lady Grattan Fountain & Troughs (at junction with Dawson Street), Lord Ardilaun Monument, Robert Emmet Statue, O’ Donovan Rossa Memorial, and the African Rose Bowl;
- At O’Connell Street - Daniel O’Connell Monument, Jim Larkin Monument, Sir John Gray Monument, William Smith O’ Brien Monument, lamp standards on O’Connell Bridge and the pavement art at junction O’Connell Bridge, Westmoreland Street and D’Olier Street; and
- At Parnell Square – the Óglaigh na hÉireann Memorial and railings.

RPA has developed an architectural heritage protection plan in consultation with the Department of Environment Heritage and Local Government, the Office of Public Works, Dublin City Council and other stakeholders. As part of this strategy and to secure the agreement of these stakeholders to support the Metro North project at the oral hearing it was necessary for RPA to agree that RPA would directly appoint a heritage works contractor who shall be responsible for removal, temporary display/storage and full reinstatement of a range of monuments, statues, heritage items, street furniture and paving from in and around the areas designated for stop box construction. The initial removal of monuments by the heritage works contractor is required to be carried out under the supervision of RPA in order to satisfy stakeholder requirements. The heritage works contractor shall be novated to InfraCo who shall be responsible for the ongoing storage, reinstatement and supervision of the heritage works contract.

It is worth noting that the main reason for the heritage package starting early is because of the requirement to carry out advance utility works. For example the statues of Gray, O'Brien and Larkin in O'Connell Street need to be removed prior to utility works scheduled in O'Connell Street for early 2011.

9.4.5.4 Archaeological Excavation and Resolution

In advance of development of the enabling works strategy in 2007 it was recognised that there were likely to be areas of archaeology along the length of the route. This gave rise to the risk of archaeology being discovered by InfraCo during works which could have a programme and cost risk for InfraCo which was likely to be unacceptable. In consequence it was decided that to minimise as far as possible these risks and to provide PPP bidders with sufficient information to allow elements of the risk to be transferred under the PPP contract, there was a need to carry out enabling works. That approach is wholly consistent with best practice both in Ireland and other jurisdictions and is supported by the experience of the NRA on their roads programme wherein a number of projects have been held up after discovering archaeology, most recently on the Clonee to Kells M3 motorway. In the case of Metro North this risk is compounded by the fact that RPA will be excavating in the historic heart of the city where archaeological finds will be inevitable.

An archaeological strategy for Metro North project has been developed for RPA by Margaret Gowen Ltd. The strategy, which presents an approach to the evaluation and management of archaeological heritage and the mitigation of construction impacts on archaeology, has been approved by the Department of Environment Heritage and Local Government. The approach to the management of archaeological investigation and arising resolution (archaeological excavation and recording works) has been devised and sequenced with a view to ensuring that, subject to land and site access, key sections of the route can be investigated and resolved at the earliest opportunity and, where possible, in advance of the Infrastructure Contract commencing.

In line with that strategy some archaeological surveys have already been undertaken to inform the environmental impact assessment. An enabling works package will comprise further geophysical surveys, underwater surveys, centre line testing and excavations which will take place dependent on the results of the surveys and centre line testing.

It will not be possible to do advance excavations at Drumcondra, Parnell and O'Connell Bridge North and South Stop box locations. InfraCo shall be responsible for resolving all archaeological issues in those areas. This is likely to be an area that is heavily negotiated by the PPP Bidders at the BAFO negotiation stage of the competition and in particular by the funders who see archaeological risk as something that the state should bear.

9.4.5.5 Liffey Temporary Bridge

Dublin City Council is planning to build a new bridge over the River Liffey, to the east of O'Connell Bridge. The bridge will provide a direct transport link between Marlborough Street, Hawkins Street and the North and South Quays. The bridge will be designed to be a public transport bridge to carry buses and the proposed Luas Broombridge. Dublin City Council has planning permission for the new bridge. Dublin City Council will need to award a contract for construction of the bridge in 2010 if the bridge is to be available at the time the main construction works for Metro North begin. A detailed scheme traffic management plan has been developed by RPA in conjunction with key stakeholders. The implementation of the traffic management plan in the city centre area is dependent on this bridge being in place. If the permanent bridge is not in place construction of a temporary bridge by RPA will be required in order to facilitate traffic diversions during the construction phase. The timescales for design and construction of the temporary bridge means that this will need to be done in advance of award of the Infrastructure contract so that it will not have an adverse impact on the construction programme of InfraCo.

9.4.5.6 St Patrick's College Retaining Wall

A ventilation and emergency escape shaft is required in the grounds of St. Patrick's College. This will be constructed as part of the InfraCo's scope of work. However, St. Patrick's College had concerns about the impact of these works. RPA has endeavoured to address and mitigate disruption to the college and school and has therefore agreed that a number of enabling works will be carried out under RPA's supervision in order to limit InfraCo's worksite. The agreement requires that these works will be completed prior to InfaCo mobilising and will include relocation of school playgrounds to a grassed area; limited tree removal, construction of a retaining wall including sports fencing running the width of the playing field including ducting and drainage, and construction of the boundary wall between the shaft and school.

9.4.5.7 Surveys and investigations.

A significant number of surveys and investigations have been carried out to inform the design for the enabling works, in particular the RPA designed utility diversion and further surveys and monitoring will be carried out in order for RPA to meet its obligations agreed as part of the oral hearing and environmental impact assessment process. The results of these surveys and monitoring will be handed over to InfraCo at financial close.

9.4.6 Enabling Works Procurement Approach

One of the key factors to be considered in developing the procurement process for the enabling works was value for money. The following factors influence achievability of value for money are:

- Competitive tendering;
- Optimum risk transfer;
- Good project management and planning;
- Whole life approach to design;
- Private sector innovation; and
- Use of lessons learned from previous RPA projects.

Most of these factors are about reducing the costs of the project, or improving its quality. The weighting strategy for the award criteria of each enabling works tender, in particular the quality cost ratio was tailored for each of the tenders which make up the enabling works. A greater emphasis was placed on cost for repeat contracts

where RPA has previous experience such as utility diversions whereas contracts with unique requirements such as the movement of national monuments put a greater focus on the quality element of tender submissions.

Costs should be lower if the process is cognisant of the lessons learned from the current Luas projects and allows bidders scope to provide innovative designs. Given the extent of technical constraints due to the built up nature of the environment, the extent of existing utilities and the restrictions in relation to stakeholder agreements, the opportunity for private sector innovation was considered to be low.

Experience also shows that maintaining competitive tendering between bidders until close to contract award will reduce costs. Good management and planning of the project are also vitally important to adding value.

Minimising costs to the public sector over the life of the project is also an integral part of obtaining value for money. The public sector should be looking for the optimal allocation of risks and should put a value on risks that can be transferred to the private sector. On past Luas projects, the risk of unforeseen utilities lay with RPA. A thorough utilities investigation programme has been undertaken as part of the Metro North enabling works, and the procurement strategy has been to transfer, through the Government Construction Contract Committee (GCCC) form of contract, the risk of unforeseen utilities to the contractor. Although it should be recognised RPA will pay a premium for this risk transfer to the contractor, it should result in better value for money through the reduction in claims. It should however be recognised that the GCCC contract is largely untested in the market at present.

As noted in section 9.4.5.1 above utility diversions are required in a number of locations. The following procurement options for utility diversions were considered:

- Option 1: Tender a single utilities package to be managed by a single contractor.
- Option 2: Tender several utility packages split by size and geographical location.
- Option 3: Establish a Framework Agreement and tender several utility packages through mini-calls.

Option 3 was adopted based on greater flexibility to manage the scope of individual packages. The establishment of the framework could be progressed while the final scope of each package could be finalised up until the tender of mini-calls. The framework was further divided into panels of contractors to cater for varying size and value of works. Option 2 would have required the scope of each package to be agreed prior to issuing the tender notice and therefore had programme disadvantages. It was considered that a utilities package under Option 1 would be too large and risky for one contractor and this would bring additional programme risk also.

9.4.7 Enabling Works Phasing

The current programme for Enabling Works envisages the staggered commencement of various packages of work starting with contract award in October 2010. The commencement dates are driven by the requirement to hand over sites to InfacCo on dates specified in the bidders construction programme(s). Wherever possible Enabling Works are scheduled to commence as early as possible to allow for potential programme slippage and thus reduce the risk of late handover to InfraCo. After contract award a period of time is required for contractors to mobilise and apply for and put in place all the necessary consents and permits to be in a position to commence works on site. The current dates for commencement of the significant Enabling Works packages are as follows:

Table 9.1

Enabling Works Package	Commence
Mater Stop Box	Feb 2011
Heritage Works	Jan 2011
Temporary Liffey Bridge	Mar 2011
St Stephen's Green Utility Diversions	Jan 2011
Parnell Square Utility Diversions	Jan 2011
O'Connell Bridge Utilities & Sub-Station Works	Jan 2011
Ballymun Utility Diversions	Apr 2011

There are a number of other more minor enabling works packages including various surveys, monitoring and works at St Patrick's college which have either commenced or would not need to commence until well into 2011.

9.4.7.1 Options for Enabling Works Phasing

In early 2010 RPA was asked to consider whether any other phasing of the enabling works was possible in light of the challenges facing the PPP market and the impact on Metro North. RPA prepared a paper on the possible options. That paper was considered by a committee containing representation from RPA, Department of Transport, National Transport Authority and the National Development Finance Agency. The paper considered four scenarios for funding approval of Enabling Works in light of the challenges facing the PPP market and the risk that money may be expended on enabling works and the PPP does not successfully reach financial close. The four scenarios considered were:

- Scenario 1 was to continue with the planned enabling works programme
- Scenario 2 envisaged deferring certain enabling works spend, with the exception of Mater Stop Box enabling works, O'Connell Bridge, elements of the Heritage works and Ballymun Utilities, until after a PPP preferred bidder has been appointed
- Scenario 3 envisaged only the Mater Stop Box construction commencing prior to a PPP preferred bidder being appointed
- Scenario 4 envisaged not awarding any enabling works contracts until immediately after PPP financial close and as a consequence putting all the Mater Stop Box back into the PPP contract.

In assessing the four scenarios RPA has considered a number of objectives in deciding on the optimal strategy for enabling works including:

- Retaining PPP market confidence in the project;
- Meeting the dates in the renewed Programme for Government;
- Limiting sunk costs;
- Maintaining realistic programme contingency;
- Limiting costs on RPA Enabling Works team;
- Availing of current favourable construction market conditions;
- Managing stakeholder expectations; and
- Impact on PPP contract price.

The following table assesses each of the four scenarios against the objectives set out above.

Table 9.2

Objective	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Market Confidence	Good	Fair	Poor	Very Poor
Meeting the dates in the renewed Programme for Government	Good	Fair/Poor	Poor	Very Poor
Limiting Sunk Costs on Enabling Works	Very Poor	Very Poor	Poor	Very Good
Maintaining realistic programme contingency	Good	Poor	Poor	Good
Minimise costs on RPA Enabling Works Team	Good	Fair	Poor	Poor
Avail of current market conditions	Good	Good/Fair	Poor	Poor
Stakeholder interfaces	Good	Good/Fair	Poor	Very Poor
Impact on PPP Contract price	Good	Fair	Poor	Very Poor

9.4.7.2 Conclusion of Assessment of Options for Enabling Works Phasing

Scenario 1 is by far the preferred option in that it meets the various objectives with the exception of limiting sunk costs on enabling works where it scores very poorly.

Scenario 2 provides only a small reduction in the pre-financial close enabling works expenditure and introduces additional risks to the overall programme, particularly in relation to maintaining realistic programme contingency where it scores poorly. Experience to date on other RPA enabling works packages has demonstrated that due to critical dependencies on utility companies and the complex working environment, utility diversions works run over time and risk contingency on programme is almost always required. For this reason the objective of meeting the dates in the Renewed Programme for Government does not score well. Scenario 2 also increases the risk of RPA having to pay significant damages to InfraCo in compensation for failure to make sites available on time.

Scenario 3 scores poorly against all of the objectives. However it scores marginally better than Scenarios 1 and 2 in the objective of limiting sunk costs, albeit the quantum of any reduction in expenditure is small relative to the sunk costs on enabling works.

Scenario 4 scores very well against the objective of minimising sunk costs where it obviously scores significantly better than the other 3 options. In Scenario 4 it is estimated that €76 million less of exchequer funding would be at risk than in Scenario 1 if financial close was not achieved. However, it is equally important to note that in the event that the project does proceed to financial close adopting Scenario 4 would result in significant additional costs to the project and could increase project costs by between €90 and €175 million. Despite that significant advantage of Scenario 4 in terms of sunk cost there are also significant disadvantages. Scenario 4 will:

- Run a very high risk of the project collapsing as PPP bidders lose confidence in the Government commitment to the project. The market confidence risk could perhaps be reduced by payment of bid costs and ensuring that there is early and a carefully managed communication of the change of approach to the bidders. Even in the event that bid cost reimbursement was put in place Scenario 4 would remain a high risk option and the payment of bid costs may not be sufficient incentive to keep both bidders in the project.
- Increase the overall delivery timescale for the project. The very earliest that operational service could commence would be January 2018 and this therefore does not meet the dates in the Renewed Programme for Government.
- Impact significantly on the New Adult Hospital at the Mater Hospital site which is due to open in January 2012. Certain wards and services would need to close while certain elements of the Metro North works are ongoing. In addition to the important practical implications for patient care or resultant compensation, significantly curtailing services in a newly opened hospital would generate significant negative press coverage for the Department of Health, the HSE, the hospital itself and the Metro North project.
- Increase RPA's costs in relation to the enabling works.
- Probably increase the enabling works prices as under this scenario RPA would not be awarding Enabling Works contracts until end 2011/beginning of 2012.
- Increase the PPP contract price at BAFO significantly as the bids would need to allow for price inflation over a longer period and the risk of inflation volatility over that period.
- Severely dent the confidence of key stakeholders in the process including Dublin City Council, Fingal County Council, the utility companies, and the National Museum, who have devoted substantial time and effort to developing and agreeing the scope of Enabling Works and the programming of these works. .

9.4.7.3 Preferred Option

It is RPA's view that if Scenario 4 is the preferred option there would be a very high risk that at least one of the PPP bidders would withdraw from the competition, with obvious consequences for the project. Should this be the case it is unlikely that Metro North could ever be delivered. RPA, however, does not believe that there is a high risk that Metro North will not reach financial close in particular now that EIB has indicated that it is willing to provide significant funding to the project. This view was strengthened by an extensive bank consultation exercise that RPA carried out in June 2010. RPA believes there is significant merit in proceeding with the planned programme of enabling works as set out in Scenario 1 and this business case is therefore being prepared on that basis.

9.5 PPP Financial Structure

As noted earlier the decision that Metro North works would be delivered by a PPP structure was confirmed when Transport 21 was announced in November 2005. However, although the Revised Proposal had identified that an exchequer funded capital contribution to the PPP Co in the range of 25%-50% of the construction costs

would be required no exchequer funds were provided for Metro North in the Transport 21 capital envelope. In 2007 RPA put forward a proposal in that regard. In January 2008 the Government approved an exchequer funded capital contribution of up to €1 billion.

RPA has set the following parameters around capital contributions in the PPP tender documentation. PPP bidders may bid capital contribution payments (up to €1 billion in nominal terms exclusive of VAT) to be paid by RPA to the Infrastructure Contractor during the construction period on achievement of milestone events, which shall be proposed by the bidders as part of their tender and agreed with RPA. Capital contributions will be subject to the following key conditions:

- The cumulative capital contribution payments shall not exceed 40% of the cumulative certified value of the work completed (exclusive of VAT) at any point in time;
- The occurrence of the first milestone event to which the capital contribution payments will relate cannot occur until the cumulative certified value of work (as certified by an independent certifier) completed exceeds €200 million (exclusive of VAT);
- The final milestone event must occur on the passenger service commencement date and cannot be less than 5% (five percent) of the total proposed capital contribution payments;
- Each milestone event must relate to an identifiable and certifiable milestone within the overall construction works;
- RPA can withhold payment of the capital contribution where the Infrastructure Contractor has failed to achieve a milestone event to the satisfaction of RPA or where the Infrastructure Contractor is in default of their obligations under the Infrastructure Contract;
- RPA shall not be required to make payments of capital contributions instalments until the later of (1) the achievement of the relevant milestone event and (2) the occurrence of the relevant milestone date. However, with respect to the final capital contribution payment, should passenger services commence on a date which is earlier than that set out in the construction programme the final capital contribution payment may be made on this earlier date;
- RPA will require conditions precedent to the drawdown of funding for the capital contribution payments which are generally equivalent to those required by the credit providers for any drawdown of debt funding; and
- The capital contribution payments in any one calendar year (exclusive of VAT) may not exceed current RPA affordability limits of €150 million for 2010 and €300 million for each calendar year thereafter. It should be noted that the 2010 and 2011 limits are no longer applicable as the PPP contract will not be awarded until Q3/Q4 2011.

9.5.1 Proposed Amendment PPP Financial Structure

As noted in 9.4.5.2 above the change in strategy at the Mater Stop box has reduced the scope of the enabling works and increase the scope of the PPP contract. Exchequer funding for the full construction of the Mater Stop Box (excluding “fit out”) had been included in the enabling works exchequer funded budget approved in principle by Government in January 2008. The reduction in scope of the enabling works and resultant increase in scope for InfraCo results in an increased funding requirement for InfraCo. Given the constrained capacity in the debt funding markets it does not necessarily make sense to increase the debt funding requirement further. It is therefore envisaged that a transfer of €50 million should be made from the enabling works exchequer funded budget to the capital contributions exchequer funded

budget, so that the PPP bidders can bid a higher level of capital contributions and therefore not increase the debt funding requirement. It is not envisaged that this would impact on the balance sheet treatment of the project and the 40% limit set out above would still apply. As set out in Chapter 8 this change does not result in an increase in the overall Exchequer funding requirement for Metro North.

9.6 Conclusions

RPA has carried out extensive work on the commercial structure and procurement strategy for Metro North since the OBC was developed in 2002.

The PPP commercial structure and procurement strategy adopted is a Design, Build, Finance & Maintain contract with a separate Operations Contract.

The structure has been designed specifically for Metro North and has been tailored to give the long term flexibility required recognising that Metro North is just one element of a light rail and metro network.

Specific provision has been made in the contractual structure through priced options for the following

- purchase of additional rolling stock should demand justify reducing the peak headway from five minutes to four minutes;

- the extension of the Operators scope to include the operation of Metro West.

The adopted strategy and contract structure was accepted by the market and the procurement competition attracted a strong list of candidates. RPA pre-qualified a strong panel of bidders who participated in the tendering stage of the process. RPA shortlisted to two bidders in June 2009 and those two bidders will be invited to submit Best and Final Offers as soon as a decision is made on the Railway Order application.

RPA will require the bidders to price options at the BAFO stage of the competition for certain Luas Broombridge works and Metro West infrastructure in the vicinity of Dardistown. These options if exercised will be exchequer funded and approved within the context of approval of those projects. The value for money of procuring these elements of infrastructure through Metro North can only be tested and evaluated once the final bids for Metro North have been received.

RPA is bringing forward a suite of enabling works on the project. There is significant precedent for advance works for PPP projects being completed by separate contracts ahead of PPP contract award. The Government approved exchequer funding for the acquisition of property and carrying out enabling works in January 2008. There remains a very strong rationale for carrying out each of the enabling works packages for Metro North.

Enabling works to be undertaken on Metro North can be broken down into the following broad categories;

- Utility diversions and associated civil works;
- Mater Stop Box advance works;
- Heritage Works;
- Archaeological excavation and resolution;
- Liffey Temporary Bridge;
- St Patrick's College Retaining Wall; and
- Surveys and investigations.

RPA has carried out detailed analysis of the phasing of enabling works. RPA must proceed with enabling works as soon as the Railway Order is operational if the date for Metro North delivery in the Revised Programme for Government is to be achieved. Any significant delay in proceeding with enabling works as planned could result in collapse of the project.

In relation to the exchequer financing structure of Metro North, Government approved a capital contribution of up to €1 billion during construction. There is an argument, given the constraints in debt market capacity, for increasing the available capital contribution by €50 million and reducing the exchequer funded enabling works by an equivalent amount due to a switch in scope from enabling works to the PPP Contract. This does not result in an increase in the construction period Government approved Exchequer funding requirement.

10. Programme and Way Forward

10.1 Chapter Summary

- This chapter looks at the activities following submission of the Updated Detailed Business Case to the National Transport Authority.
- Work is already well underway with PPP bidders in preparation for the BAFO stage of the competition.
- RPA will proceed with the issue of the PPP invitation to BAFO within the quickest practicable timescale after An Bord Pleanála has made a decision on the Railway Order application.
- Significant work has already been undertaken in relation to enabling works procurement and RPA will be in a position to award the first enabling works contracts in October 2010 once the Railway Order is enforceable.
- Government approval to proceed with enabling works is required in October 2010 (at the same as the RO is enforceable) in order to keep Metro North on programme and to maintain a realistic possibility of achieving the target date of December 2016 for delivery of Metro North, as set out as a priority in the renewed Programme for Government
- Metro North enabling works construction can commence in January 2011.
- The final delivery date for Metro North is dependent on the outcome of the PPP BAFO process and the speed with which financial close can be reached which is dependent on a level of financial market stability.

10.2 Activities

Following the decision on the Railway Order application by An Bord Pleanála (ABP) in August 2010 RPA will formally submit the Updated Detailed Business Case to the National Transport Authority seeking approval for RPA to proceed to award of enabling works contracts and commencement of enabling works construction. The following activities are required in order to keep Metro North on programme and to maintain a realistic possibility of achieving the target date of December 2016 for delivery of Metro North, as set out as a priority in the renewed Programme for Government.

Table 10.1.1 Activities required to keep Metro North on Programme

Activity	Overview	Start
Finalisation PPP Invitation to BAFO documentation	It is envisaged that the formal invitation to submit a Best and Final Offer will be issued to the two shortlisted bidders within six to eight weeks of the Railway Order decision. This timescale is dependent on the level and complexity of conditions imposed in the Railway Order by An Bord Pleanála (ABP). An analysis of the conditions imposed will need to be undertaken in order to remove any apparent inconsistencies with the PPP contractual documentation including the technical requirements. Should any conditions have significant cost implications RPA may need to review the scope further with a view to maintaining the project capital costs within the approved capital envelope for the project. Significant work has already been undertaken in ensuring that agreements reached or commitments made to third parties as part of the oral hearing process have been reflected in the documentation and communicated to bidders.	Following decision on Railway Order by An Bord Pleanála

PPP BAFO Bidders - Due Diligence and Contract Negotiations with RPA	RPA has reissued the PPP contracts (Infrastructure Contract, Operator Contract and Co-Operation Agreement) to the two BAFO bidders on 9 July 2010. The two bidders will provide a contract mark up back to RPA towards the end of August. Negotiations will take place during September and October with a view to the bidders completing sufficient due diligence to be in a position to sign off on the contract at the end of October.	Already commenced
Government Approval of Enabling Works	The Updated Detailed Business case has been prepared to ensure sufficient information is available to inform the Government decision. This approval is required in early October 2010 so that RPA can proceed to award of enabling works contracts as soon as the Railway Order is enforceable.	Following submission of Updated Detailed Business Case to NTA
Award of Enabling Works Contracts	Bidders for the majority of enabling works packages have already been pre-qualified. Tender submissions have been received for the St. Stephen's Green utility package and these are currently being evaluated. The tender documents for the heritage works package have been issued and submissions are due back in August 2010. The tender documents for utility packages in Parnell Square and O'Connell Street will be issued in August 2010, with the Mater D&B tender documents to be issued in September 2010. The first contracts to be awarded in October 2010 will be the Heritage Works contracts and the Stephen's Green utility package. Award of the contracts for the utility diversion packages for Parnell Square and O'Connell Street will follow on in November 2010.	Preparation started – cannot be completed until Government approval
Commence Enabling Works	Following contract award in October and November 2010 enabling works contractors will mobilise during November/December so that construction works can commence in January 2011 once Operation Freeflow traffic restrictions have been lifted.	Dependent on award of first contracts in October 2010
Evaluation of PPP BAFO Tenders and Selection of Preferred Bidder	PPP BAFO tenders are expected to be received in December 2010. These will be evaluated with a view to appointment of the preferred bidder at the end of Q1 2011. It should be noted that if there is any delay in the award of enabling works contracts this could have a knock on impact on receipt of PPP BAFO submissions. This is because PPP bidders will need to base their price and programme on when they will have access to the site. Access to the site at the critical path locations of St. Stephen's Green, O'Connell Bridge and Parnell Square is dependent on completion of enabling works.	Following receipt of PPP BAFOs in December 2010
Preparation of Final Business Case	RPA will prepare the Final Business Case once a preferred bidder has been appointed. The Final Business Case will be an update of the Updated Detailed Business Case. The key elements which will be updated are : • PPP costs including operations costs • Update to reflect any revised estimates for property costs, RPA costs and enabling works • Update of development levies forecast • Update on contractual risk allocation • Programme update • Update on value for money and affordability tests	Following appointment of PPP preferred bidder

Government Approval of Final Business Case	The Final Business Case will be prepared to ensure sufficient information is available to inform the Government decision. This approval is required in June 2011 so that RPA can proceed to financial close and contract award once the final PPP funding package has been assembled.	Following submission of Final Business Case
Final PPP Funding Package and documentation completion	The length of time required for the preferred PPP bidder to assemble their funding package will be dependent on the level of funding support the preferred bidder has assembled to support their BAFO submission and the extent to which a preferred bidder funding competition is required. Financial market conditions at that time will also be a determining factor in the approach to be adopted.	Following appointment of PPP preferred bidder
PPP Financial Close and Contract Award	The final value for money review and affordability analysis will need to be completed prior to financial close.	Q3/Q4 2011
Main Works Design and Construction	. [text deleted] Based on all preceding activities being completed on programme it is envisaged that the main construction works will commence in 2012.	Design 2011 Construction 2012

10.3 Programme

The key programme dates are set out in Table 10.2 below.

Table 10.2 Key Milestone Dates in Metro North Programme

Milestone/Activity	
Railway Order Decision	Aug10
BAFO invitation to PPP bidders	Sep 10
Government Approval of Enabling Works	Oct 10
Enforceable Railway Order	Oct 10
Award first Enabling Works contracts	Oct 10
Receipt of PPP BAFO Tenders	Dec 10
Commence Heritage Works	Jan 11
Commence Utility Works	Jan 11
Preferred PPP Bidder Selection	Mar 11
Government Approval of Final Business Case	Jun 11
PPP Contract Award	Q3/Q4 2011
PPP Construction Commencement	Q2-Q4 2012
PPP main construction completion	2016
Operational Service Commencement	Late 2016 or early 2017

The dates set out in the above table are dependent on a number of factors external to RPA including:

- Decision by An Bord Pleanála (ABP) on the Railway Order application by mid August 2010;
- Approval from Government in early October 2010 to proceed with enabling works;
- Operational Railway Order in October 2010 which assumes there is no application for judicial review;
- Timely approval of the Final Business Case by Government once a preferred PPP bidder is appointed;
- Continued stability of financial markets so that financial close can be achieved quickly once a preferred bidder is appointed;
- The two bidders have different construction programmes (including testing and commissioning). These programmes will be updated as part of the bidders BAFO submission. The final programme will be dependent on the programme of the preferred bidder. It should be noted that conditions imposed by ABP in the Railway Order may have the effect of extending the construction programme. Any delay in awarding enabling works contracts will also have a knock on impact on PPP bidders programmes as their access to the site would be delayed at critical locations.

APPENDIX 1 - Land Use and Transport Policy

Land Use and Transport Policy

Land use and transport policy at a national level is captured in the *National Development Plan 2007 – 2013 (2006), Transport 21 (2005)* and the *National Spatial Strategy, (2002)*. The *Regional Planning Guidelines Greater Dublin Area 2004-2016 (RPG)*, the *Dublin City Development Plan 2005 – 2011* , the *Fingal County Council Development Plan 2005 – 2011* and other local policies form the framework for development at local level.

National Development Plan 2007 – 2013

The National Development Plan (NDP) is a plan devised to guide infrastructural development in a co-ordinated manner. The National Development Plan covers the seven year period to 2013 and includes amongst its key themes the elimination of major infrastructure deficits to improve the quality of life for all; the protection, preservation and improvement of the natural environment with long term sustainable development; commitments on social inclusion; reinforcement of the Regional Planning Guidelines; and adherence to value for money in the implementation of the plan.

Investment in transport infrastructure over the period of the Plan totals nearly €33 billion nationwide, of which €12.9 billion is earmarked for public transport, particularly in the Greater Dublin Area, where the delivery of a radically upgraded and more integrated public transport system in line with *Transport 21* (below) is identified.

Specifically with regard to the urban areas, the Plan notes that it is not sustainable to promote road and car transport as the major long-term mode of passenger transport. The growth in population and employment, together with the environmental imperative to reduce carbon emissions, demands a major modal shift from car to public transport. It is vital, the Plan states, that the workforce has access to reliable and efficient means of transport which is environmentally sustainable.

The NDP further reinforces Government's commitment to the delivery of the transport infrastructure set out in Transport 21.

Chapter 7 of the NDP states that a key output under investment priorities will be:

"to deliver a radically upgraded public transport system in line with the timetable in Transport 21 especially in the Greater Dublin Area (GDA), but with significant impacts in other area".

The Metro North alignment is located within the GDA and the National Development Plan includes the project in its list of priorities.

The Plan states, on page 133, that

"the following projects will be advanced in line with the timetable in Transport 21…Completion of the Metro North line from the city centre to Swords via Dublin Airport".

The plan goes further stating the importance of Metro North in providing improved public transport connections to the Greater Dublin Area.

The NDP recognises that: -

- Public transport projects such as Metro North are needed because they help Dublin enhance its competitiveness and ensure its position as a leading international urban metropolis;
- Transport infrastructure programmes are an economic priority;
- Public transport and investment in public transport are viewed as a means of supporting sustainable development; and
- Modal shift from private vehicles to public transport is necessary in order to promote efficiency, quality of life, competitiveness and environmental sustainability.

National Spatial Strategy (NSS) for Ireland 2002 – 2020

The National Spatial Strategy (NSS) is a 20 year planning framework for Ireland. While not an infrastructural investment plan, the future development of a spatial strategy will be underpinned by a national transport framework to facilitate planning for an improved network of roads and public transport services.

The NSS endorses the principle of increased use of public transport in major urban areas and notes that for balanced development the performance of the Greater Dublin Area be built upon and physically consolidated and that the Greater Dublin Area's vital national role is secured in terms of improved mobility, urban design quality, social mix, international and regional connections.

In particular, the Strategy promotes:

- the continued development of infrastructure connecting Dublin to the regions through an improved network of roads and rail
- the expansion of the transport network to enable interchange facilities between the national transport network and the international airports and sea ports; and
- An increase in public transport and so-called slow (cycling and walking) mode share.

The Regional Planning Guidelines Greater Dublin Area 2004-2016

The Regional Planning Guidelines (RPGs) develop the national policy and strategy outlined in the NSS at a regional and area specific level. The RPGs identify the critical relationship between land use development and infrastructure provision with a key infrastructure element being public transport. The RPGs identified the marrying of development with high quality public transport provision and take the principle of the transportation strategy for the Dublin metropolitan region set out by the DTO in *A Platform for Chan*ge as the basis for regional development and consolidation of the metropolitan region by stating:

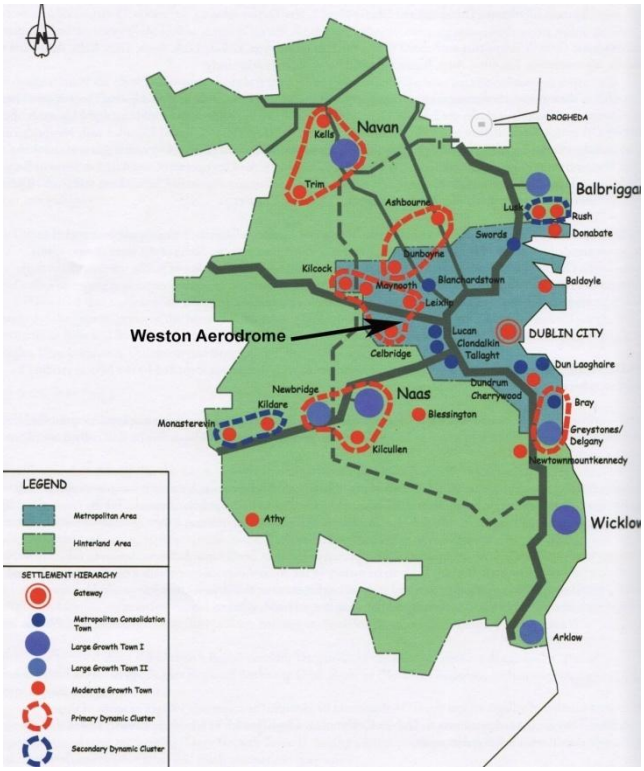
…'Development within the Metropolitan Area will be consolidated, with a much-enhanced multi-modal transport system…

The document also states that:

…In the Metropolitan Area, public transportation and other sustainable modes should be given precedence over the requirements of the private car in all relevant policy and decision-making…

The entire Metro North scheme falls within the Dublin Metropolitan Area as illustrated in figure 2.3, which lies at the core of the Greater Dublin Area.

Figure 0.3 Metropolitan Area from Regional Planning Guidelines



Dublin City Development Plan 2005 to 2011

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

Paragraph 7.4.0 states *"Dublin City Council support the measures currently being implemented or proposed by the Railway Procurement Agency, Iarnród Éireann, Dublin Transportation Office and other agencies to enhance capacity on existing lines/services and provide new infrastructure including the extension of Luas to the Point Depot and further extensions to Luas"*.

The overall Development Strategy is set in the context of NSS and RPGGDA and acknowledges *A Platform for Change* providing for an integrated network of public transport facilities including Metro.

Policy T1 supports the sustainability principles set out in the DTO's *A Platform for Change*. The policy commits Dublin City to identifying land required for transportation and infrastructure needs of the city.

Policy T2 supports a modal shift from private car use towards increased use of public transport and other sustainable forms of transport.

Paragraph 7.4.0 states that *"Dublin City Council support the measures currently being implemented or proposed by the Railway Procurement Agency…to enhance capacity on existing lines services and provide new infrastructure"*, which includes the provision of Metro North. The written statement goes further and states that Dublin City Council *"supports a City Centre rail connection to Dublin International Airport with a preference for stops at Dublin City University and Ballymun."*

Policy T4 states *"It is the policy of Dublin City Council to co-operate with Iarnród Éireann, the Rail Procurement Agency and other relevant transportation agencies, in order to increase passenger capacity and increase rail efficiency".*

The proposed Metro North scheme therefore complies with and supports the policies detailed in Dublin City Council's Development Plan 2005–2011 and is itself endorsed within the Plan.

Dublin – A City of Possibilities; Economic, Social and Cultural Strategy 2002–2012 (2000)

This strategy for economic, social and cultural development was prepared by Dublin City Development Board. It is a ten year strategy and provides a framework for guiding all public services and development activities within the administrative area of Dublin City Council. Its vision is that Dublin city is accessible to all by transport systems that are efficient, safe, affordable, accessible, integrated and that maximise sustainable social and economic development and minimise negative environmental impacts. The Strategy fully supports the implementation of the DTO *Platform for Change* Strategy.

Metro North- A link to the Future (2005)

A feature of the strategic infrastructure legislation and sub-regional land use and transportation planning is that it makes provision for trans-boundary planning and for integration of planning strategies between local authorities and transportation agencies. This study was prepared in 2005 by Fingal County Council in association with Dublin City Council, Dublin Airport Authority and the Railway Procurement Agency.

The foundations for the report were based on higher order strategies, including NSS, which identified the Dublin – Belfast Economic Corridor as a key National Transport Corridor, of European importance. Fingal County Council had already prepared the South Fingal Planning Study, which was a major study of the long-term development of Dublin Airport and environs and the South Fingal fringe.

The report identified that in the current rail map of the Dublin region, there is an entire empty segment of the city region, influenced in the past by Phoenix Park and Dublin Airport, with the airport at the centre of the rail transport void. On a capacity and return basis, Metro was the preferred model for rail based transportation provision.

The report identified the areas that could be subject to the Section 49 supplementary Development Contribution Scheme, which was subsequently adopted and put into effect. The level of contribution was predicated upon an amount levelled per hectare to encourage maximisation of development density on development lands within the corridor. (Note: The corollary is that, if the infrastructure is not provided, the densification could become unsustainable in transportation effects).

It concludes that Dublin airport and the city region cannot cope with projected levels of growth without the provision of Metro North.

Fingal County Council Development Plan 2005 to 2011

The Fingal County Council Development Plan 2005 to 2011 sets outs Fingal County Council's policies and objectives for the development of the County up to 2011. A number of policies contained in the plan refer to Metro North and in particular the plan promotes

"the development of a new and improved rail based transport system, including a metro link, from Dublin City to swords via the airport".

The Development Plan seeks to develop and improve in a sustainable manner the environmental, social, economic and cultural assets of the County. In terms of its urban strategy, the Development Plan outlines a hierarchy of urban centres through which spatially balanced development can take place, based on size and function, in line with the provisions of the Regional Planning Guidelines for the Greater Dublin Area. Swords is a major centre in the County town.

Key Economic Challenges facing the County include: -

- Fingal's strategic location close to Dublin city and adjacent to some of the country's most important transport corridors results in two main challenges for the County. Firstly, it is reliant on national decisions in relation to major infrastructure projects e.g. development of Dublin Airport, proposed Metro from Dublin City to Swords via the airport. Secondly, Fingal has a responsibility to ensure that the effectiveness of national infrastructure is not reduced as a result of unsuitable local planning.

Economic opportunities, which the County Development Plan aims to build on include:

The completion of on-going, planned and proposed major infrastructure projects such as … the Metro to Swords will greatly strengthen the attractiveness of the County to potential investors.

As part of the General Urban Strategy for Fingal the County Development Plan recognizes the strategic role of Swords at a regional level in confirming its status as a Metropolitan Consolidation Town, one of the main growth areas within the Metropolitan Area along with Blanchardstown.

The Regional Planning Guidelines advise that these locations should be developed to a relatively large scale as part of the strategy for the Metropolitan Area involving its consolidation.

Strategy TS2: - To facilitate and promote the development of a new and improved rail based transportation system including a Metro rail Link from the City to Swords via the Airport.

With respect to Local Area Plans the County Development Plan strategy provides for: -

- Increasing residential densities permitted on zoned land, especially where near to public transport links, with a requirement for a high standard of layout design and a mix of housing types,

- Providing more intense industrial and commercial uses to a high standard of design,
- Assisting in providing for the demand for zoned serviced land to be matched by the supply of such land to the greatest practical extent,
- Providing for the development of land to be phased with the provision of infrastructural and social facilities,

Metro North is seen as a major economic opportunity in the area, which would deliver sustainable transportation objectives. The Development Plan acknowledges that Fingal County Council is not directly responsible for the development and provision of public transport. However, it has an important role in facilitating the provision of public transport services.

Policy TP7 seeks to prioritise and safeguard Metro North amongst other public service provisions.

Policy TP12, aims to facilitate and promote a Metro rail link from the City to Swords via the Airport.

Objective T06, aims *"To facilitate and promote the development of a Metro line from the City Centre to Dublin Airport and on to Swords by protecting the preferred route identified by the Railway Procurement Agency, preparing and implementing proposals for the integration of this line with the development of adjoining lands in co-operation with the developers of such lands, and implementing a scheme under Section 49 of the Planning and Development Act 2000"*.

Fingal County Development Plan Variation 29

The preparation of a comprehensive Swords LAP was commenced in 2007, with a 6-week period of non-statutory public consultation. It became apparent that a Variation of the CDP was needed to accommodate a new Swords Plan, which would take the form of a comprehensive LAP, or a series of integrated LAPs to incorporate Metro North and the Council's vision for an emerging green city of 100,000 people.

The process of comprehensive plan adoption including the requirement for SEA/AA indicated a long process and in the interim, Fingal CC has adopted an elaborated Strategic Vision for Swords (Your Swords, An Emerging City- Strategic Vision 2035), which will inform the preparation of LAPs and provide a statutory context for accommodating Metro North, stating: -
"It is considered important that Metro North is considered within an appropriate and proactive planning context".

The proposed variation, adopted as Variation 29, in conjunction with this elaborated 'Strategic Vision 2035' document, to be realised through subsequent statutory processes, sets out the Council's vision and gives it a formal basis.

For the most part, the Strategic Vision is dependent on Metro North. Swords will have…*"an integrated transport strategy, comprising significant public transport services (including Metro North and local and regional bus services) and strategically important road infrastructure"*.

It is anticipated that Swords will be a major transport hub with an integrated public transport system, and will exploit the opportunities that the development of Metro North presents.

"Metro North will facilitate the optimal development of Swords Town in future years and the Council will maximise the benefits of and the efficient use of the Metro for the benefit of those living and working in the Town".

Major population growth (estimated to be in the region of 100,000 population by 2035) in Swords will be facilitated by Metro North. As a result, demand for new housing will be substantially concentrated within the catchment zone of Metro North.

The Vision reflects, that the changes have led to a more legible and rational integration of Metro North into the existing and proposed urban form of Swords, with lands to the north of the town strategically located along the proposed Metro North and adjacent to the M1 and Belfast - Dublin corridor (P51). The Strategic Vision envisages that this area could in the future accommodate the development of a substantial mixed-use urban district providing for a significant level of employment.

Within this Variation, a number of Local Objectives relevant to the scheme have been added:

Local Objective E: "To facilitate the RPA's development of a strategic Metro-North 'Park and Ride' facility [providing a minimum of 2000 cars] in a multi-storey complex at Belinstown (north of Lissenhall). This multi storey 'Park and Ride' facility shall be well designed and sited with particular attention given to the adequacy of vehicular access, connectivity to Belinstown (Metro) stop, elevational treatment, landscaping and mitigation of potential adverse impact on the amenity of existing residents".

Local Objective F: "To facilitate the RPA's development of a well designed Depot to serve Metro (North & West) on a site on north side. The depot shall be sited, designed, landscaped constructed, operated and maintained into the future to ensure that any potential noise, air and/ or light pollution, as well as visual impacts of this development in the landscape are minimised. The depot shall be screened on all sides. In particular the proposed landscaping scheme, which may include significant bunding shall provide for the mitigation of the visual impact of this development as viewed from the R132 and M1 to east and the future Lissenhall development area to the south".

Local Objective G: "To facilitate the development of a local Park and Ride facility [300 spaces] by the RPA at Fostertown stop".

Variations to the Development Plan take account of the 2008 Metro North alignment, which is the subject of this Railway Order, necessary and ancillary Park and Ride and depot developments.

Economic Development Strategy for the Metro North Economic Corridor 2008

This report was commissioned by Fingal County Council and prepared by Indecon International Economic Consultants, with support from other consultants. It related to the identified Metro North Economic Corridor (MNEC), which is an area of land that is approximately 1km on either side of the proposed Metro North as it extends through Fingal from Lissenhall to the south Fingal area and incorporates Swords, Dublin airport and Metro Park. This strategy has a 20 year horizon, extending to 2030 and is designed to deliver a fundamentally changed vision for the development of Swords and the MNEC, which coincide with the delivery of major infrastructure investment, including in particular, the Metro North.

The strategy is envisaged as playing a central role in shaping other economic development and planning strategies for Fingal in the future, including the Swords Town Area Plan and is designed to ensure the maximum economic benefits are derived from Government investment in Metro North, thereby maximising value for money.

It identified undeveloped land banks, which are particularly relevant to the Corridor, which will be important for the economic development of the area. It identified that in the future one of the key strengths of the MNEC will be the Metro North rail link, along with other infrastructure and advantages that pertain to the area. It is envisaged there will be significant land use changes within the corridor, including the "Airport City" concept, science and technology related development, education, R&D and healthcare including population concentration.

Swords Masterplan (2008)

The anticipated arrival of the Metro North in Swords, will facilitate the economic growth and expansion of Swords in line with the projections of the Regional Planning Guidelines. The Fingal County Development Plan 2005-2011 identified the need for Masterplan for Swords Town Centre to guide its future growth and development. It is key to the future success of Swords as a multi-functional high quality Major Town Centre within the Dublin-City region, that the traditional Town Centre extend in a compact manner to the south and south east, within the Pavilions1 and Barrysparks 2 development areas respectively, and integrate fully with Metro North.

The expansion of the Town Centre, presents a unique opportunity to provide an appropriate mix of uses, including modern retailing formats, and quality urban environment appropriate to the function of a successful Major Town Centre within the Dublin-City Region.

The focus of the Swords Masterplan area relates to the MC (Major Town Centre) zoned lands within the Main Street and North Street Areas, Pavillions development area and Barrysparks development area. The latter areas are astride the proposed metro line where it passes along the central reservation of the R132 at the Swords stop, linked by proposed infrastructure including the metro box and metro plaza, which have procured permission via Part 8 procedures.

APPENDIX 2 - 2025 Line Flows

Line Flows

The line flows show the numbers of passengers per am peak hour who board and alight the Metro North at each stop, and give the respective loading at each stop. The line flows for each of the Metro North Base case and sensitivity scenarios are presented below.

Table 1 – Line Flows No Growth (per hour during AM peak) Base Case

Total (Southbound)	Board	Alight	Load
Belinstown	77	0	77
Lissenhall	21	0	98
Estuary	534	0	632
Seatown	409	4	1,037
Swords	285	12	1,309
Fosterstown	719	43	1,985
Airport	297	60	2,222
Dardistown	5	7	2,220
Northwood	87	37	2,270
Ballymun	410	197	2,484
DCU	154	52	2,586
Griffith Avenue	116	120	2,582
Drumcondra	93	303	2,372
Mater	43	94	2,321
Parnell Square	64	249	2,137
O'Connell Bridge	46	1,091	1,091
St. Stephen's Green	0	1,091	0
Total (Northbound)	**Board**	**Alight**	**Load**
St. Stephen's Green	1,056	0	1,056
O'Connell Bridge	473	166	1,362
Parnell Square	125	119	1,368
Mater	65	103	1,330
Drumcondra	417	68	1,679
Griffith Avenue	149	94	1,734

DCU	184	69	1,848
Ballymun	185	112	1,921
Northwood	42	104	1,859
Dardistown	1	22	1,837
Airport	22	908	950
Fosterstown	32	244	738
Swords	4	153	589
Seatown	6	446	149
Estuary	0	117	33
Lissenhall	0	32	1
Belinstown	0	1	0

Table 2 – Line Flows Moderate Growth (per hour during AM peak) Base Case

Total (Southbound)	Board	Alight	Load
Belinstown	175	0	175
Lissenhall	492	0	666
Estuary	757	0	1,423
Seatown	516	12	1,927
Swords	541	25	2,443
Fosterstown	809	80	3,172
Airport	470	105	3,537
Dardistown	27	42	3,522
Northwood	118	50	3,590
Ballymun	433	501	3,521
DCU	163	63	3,621
Griffith Avenue	98	178	3,541
Drumcondra	102	412	3,230
Mater	46	137	3,139
Parnell Square	68	455	2,752
O'Connell Bridge	63	1,639	1,176
St. Stephen's Green	0	1,176	0

Total (Northbound)	Board	Alight	Load
St. Stephen's Green	1,227	0	1,227
O'Connell Bridge	670	200	1,697
Parnell Square	145	123	1,718
Mater	76	133	1,661
Drumcondra	636	71	2,227
Griffith Avenue	200	115	2,312
DCU	217	67	2,462
Ballymun	259	183	2,539
Northwood	73	130	2,481
Dardistown	3	107	2,377
Airport	30	1,225	1,182
Fosterstown	118	231	1,069
Swords	28	189	908
Seatown	59	509	458
Estuary	2	194	266
Lissenhall	0	265	1
Belinstown	0	1	0

Table 3 – Line Flows LA Growth (per hour during AM peak) Base Case

Total (Southbound)	Board	Alight	Load
Belinstown	399	0	399
Lissenhall	1,283	0	1,682
Estuary	1,045	0	2,727
Seatown	611	27	3,311
Swords	932	45	4,197
Fosterstown	862	121	4,938
Airport	512	142	5,308
Dardistown	77	121	5,263
Northwood	168	69	5,363

Ballymun	439	668	5,134
DCU	191	77	5,248
Griffith Avenue	104	259	5,093
Drumcondra	114	580	4,627
Mater	57	221	4,463
Parnell Square	100	795	3,768
O'Connell Bridge	128	2,328	1,569
St. Stephen's Green	0	1,569	0
Total (Northbound)	**Board**	**Alight**	**Load**
St. Stephen's Green	1,403	0	1,403
O'Connell Bridge	940	250	2,092
Parnell Square	148	129	2,111
Mater	83	199	1,995
Drumcondra	928	66	2,857
Griffith Avenue	238	132	2,963
DCU	258	56	3,166
Ballymun	268	196	3,238
Northwood	120	175	3,184
Dardistown	8	298	2,893
Airport	42	1,212	1,724
Fosterstown	328	217	1,834
Swords	78	261	1,651
Seatown	131	586	1,197
Estuary	6	384	819
Lissenhall	0	818	1
Belinstown	0	1	0

Table 4 – Line Flows Moderate Growth (per hour during AM peak) Transport 21[22]

Total (Southbound)	Board	Alight	Load
Belinstown	175	0	175

[22] Includes Metro West Boardings

Lissenhall	500	0	675
Estuary	775	0	1,450
Seatown	534	12	1,972
Swords	548	25	2,495
Fosterstown	706	80	3,121
Airport	408	172	3,357
Dardistown	347	97	3,607
Northwood	83	48	3,641
Ballymun	446	522	3,565
DCU	157	94	3,628
Griffith Avenue	95	179	3,544
Drumcondra	86	395	3,236
Mater	50	141	3,144
Parnell Square	23	470	2,697
O'Connell Bridge	19	1,631	1,085
St. Stephen's Green	0	1,085	0
Total (Northbound)	**Board**	**Alight**	**Load**
St. Stephen's Green	975	0	975
O'Connell Bridge	682	4	1,653
Parnell Square	150	18	1,785
Mater	64	150	1,699
Drumcondra	517	49	2,167
Griffith Avenue	208	112	2,263
DCU	179	66	2,376
Ballymun	297	244	2,430
Northwood	61	125	2,366
Dardistown	136	255	2,247
Airport	163	1,069	1,341
Fosterstown	118	265	1,194
Swords	28	219	1,003
Seatown	59	563	499

Estuary	2	218	283
Lissenhall	0	282	1
Belinstown	0	1	0

Table 5 – Line Flows Moderate Growth (per hour during AM peak) Base Case with BxD

Total (Southbound)	Board	Alight	Load
Belinstown	175	0	175
Lissenhall	492	0	666
Estuary	757	0	1,423
Seatown	516	12	1,927
Swords	541	25	2,443
Fosterstown	798	80	3,161
Airport	471	105	3,526
Dardistown	27	42	3,511
Northwood	118	50	3,578
Ballymun	433	501	3,510
DCU	163	63	3,609
Griffith Avenue	97	178	3,528
Drumcondra	73	413	3,189
Mater	40	137	3,092
Parnell Square	17	454	2,655
O'Connell Bridge	21	1,640	1,036
St. Stephen's Green	0	1,036	0
Total (Northbound)	**Board**	**Alight**	**Load**
St. Stephen's Green	879	0	879
O'Connell Bridge	672	5	1,546
Parnell Square	153	13	1,687
Mater	71	124	1,634
Drumcondra	634	49	2,218

Griffith Avenue	200	111	2,307
DCU	217	63	2,461
Ballymun	259	183	2,537
Northwood	73	130	2,480
Dardistown	3	107	2,376
Airport	30	1,225	1,181
Fosterstown	118	230	1,069
Swords	28	189	908
Seatown	59	509	458
Estuary	2	194	266
Lissenhall	0	265	1
Belinstown	0	1	0

Table 6 – Line Flows Moderate Growth (per hour during AM peak) Base Case with Metro West (Do Something A; Metro West to Dardistown)

Total (Southbound)	Board	Alight	Load
Belinstown	175	0	175
Lissenhall	498	0	672
Estuary	777	0	1,449
Seatown	537	12	1,974
Swords	566	25	2,515
Fosterstown	824	80	3,259
Airport	492	105	3,646
Dardistown	410	225	3,831
Northwood	83	53	3,860
Ballymun	422	571	3,711
DCU	157	102	3,766
Griffith Avenue	96	221	3,642
Drumcondra	100	380	3,362
Mater	45	141	3,265
Parnell Square	67	474	2,858

O'Connell Bridge	61	1,616	1,303
St. Stephen's Green	0	1,303	0
Total (Northbound)	**Board**	**Alight**	**Load**
St. Stephen's Green	1,233	0	1,233
O'Connell Bridge	641	200	1,675
Parnell Square	141	118	1,697
Mater	72	126	1,643
Drumcondra	506	57	2,092
Griffith Avenue	214	88	2,219
DCU	194	63	2,349
Ballymun	306	157	2,498
Northwood	66	120	2,444
Dardistown	486	282	2,649
Airport	30	1,305	1,373
Fosterstown	118	280	1,211
Swords	28	223	1,016
Seatown	59	569	505
Estuary	2	224	284
Lissenhall	0	282	1
Belinstown	0	1	0

Table 7 – Line Flows Moderate Growth (per hour during AM peak) Base Case with Metro West (Do Something B; Metro West to Belinstown, SSG and Dardistown)[23]

Total (Southbound)	**Board**	**Alight**	**Load**
Belinstown	175	0	175
Lissenhall	504	0	679
Estuary	894	0	1,572
Seatown	545	13	2,105
Swords	591	27	2,669
Fosterstown	775	84	3,359

[23] Includes Metro West Boardings

Airport	526	127	3,759
Dardistown	23	32	3,384
Northwood	81	68	4,306
Ballymun	429	634	4,102
DCU	167	113	4,156
Griffith Avenue	103	238	4,021
Drumcondra	117	400	3,737
Mater	56	167	3,626
Parnell Square	77	504	3,199
O'Connell Bridge	81	1,785	1,495
St. Stephen's Green	0	1,495	0
Total (Northbound)	**Board**	**Alight**	**Load**
St. Stephen's Green	1,407	0	1,407
O'Connell Bridge	661	230	1,838
Parnell Square	150	137	1,851
Mater	79	135	1,795
Drumcondra	507	66	2,236
Griffith Avenue	219	93	2,362
DCU	205	63	2,504
Ballymun	436	153	2,788
Northwood	61	80	2,123
Dardistown	3	109	2,824
Airport	34	1,468	1,390
Fosterstown	119	236	1,273
Swords	30	237	1,067
Seatown	64	586	544
Estuary	2	254	292
Lissenhall	0	291	1
Belinstown	0	1	0

APPENDIX 3 – CBA Parameters and Assumptions

Discount Rate	4.00%
Appraisal Period	30
Price Base	2002
Evaluation Base	2002
Opening Year	2017
Inflation (2009 onwards)	
Background inflation pa	2.00%
Construction inflation pa	variable
Land Inflation	variable
Machinery inflation pa	variable
O&M Inflation pa	2%

From-to	**Real GNP Growth % pa**
2000 to 2002	6.23%
2002 to 2010	2.70%
2011 to 2015	2.37%
2016+	2.29%

Car (Non User Benefits)		
Am Peak (2002)	€	10.92
Off Peak (2002)	€	12.24
PT (User Benefits)		
Am Peak (2002)	€	8.89
Off Peak (2002)	€	8.62

Car Occupancy	
2000	
Am Peak	1.2
Inter Peak	1.4
2016	
Am Peak	1.2
Inter Peak	1.4
Accident Costs	
Accident Rate (per m veh	0.054

km)	
Average cost per accident (2002)	€ 179,343
Vehicle Operating Costs	
Fuel Consumption Parameters	
Resource cost of fuel	€ 0.33
Duty	€ 0.39
VAT	€ 0.15
L = a + bv + cv^2	
A	0.1587516
B	-0.0026590
C	0.0000181
Non Fuel Costs	
C=a1 +(b1/V)	
a1 work	6.18
b1work	31.58
a1 non work	6.18
b1non work	31.58
Operational Build Up	
Years from opening	
2017	100%
2018	100%
2019	100%
2020	100%
2021	100%
2022	100%
Demand Build Up	
Years from opening	
2017	80%
2018	85%
2019	90%
2020	100%
2021	100%
2022	100%
Annualisation	
Public Transport	
Peak	1040
Off Peak	3807

Highway	
Peak	1040
Off Peak	3965
Air Quality (Urban) € (2002) per vehicle km	
CO2	0.007458
Non- CO2	0.008080