An Bord Pleanála

DUBLIN METRO NORTH

REPORT ON TRAFFIC AND TRANSPORTATION

This report has been produced by Steve Wallace BSc, CEng, MICE, MCIHT, CMILT, who has been appointed by An Bord Pleanála to assist the Inspector in the consideration of traffic matters relating to the Railway Order application for the Dublin Metro North strategic infrastructure development.

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1 INTRODUCTION

1.1 Background

Metro North is a light rail system proposed to connect the townland of Belinstown in north County Dublin to Dublin city centre. The route would serve a number of key destinations, including Dublin Airport, hospitals, universities and retail centres as well as high density residential and employment districts. The route corridor would have a length of 18km which would include underground tunnelling for a length of approximately 8km. The proposed development would comprise a metro system running under full signal control on a segregated alignment between St.Stephen's Green and Fosterstown stops and running on a line of sight basis, at grade, in underpasses or on elevated sections between Fosterstown and Belinstown, north of Swords. It would run in a mix of bored and cut and cover tunnels beneath the city and beneath Dublin Airport. Services are proposed to operate between 5.00am and 1.00am on weekdays with late night services operating on Fridays and Saturdays. Service hours would be shorter on Sundays and bank holidays.

A Railway Order Application for the development was lodged for consideration by An Bord Pleanála in September 2008. The application included supporting material including an Environmental Impact Statement containing various technical appraisals.

1.2 Brief

An Bord Pleanála appointed an in-house Inspector to examine and report on the railway order application. I have been commissioned to assist the Inspector in a specialist capacity in considering traffic-related matters. In broad outline, the nature of the advice is as follows:

1. Following a review of the documentation submitted with the application in relation to traffic, advise on the adequacy of the application details and Environmental Impact Statement in relation to predicted traffic impacts, both for the construction and operational phases of the scheme.

2. Advise on the adequacy of the applicant's methodology in assessing traffic impacts and on mitigation measures proposed, including confirmation of the robustness of the traffic models chosen.

3. Specifically, to advise on the construction impacts of the proposed development on the city centre area between the Mater Stop and St. Stephen's Green.

1.3 Approach

Since being commissioned in March 2009 I have reviewed the order material, the Environmental Impact Statement (EIS) and subsequent RPA submissions relating to traffic such as the Scheme Traffic Management Plan (STMP). I have also considered specific traffic issues raised in observer's submissions. I have been present throughout the majority of the oral hearing and had the chance to ask questions of the applicant and observers when appropriate.

2 APPLICANT'S TRANSPORT ASSESSMENT METHODOLOGY

2.1 Introduction to Modelling used for Transport Assessment

As well as using existing transport models where appropriate, a number of specific models have been created and used in the assessment of traffic effects associated with the construction and operation of Metro North. These are introduced in the following sections, after which the transport assessment process adopted by the RPA is described.

2.2 Demand Modelling using RPA Multi-Modal Model

In order to predict travel demand for public transport projects in Greater Dublin Area such as LUAS, Metro and other transport initiatives, the RPA commissioned Steer Davies Gleave to produce a multi-modal transport model in 2002. The resulting model was subject to independent audit that was carried out by MVA in 2003. The RPA model has subsequently been extensively used for patronage and revenue forecasting to demonstrate the case for new projects and investment.

The RPA model produces demand forecasts for 2016, the end of the plan period covered by the DTO "Platform for Change" strategy. The demands are predicted for an AM peak hour and an off-peak hour. The model is divided into 700 zones, largely based on electoral divisions. Each zone has specific demographic and land use forecasts, with such forecasts being based on projections from the local authorities.

For the Metro North model tests the assumed transport network in 2016 contains:

- Extensive network of Quality Bus Services;
- Luas Line BX;
- Metro West;
- Luas Line B2;
- Luas Line D;
- Luas Line F;
- Interconnector Services as defined by Irish Rail.

Given that it is now unlikely that all these projects will be in place by 2016, and that projections in land use development are also unlikely to be achieved, it is considered the demand forecasts reported using the RPA model for this year would also be subject to a degree of overestimation.

The RPA model has also been used to predict demand in 2040. For this scenario a number of further assumptions have been made to reflect continued development of the transport system:

- Full public transport integration (fares and bus services);
- Demand management measures (no free employee parking, cordon charging);
- Development of the transport system beyond Transport 21 projects;
- Continued growth in economy and population.

Inclusion of all these in such testing is considered to provide a high projection that is suitable for checking that the ultimate design capacity of Metro North is adequate.

2.3 Corridor Modelling using Metro North Traffic Model

MVA, on behalf of the RPA, have developed a specific model for the Metro North corridor to assess the impact of the project during both construction and operation phases. The model is titled the Metro North Traffic Model, the MNTM. The starting point in constructing the MNTM was to use the existing Dublin Transportation Office Multi-modal Model (DTOTM) and enhance the detail of the highway network in an approximate 2km wide corridor either side of the proposed metro route such that the resulting model would be capable of determining both strategic (city wide) and local (around construction sites) impacts.

The main attributes of the MNTM are as follows:

- Two modelled hours: 08:00 to 09:00hrs and 14:00 to 15:00hrs;
- Validated to 2006;
- Provides forecasts for 2009(enabling works phase), 2011(main works phase), 2014 and 2029(operational phase);
- Four user groups: cars / light goods vehicles, heavy goods vehicles, buses and Metro North construction vehicles.

2.4 Microsimulation Modelling

The Dublin City Council Q-Paramics model has been used for detailed assessments of the construction stage traffic impacts and proposed mitigation in the core city centre area. This model simulates links and junction performance for the period 17:00 to 18:00 hours, which is the busiest time of the day for central Dublin. Further microsimulation models have also been prepared by MVA to assess construction stage effects for three areas in the AM peak period (08:00 to 09:00 hours):

- R132 Swords Road between Lissenhall interchange and Cloghran roundabout;
- R108 Ballymun Road between M50 and Albert College Park; and
- the city centre road network within the immediate surroundings of the proposed stop locations at Parnell Square, O'Connell Bridge and St Stephen's Green.

The traffic modelling of a particular scenario has involved use of these models as well as the MNTM. This has allowed for interchange of results between the various models to develop appropriate levels of detail in the areas being appraised. Typical outputs have been traffic flows and level of congestion on key links as well as journey times on key radial and orbital routes.

2.5 Modelling of Mode Share Changes

A particular measure that significantly affects travel behavior in the city is the College Green Public Transport Gate. As this was implemented in 2009 it does not exist in the 2006 base year models prepared for the Metro North Scheme. In order to simulate the mode share change associated with the public transport gate (ie shift from car trips to bus trips) the DTOTM multi-modal model has been used.

2.6 Pedestrian Assessment

In order to appraise the level of impact on pedestrian movement around city centre construction sites quantitative assessments were undertaken with the results related to the level of service criteria quoted in the Highways Capacity Manual. These assessments were based on pedestrian flows as surveyed in 2007 and the proposed footpath widths as shown on enabling and construction works drawings. The calculated level of service also took account of the presence of shop frontages and street furniture which reduce the effective width of footpath available for pedestrian passage.

2.7 Transport Assessment Process

The EIS records the three stages of transport assessment undertaken as follows:

- Stage 1 – determination of criteria against which traffic impact is measured;
- Stage 2 - Strategic assessment of full alignment and recommended mitigation measures; and
- Stage 3 – Localised impact assessment within each of the seven Metro North areas, MN101 to MN107 with specific mitigation measures, in addition to those in Stage 2, being identified.

The STMP further documents the results for these three stages. Initially it sets out an "Impact Assessment Process" that relates to Stage 1 and enables:

- the likelihood of impact to be determined (Step 1 - Determination);
- the significance of the impact to be categorized (Step 2- Categoristaion);
- the zone of influence to be assessed (Step 3 - Assessment); and
- the severity of the impact to be rated for all user groups (Step 4 - Rating).

In this four step process those impacts at Step 1 that are identified as being significant are taken forward to be categorized at Step 2 where impacts with slight significance are not considered further since it is considered that such impacts could be overcome at detailed design stage. Impacts categorized with moderate or severe significance are subject to both strategic and/or local assessment at Step 3 and Step 4 where impacts by user group are rated.

In the final step, the rating system concludes that a particular issue leads to either slight, moderate or severe impact. The rating has been carried out using performance indicators that are measurements which reflect the objectives established in the plan to minimize traffic related impacts. Table 2.1 summarises the objectives and performance indicators identified in the STMP for general traffic, public transport and vulnerable road users.

Table 2.1 STMP Objectives and Performance Indicators

General Traffic

Extent of Impact	Objective – Minimise impact :	Performance Indicator
Strategic	On vehicle journey times on key corridors	Journey times
Strategic	On congestion	Ratio of flow to capacity on key links
Local	On traffic levels in local areas	Traffic flows on key links
Local	Of heavy goods vehicles on others	Change in HGV volumes
Local	On levels of loading bay facilities	Length of loading bay affected
Local	On levels of on-street car parking	Number of spaces affected
Local	On access route lengths	Length of diversions

Public Transport

Extent of Impact	Objective – Minimise impact :	Performance Indicator
Strategic	On bus journey times on key corridors	Bus journey times
Local	On bus journey times on local areas	Bus journey times
Local	On bus stop arrangements	Distance to alternative bus stop
Local	On city centre taxi ranks	Number of rank spaces affected
Local	On taxi service coverage	Length of diversion to alternative rank

Vulnerable Road Users

Extent of Impact	Objective – Minimise impact :	Performance Indicator
Local	On pedestrian journey lengths	Length of diversions
Local	On pedestrian congestion in city centre	Density / Level of Service
Local	On cycle route facilities	Length of cycle facility affected
Local	On cycle journey lengths	Length of diversions

For a number of the quantified performance indicators both the absolute change and the percentage change have been jointly considered in rating the impact. For example if the volume of heavy goods vehicles (hgvs) on a particular route increased by more then 20 vehicles per hour then the rating would also take into account the percentage change in hgv volumes – if this was 10-20% then the impact would be slight, for 20-30% it would be moderate and over 30% the impact would be rated as severe. Rating tables for other performance indicators that work in a similar way are set out in the STMP.

2.8 Scheme Traffic Management Plan (STMP): Status and Future Development

The EIS highlighted there would be severe traffic impacts associated with the loss of road space and volume of construction traffic over construction period for Metro North. The EIS stated that mitigation of these impacts would be addressed in a Scheme Traffic Management Plan (STMP). The applicant has subsequently produced the STMP which details new appraisals and provides more specific proposals for mitigation measures. It should be noted that the results of assessments contained in the STMP supersede the traffic impacts reported in the EIS.

The STMP is seen as a live document to reflect:

- that the scheme is subject to a future contractor being appointed who will develop the detailed design and construction proposals; as well as
- to take cogniscance of ongoing changes in baseline conditions that will inevitably occur up to and during the estimated five year construction period.

The March 2009 STMP document represents "Stage 1 Plan to Railway Order", with subsequent revisions planned to be undertaken to produce "Stage 2 Plan to Best and Final Offer" and "Stage 3 Plan through Construction". These future documents reflect the procurement process leading to the appointment of a contractor who would be a key stakeholder in the development of the Plan. The Stage 2 plan would also include adjustments resulting from the Railway Order process. Future contract documents would stipulate that the requirements contained in the STMP would be mandatory.

The Stage 1 STMP contains several such "requirements":

- Maintain emergency service access to all buildings and facilities;
- Maintain access for current delivery and servicing arrangements;
- Maintain current levels of general access to all properties;
- Maintain access to all city centre multi-storey car parks;
- Maintain the existing bus network (frequency and general routing);
- Ensure full compliance for mobility impaired and disabled persons; and

- Maintain safe pedestrian access to all buildings and facilities.

In relation to objectives contained in the STMP, which in general use the term "minimize", the contractual requirement would be that the ratings of impacts contained in the Stage 1 document need to be achieved by the contractor.

The STMP recognises the need for a review mechanism to enable, where necessary, changes to be made to traffic management plans. The review would ensure adherence to the minimum requirements and objectives set out in the STMP Stage 1 document. In this regard the RPA propose to set up a "Metro North Traffic Forum" comprising members of the following agencies:

- Dublin City Council;
- Dublin Bus;
- An Garda Siochána;
- Fingal County Council;
- National Transport Authority;
- Bus Éireann;
- Railway Procurement Agency; and
- The Contractor or Contractors.

The forum is envisaged to meet fortnightly to review and approve traffic management details, with specific issues requiring decisions would be presented to the forum by the contractor. The RPA would also report on compliance/monitoring issues. The forum would, through the RPA, report to the Transport 21 Implementation Working Group on progress and planned works matters. During the course of the oral hearing the RPA also indicated that there would be some means by which city centre businesses could make representations to the forum and be offered the opportunity to feedback on traffic management proposals.

The contractor would be responsible for implementing the STMP and adhering to its requirements and objectives. The contract documents prepared by the RPA would stipulate how the contractor needs to comply with the STMP and would set out processes for seeking formal Roads Authority approval for detailed traffic management plans.

2.9 Adequacy of Assessment Methodology and Modelling

The validation reports for the models prepared by the RPA demonstrate reasonable correlation against independent observations of 2007 traffic conditions. As a base case the MNTM and VISSIM models are considered to be fit for purpose in determining traffic pattern changes in the Metro North corridor. The main issue is their accuracy, or otherwise, in future years for which the RPA have made the best available assumptions at the time of the assessments. However since 2008-2009 there has been a slow down in both traffic

growth and transport project delivery programmes. Whilst forecasting to an operational assessment year of 2029 is likely to have a high degree of uncertainty there is less uncertainty in the appraisals associated with the construction stage, assumed to be 2011. The RPA traffic witnesses have confirmed that, if anything, the degree of impact reported in the documentation for the construction stage is likely to be an overestimate.

The STMP process has been set up to deal with such changes in both the base case and with detailed construction proposals. The approach of measuring potential effects using performance indicators at both strategic and local level is considered to be adequate in identifying both impacts and appropriate mitigation measures.

Some observers, including the Dublin Chamber of Commerce, expressed the desire that all planned major transport projects in the city centre be concurrent in order to reduce the overall period of construction. Whilst such a scenario would seem unlikely due to the differing timescales for individual projects, the STMP process has the ability to reflect changes in the baseline and subsequent levels of impact and mitigation.

Dublin City Council's Senior Engineer, Mr Eoghan Madden confirmed in evidence that the methodologists employed by the applicant for modelling the impact of the scheme construction were acceptable to the city council. He also reflected that the mitigation measures would evolve through the procurement process but that those in the STMP Stage 1 represent the minimum standard that would be acceptable to Dublin City Council. Dublin Bus agrees with this position that the STMP Stage 1 mitigation is a minimum standard.

Mr Seamus MacGearailt, on behalf of Fingal County Council, also confirmed in evidence that the council was satisfied with the methodologists employed by the applicant in relation to traffic impact assessment at strategic and local level.

3 STRATEGIC TRAFFIC IMPACTS - CONSTRUCTION STAGE

3.1 Introduction

Traffic impacts during construction would be experienced at a city-wide level due to the combined cumulative impact of reduced road capacity in the vicinity of the various works areas. In locations where the works are to be undertaken in the carriageway, existing traffic lanes would be closed and the remaining roadspace subject to traffic management measures. The City Centre is a key part of the transport network for both general traffic and public transport movement as well as for other user groups such as pedestrians and cyclists. Any significant change to traffic management within the city centre would give rise to strategic (city-wide) impacts, potentially affecting all user groups.

3.2 Proposed Traffic Management Measures

The STMP reports on the testing of four scenarios relating to the main construction phase:

Scenario 1 – Do no construction

Scenario 2 – Do construction

Scenario 3 – Do construction with public transport gate

Scenario 4 – Do construction with public transport gate and further mitigation

For each scenario the AM peak period has been analyzed using the MNTM and the PM peak period using the City Centre Q-Paramics model. The modelling has assumed an evaluation year of 2011 with the Samuel Beckett Bridge opened and the M50 upgrades completed.

In terms of the consideration of the Railway Order the RPA have confirmed that Scenario 3 should be taken into account. The traffic management measures contained within Scenario 3 lie within the vicinity of the O'Connell Bridge Stop, where a large works site would be situated within the existing carriageway of Westmoreland Street. Three of the four northbound lanes on Westmoreland Street would be taken up, with the remaining lane catering for public transport only. Four specific traffic management alterations are set out in the STMP:

- A new Marlborough Street Bridge over the River Liffey immediately east of the O'Connell Bridge to cater for southbound buses and taxis as well as pedestrians and cyclists;
- Right turn ban from Bachelor's Walk to O'Connell Bridge (since the Marlborough Street Bridge could accommodate this movement for buses and taxis);
- Right turn ban from O'Connell Bridge to Eden Quay in order to divert southwest to northeast movements through the city to other road crossings of the River Liffey; and

- Public Transport Gate at College Green, as implemented by Dublin City Council in 2009 with a ban on general traffic movements in both directions (at present the public transport gate operates in peak periods, from 7.00am to 10.00am and 4.00pm to 7.00pm on weekdays).

3.3 Modelling Results

The MNTM has been used to produce summary statistics for the complete modelled area. These show that overall city-wide queuing in the AM period increases by 6.5% as a consequence of the Metro North construction traffic management arrangements with average speeds for general traffic reducing from 25.9kph to 25.4kph. However there is a benefit to public transport with modelled bus speeds increasing from 18.7kph to 19.1kph and corresponding bus queuing decreasing by 4%. The College Green Public Transport Gate is a significant measure in achieving this effect by prioritising bus movements through the O'Connell Bridge stop works area.

A more detailed analysis using the city centre Q-Paramics model demonstrated that during the critical PM peak period there was a reduction in city centre delay to both general traffic and buses as a consequence of the Metro North traffic management measures, again mainly attributable to the public transport gate.

In terms of modelled AM journey times through the city, the most significant speed reductions occur in the vicinity of works sites on the R132 in Swords and the R108 in Ballymun, with these being considered as local impacts elsewhere in the transport assessment process. The modelling does however pick up an increase in journey time of 12 minutes on the N11 northbound coming into the city centre. Further examination of the model results shows that specific congestion occurs in Leeson Street Lower, which is designated as part of the inner orbital route around the city centre. If such an effect emerged in the next stages of STMP development then it would need to be addressed by mitigation which may involve either adjustment of traffic signal settings in the area or alterations to the inner orbital route signing strategy.

3.4 Other Measures in STMP

As well as the on street traffic management measures described above, the RPA have stated in the STMP that:

- A public information campaign would inform the general public and business community of traffic management arrangements for the various work phases;

- They would stipulate that the Contractor provides a vehicle recovery service to ensure the timely removal of breakdowns in the vicinity of city centre works sites; and

- They would develop proposals for park and ride sites to be effective during the main works, in conjunction with the Transport 21 Contingency Planning Sub-Group.

4 LOCAL AREA ASSESSMENTS – CONSTRUCTION STAGE

4.1 Introduction

This chapter highlights particular traffic routes that would be affected by Metro North construction activity and the RPA's proposals for mitigation of impacts. These are described for the seven Metro North areas (MN107 to MN101), running from south to north which is the same sequence that the modules of the oral hearing were conducted. All impacts that have been rated as either severe or moderate in the STMP are summarised.

4.2 MN107 – Mater to St Stephen's Green

Introduction

There would be extensive works around St Stephen's Green, O'Connell Bridge and Parnell Square stops during both the enabling and main contract stages of Metro North.

Enabling Works Impacts

In terms of enabling works the RPA have identified detailed arrangements whereby impacts on loading bays, parking, bus stops, taxi ranks and pedestrian/cycle facilities are minimised to being both localized and short term. The rating system used in the STMP identified that whilst there would be no severe impacts, moderate impacts would be experienced:

- By relocation of a taxi rank at St Stephen's Green by some 200 metres;
- Through loss of on-street parking on St Stephen's Green West and North, Westmoreland Street and Parnell Square East;
- Through the shortening of a loading bay on St Stephen's Green West;
- By closure of the central median on O'Connell Street to pedestrian north-south movements

In general, the traffic capacity of the city centre network would be maintained during the enabling works, apart from Parnell Square East that would be reduced to one lane for general traffic and one lane for buses.

Main Construction Works Impacts

For the main works phase the STMP requires a number of traffic lanes to be maintained on key city centre streets:

- O'Connell Street (and Bridge) - two northbound lanes, two southbound lanes;
- Westmoreland Street - one northbound lane;

- D'Olier Street – three lanes; and

- Parnell Square East - one lane southbound for public transport.

These requirements, implemented in conjunction with traffic management proposals such as the College Green Public Transport Gate and the provision of the Marlborough Street Bridge, have been modelled by the RPA in reporting the appraisals contained in the STMP. Also taken into consideration is the closure of the one-way route from St Stephen's Green North and West to Glovers Alley.

The STMP reports severe impacts associated with:

- General traffic increases in St Stephens Street Lower, Meath Street and Golden Lane;

- Construction traffic increases in Lincoln Place, Lombard Street East, Lower Merrion Street, Tara Street and Westland Row;

- Loss of on-street parking in Parnell Square East;

- A 700 metre long diversion for traffic heading to Glovers Alley from the east.

There are also a number of moderate impacts reported:

- Loss of parking spaces in Parnell Square East and Westmoreland Street;

- Increase in general traffic on North Great Georges Street;

- Localised relocation of bus stops in Parnell Square East and Westmoreland Street;

- Closure of the western footway on Parnell Square East with increased usage of the eastern footway;

- The only lane available to cyclists in Parnell Square East would be the bus lane;

- Loading arrangements for premises in Westmoreland Street;

- Increased pedestrian congestion in Westmoreland Street and St Stephen's Green North/West;

- Service access between Grafton Street and St Stephen's Green North;

- The relocation of the St Stephen's Green taxi rank by some 200 metres.

Specific Traffic Related Issues raised by Observers

Dublin Bus is supportive of the College Green Public Transport Gate and would wish that it is operational 24/7 during the course of the construction works for Metro North. RPA presented oral evidence explaining that the hours of operation currently in place would be subject to review by Dublin City Council in May/June 2010, six months after the opening of the Samuel Beckett Bridge. Given that Westmoreland Street would be restricted to one bus lane, Dublin Bus proposed that a contra – flow bus lane is provided in D'Olier Street northbound. This would be a contingency measure should operational difficulties arise in Westmoreland Street. RPA are content to provide such a measure and confirmed that it was included in the STMP. In general operational terms the public transport gate not only benefits buses but also cyclists. In their submission the Dublin Cycling Campaign claimed there had been 40-60% increase in central area cyclists since its implementation.

Car park operators were concerned that the implementation of the bus gate in July 2009 had led to a downturn in business at Trinity Street and Brown Thomas car parks. However there was no demonstrable impact in the occupancy figures submitted to the oral hearing, with the percentage reduction of around 10% being experienced throughout the 2009 period, both before and after the bus gate restrictions. RPA suggested that this was a consequence of general economic conditions and the increase in the number of unofficial car parks opening in the city centre.

Mr Tom Philips, representing Brown Thomas and Appleby Jewellers, suggested that the current STMP should be dismissed as an unenforceable "living document". He also suggested that the Garda Traffic Corp should be responsible for local traffic management as did Dublin Chamber of Commerce. RPA responded that the contractor would retain responsibility for such maters and that the Traffic Corp would be able to input into the process through the Traffic Forum.

The principal concern raised by several city centre retail businesses relates to ensuring continued ease of access to car parks during construction. The RPA have confirmed that continued access to car parks was a requirement in the STMP and predicted that there would only be a marginal deterioration in journey times of less than 5% for traffic accessing car parks. Some access routes would be altered and in this regard a wayfinding signage system would be provided on all major routes into the city centre from the M50.

In terms of impacts on pedestrians through the reduction in footpath widths adjacent to construction sites, one particular matter raised during the Oral Hearing related to Carroll's gift shop in Westmoreland Street. The RPA were however able to confirm that the effective width would be maintained at 4.5 metres, and that this would be sufficient to allow for passage of the high volume of pedestrians associated with this thoroughfare.

4.3 MN106 – Mater to Albert College Park

The traffic effects experienced in the MN106 area during the construction stages are anticipated to be local to stop sites at Mater, Drumcondra and Griffith Avenue. Access for construction activity would also be required off Ballymun Road at Albert College Park and Millbourne Avenue beside St Patrick's College. Permitted access routes for construction traffic are set out in the STMP, for the southern sites via Swords Road and for the Griffith Avenue and Albert College Park sites via Ballymun Road. Temporary installation of traffic signals is proposed at the Ballymun Road/St Canice's Road junction to facilitate efficient access to the construction site in Albert College Park. Access to the Mater Stop site would be taken from the west end of Eccles Street, with no trucks being permitted to pass the frontage of Mater Private Hospital at the eastern end of the street.

The most significant general traffic effect reported in the STMP is an increase in flows on St Canice's Road that is rated as severe. The RPA stated that it is unlikely that this impact would extend over a long period of time and therefore short term traffic management alterations may be most appropriate. There are also severe impacts predicted in St Mobhi Road, Swords Road and Lower Drumcondra Road resulting from increased HGV flows.

Specific Traffic – related Issues raised by Observers

A number of observers in MN106 raised concerns about the routing of construction traffic. In response the RPA explained how excavated material would be transported from city centre sites to Belinstown using a number of different routes that would be subject to agreement with Dublin City Council. Construction traffic associated with the Ventilation and Emergency Escape Shaft would access via Millbourne Avenue but be restricted at school drop off and pick up times. The RPA stated that the residential streets of:

- Whitworth Road;
- St Joseph's Avenue;
- Ferguson Road; and
- Home Farm Road

would not be used by construction traffic.

Although the Drumcondra stop works would require closure of the western end of St Alphonsus Road the RPA would provide a turning circle to allow residents to enter and leave via Lower Drumcondra Road. The RPA also stated that the Metro North contractor would be required to provide adequate on-site parking for his staff, or to arrange local bus services to bring them to work.

4.4 MN105 – Albert College Park to Santry Avenue

Construction works in area MN105 are assumed to involve cut and cover tunnelling along the R108 Ballymun Road corridor together with the creation of two underground stops at Dublin City University and Ballymun. Enabling works would involve extensive diversion of utility services to positions outwith the land required for the tunnel. Throughout both the enabling and main works stages it is proposed that one traffic lane is removed from Ballymun Road in each direction such that the route operates with 2 lanes northbound and 2 lanes southbound. One of the lanes in each direction would be designated for public transport. Although access to the side road network would be maintained at all times there would be some disruption and reduction in capacity at key junctions during certain phases of the works.

This capacity reduction would lead to some traffic diverting locally onto relatively lightly trafficked residential roads such as Glasnevin Drive, St Pappins Road and Shanliss Road. The associated traffic flow increases predicted by MNTM for these roads are rated as severe. The RPA state these would be mitigated through the introduction of local traffic management measures that would be agreed with Dublin City Council.

Given that the Ballymun Road would be a key route for Metro North construction vehicles the impact of increased HGVs on the route is rated as severe. The increase, estimated to be up to 30 vehicles per hour in each direction, is rated as a moderate impact in terms of pedestrian movement. Cyclists would also experience a moderate impact as they would temporarily loose the segregated facilities available on Ballymun Road but would be able to use the bus lanes instead.

Specific Traffic – related Issues raised by Observers

Dublin Bus commented that over 20 buses per hour would be using the Ballymun Road bus lanes during peak periods. The bus lanes do not currently operate between 10.00 and 16.00 hours and they contend that bus priority should apply 24/7 during the Metro North construction phase. In contrast Ballymun Regeneration Ltd is of the firm belief that the two lanes in each direction provided during construction should be available for general traffic. They are however happy to accept the Road Authority's decision realising that Dublin City Council's approval of the traffic management would be sought as part of the STMP process. I questioned the RPA's traffic witness, Mr Byrne on this matter. He indicated that model testing had shown there would be a significant deterioration in bus speeds if two general traffic lanes were provided.

During the oral hearing the local residents associations in the MN105 area raised concerns about the level and duration of traffic impacts during the construction phase. RPA clarified the level of traffic flow changes and confirmed that the STMP process had analysed the combined effects of construction traffic and lane restrictions and concluded there would not be unacceptable delays or safety concerns.

4.5 MN104 – Santry Avenue to Dublin Airport South

The only construction traffic effects for the MN104 area would relate to the erection of the bridge over the M50. Some short-term lane closures would be required during which traffic could be diverted via the slip roads at the Ballymun Interchange immediately to the west. The impact of such arrangements has been determined as low. Other works such as the construction of stops at Northwood and Dardistown, as well as the associated park and ride, are situated in greenfield land.

Specific Traffic – related Issues raised by Observers

Tesco Ireland Ltd were concerned that the original temporary layout proposed for the R108/Santry Business Park junction would be inadequate and cause disruption to the passage of their goods from their central distribution centre. The RPA subsequently agreed that two lanes off the R108 and two lanes onto the R108 would be maintained throughout the works phases in this area.

Irish Food Processors, as occupiers of the plant at Ballystruan, originally raised concerns about access during Metro North construction. RPA gave assurance that the contractor would be required to maintain all vehicular and pedestrian access during the phases of the works, through the provision of suitable temporary diversions.

4.6 MN103 – Dublin Airport

There are no significant traffic effects associated with construction works in area MN103. A routing for construction vehicles accessing the proposed Airport stop has been agreed with Dublin Airport Authority.

4.7 MN102 – Dublin Airport North to Swords

During the construction phases of the tunnel and elevated track in area MN102 the R132 Swords Road would continue to operate with two general traffic lanes in each direction. However the temporary loss of the northbound and southbound segregated bus lanes is rated as moderate and to both bus journey times and to cyclists. The capacity of the R132 Airside junction would be temporarily reduced resulting in localised diversion for right turning traffic exiting the retail park and there would also be a temporary reduction in facilities available for pedestrians at this location. Both of these effects are rated as moderate impacts in the STMP.

Specific Traffic – related Issues raised by Observers

Dublin Bus was concerned about the loss of the bus lanes in this area and contends that a similar layout to that proposed for the Ballymun Road is adopted. This would involve designating one of the two lanes in each direction as a bus lane. However it is noted that base traffic flows are significantly higher on the R132 whereby such a reduction in capacity for general traffic would be likely to cause significant traffic flow increases in the surrounding network. In its closing submission Fingal County Council stated that the R132 bus lanes were used by only one bus service which gained little benefits on the approaches to Malahide Road and Pinnockhill roundabouts. It is therefore considered that the

maintenance of two lanes for general traffic is the most appropriate layout for the R132, as proposed in the STMP.

A submission was made by the Airside Retail Park owners seeking assurances with regard to access both for servicing and for customers. The RPA responded that, although there would be local traffic lane diversions on the R132 as the cut and cover tunnel was being constructed, there would be continued pedestrian and vehicular access provided at the Airside junction. The RPA also explained that traffic movements to and from the service yard would not be prevented by temporary works.

The owners of Boland's car recycling facility were also given similar assurances by RPA in relation to business access during the construction stages of Metro North.

The owner of Céim Dearg veterinary practice submitted that the traffic management analysis was flawed in that it was based on traffic patterns in the area prior to the opening of the M1 Drynam interchange. At the oral hearing the RPA did clarify how the modelling of future years had taken this effect into account and that the proposed access road to the Fosterstown Park and Ride would operate without undue congestion.

The owners of the Pavilion Shopping Centre in Swords sought assurances that there would be continued access during Metro North works. The RPA confirmed this and also stated that they would liaise with Pavilion with respect to their planned site expansion which may be constructed around the same time as Metro North.

The owners of the Woodies retail outlet situated at the Seatown junction also gained confirmation that maintenance of pedestrian and vehicular access to these premises would be a Metro North contract requirement.

4.8 MN101 – Swords to Belinstown

In area MN101 there would be both sections of elevated track along the median of the R132 and new at-grade track over greenfield land leading to the depot site at Belinstown. Although two traffic lanes would be maintained in each direction on the R132 there would be junction alterations that would reduce the overall capacity of the route causing traffic to divert around the works areas. Such diversionary effects are rated on being severe on Dublin Road in Swords where traffic flows in the AM peak hour are predicted to rise by 44%. There is also an increase in traffic flows on Main Street, although this is rated as a moderate impact since there is a higher level of base flow on that particular link.

Non-construction related HGV traffic is also predicted to divert away from Metro North works route to the west of the town using Applewood Drive, St Cronan's Avenue and Brackenwood Road. This impact, which is estimated to involve around 40 trucks per hour, is rated as severe. RPA state that this effect could be mitigated by the introduction of an HGV Management Plan for the area and would seek agreement with Fingal County Council with regard to such a measure.

Metro North construction vehicles would cause increases in truck movements on the M1 and on the R132 at Lissenhall that, although rated as severe, are not considered to require mitigation due to the significant capacity available on these routes.

Bus services that run through the Swords area are predicted to experience between one and five minute increases to their journey times in the AM peak period, with Route 33 and Route 33A services being most affected, with the impact on these services being rated as severe. The RPA intend to discuss mitigation measures to reduce such impacts as part of the further development of the STMP.

During the works there would be some short pedestrian diversions and some footpath closures resulting in a moderate impact to pedestrian movement. A moderate impact would also be experienced by cyclists on the R132 who would join general traffic lanes rather than being able to use the existing bus lanes.

Specific Traffic – related Issues raised by Observers

Dublin Bus insist that a bus gate is provided during the construction stage within the Swords village area to permit priority passage of bus services and to ensure general traffic does not use Swords Main Street as an alternative to the restricted R132. The RPA stated they would be discussing such a provision with Fingal County Council. In their closing submission Fingal County Council stated that such a matter would require careful consideration, probably as part of a general access study for Swords town centre. The Council is of the view that while there may be a risk of some delay to bus services in Swords during Metro North construction that this would be tolerable. Given the predicted level of disruption, it is concluded that incorporation of a Swords bus gate as a mitigation measure in the STMP would not be an appropriate response.

5 TRAFFIC CONDITIONS – OPERATIONAL STAGE

5.1 Transport Modelling used to Inform System Concept

The RPA multi-modal model predicts that the newly opened Metro North is predicted to attract 6,000 passengers in the southbound direction in the morning peak period. This assumes all Transport 21 projects are also completed and in operation. This has been predicted on the basis that metro services are frequent and have a 4 minute headway. Given that the existing street running LUAS system has an operating capacity of 4,650 passengers per hour, it is considered that the segregated system concept proposed for Metro North is appropriate in matching the higher predicted demand. The proposed scheme would operate using 45m long light metro vehicles coupled together to form 90m trainsets resulting in an operating capacity of 10,000 passengers per hour, which would mean there would be significant spare capacity during the initial operating years. As demand increases as a consequence of growth in employment and population then the RPA would be able to expand capacity incrementally by increasing the frequency of service ultimately to 2 minutes, which equates to a line capacity of 20,000 passengers per hour.

5.2 Transport Modelling used to Inform Preferred Route Selection

The RPA model was used to test the relative performance of the west, central, alternative central and east route options. The EIS reports that the Alternative Central, which has been taken forward to form the basis of the published scheme, performed best in terms of forecast patronage and as well as having the highest benefit to cost ratio.

The RPA model has also been used to estimate the performance of alternative schemes suggested by observers. For example patronage testing of the route proposed by the Metro North East Alliance showed a predicted decrease of 4 million passengers per annum compared to the selected route.

5.3 Overall Benefits to Transport Network

Metro North would result in a significant modal shift from car to public transport that would reduce congestion on the surrounding road network, particularly at peak times. The MNTM has been used to predict this network-wide effect for a presumed opening year of 2014. In the AM peak hour there would be a reduction in queuing on the road network of 21%, with overall time spent travelling reducing by 9%.

In 2029 the traffic modelling takes into account both the higher level of demand and the implementation of other Transport 21 public transport projects. The positive effect of Metro North in this year would be to reduce time spent queuing and overall travel time by 9% and 32% respectively.

In terms of bus operations on the road network Metro North would offer similar benefits to those experienced by general traffic.

Particular strategic routes that would experience a reduction in traffic flows would be R132 in Swords, M50, M1, Port Tunnel, Ballymun Road and Finglas Road. On Metro North opening southbound journey times along the key radial routes of Swords Road and Ballymun Road are predicted to improve by 12 minutes and 6 minutes respectively.

The positive effects of Metro North would continue to grow over time as more elements of the Transport 21 network are implemented allowing better interchange and enhancing accessibility throughout the city.

5.4 Specific impacts and proposed mitigation

There would be a number of localised traffic-effects associated with the operation of Metro North. There are summarized below on an area by area basis.

MN107

The traffic routings adopted during the construction phase for access to car parks at Fleet Street and St Stephen's Green area would remain, this impact being rated as slight. The latter is a consequence of the creation of a pedestrian plaza at the northwest corner of St Stephen's Green to facilitate access between public transport services and the Grafton Street area.

MN106

The RPA acknowledges there would be additional pressure for on-street parking at the Griffith Avenue stop. Any additional parking restrictions would be a matter for Dublin City Council. However, in general, it is noted that Metro North is predicted to reduce private car usage in favour of public transport.

MN104

Traffic accessing the proposed Dardistown Park and Ride from the M50 would be facilitated by a right turn shelter lane of the Colinstown Lane / Ballystruan Lane Junction to reflect the increased level of turning movements at this location.

In relation to the Hugo Byrne land south of the M50 and the Byrne Family land to the north of the M50, RPA have reached agreement on a number of design layout matters. These recognise both existing requirements for vehicular access and for the potential for future development in the area by ensuring crossings of the Metro Line are designed to allow for future transport infrastructure. These agreements, stipulating the layouts of several bridge crossings, ensure that Metro North does not compromise future accessibility and connectivity of road, public transport and pedestrian / cycling networks in the potential development areas.

MN102

In relation to the Fosterstown Park and Ride the traffic movements generated by the facility would be offset by the general traffic reductions associated with Metro North mode transfer such that the effect in the Fosterstown area is rated as neutral.

MN101

Access to the depot site and 2000 space park and ride would be via a new access road from the R132 in the south or via a widened Batter Lane to the north. The general increase in traffic movement in the Belinstown area is rated as a moderate impact. In this regard residents on Batter Lane made submissions that traffic accessing the depot and the Belinstown Park and Ride would result in significant traffic flow increases past their properties. The RPA explained that the new facilities would be accessed by a number of routes, including the proposed access road from the R132. Given this, together with the projected drop in traffic levels generally due to mode shift, the traffic flows on the west section of Batter Lane are not predicted to increase significantly.

Given the provision of new pedestrian facilities such as footbridges and signallised crossings on the R132, taken together with the reduction in traffic volumes on the route, Metro North would bring about positive benefits to pedestrian movements in the Swords area.

6 SUMMARY AND CONCLUSION

I have considered the modelling and appraisal of transport effects associated with Metro North construction and operation and conclude that they are adequate for the reporting of impacts and mitigation at Railway Order stage. The methodologies applied are both comprehensive and robust, albeit that forecasts of future traffic conditions always contain a degree of uncertainty. The applicant has also out a methodology for dealing with future changes to both baseline and to construction proposals through the evolution of the "Scheme Traffic Management Plan (STMP)"process that leads from planning to implementation.

The mitigation set out in the STMP as submitted represents a minimum standard that would be acceptable to Dublin City Council, the ultimate authority in approving city centre traffic management arrangements. The planned Metro North Traffic Forum provides a mechanism to ensure that what is delivered is not of a greater impact than that assessed at the Railway Order stage.

The STMP contains a number of key measures, which would need to be implemented on a phased basis to facilitate the construction works and to reduce the impact of these works on the City. These key measures are summarized as follows:

- The implementation of a Public Transport Gate at College Green (assumed to be operating 24/7);
- A new bridge to be provided linking Marlborough Street and Hawkins Street across the Liffey;
- A complete ban on right turning vehicles from Bachelor's Walk to O'Connell Bridge; and
- A complete ban on right turning vehicles from O'Connell Bridge to Eden Quay.

The following is a summary of key requirements which have also been committed to by the applicant:

- Access routes to all car parks would be kept open throughout the duration of the Metro North works;
- Access to all business premises would be maintained for the duration of the Metro North works;
- Pedestrian flows in the city centre would be maintained around the worksites;
- Two traffic lanes northbound and two lanes southbound on the Swords Road (R132) would be retained throughout the works;
- Two traffic lanes northbound and two lanes southbound on the Ballymun Road (R108) would be retained throughout the works;

- A public transport lane south bound on Parnell Square East would be maintained at all times;

- The current lane capacity on O'Connell Street would be maintained through the works;

- A bus lane northbound on Westmoreland Street would be maintained at all times; and

- A contingency plan to provide an alternative contra flow bus lane on D'Olier Street would be put in place.

Whilst in conclusion I consider the level of mitigation committed to in the STMP to be adequate, there are several areas where further construction traffic management should be considered in future stages of STMP development and approval:

- for Leeson Street Lower;

- for bus lanes to operate 24/7 along Ballymun Road ;

- for St Canice's Road area.

- for Swords (HGV management plan); and

- for reducing impacts to 33 and 33a bus services in Swords.

The Metro North Traffic Forum would provide a mechanism to consider these and to ensure the overall goal of the STMP can be achieved:

> "to minimise the impact of the Metro North Scheme on road users and to maintain access to businesses and other premises, whilst keeping traffic (including vulnerable road users) moving".