



**METRO NORTH
ORAL HEARING
PROOF OF EVIDENCE
Roger Barrowcliffe
Air Quality
Wednesday 8th April 2009**



Metro North Oral Hearing

Proof of Evidence

Air Quality

Roger Barrowcliffe

1.0 NAME, QUALIFICATIONS AND ROLE IN PROJECT

- 1.1 My name is Roger Barrowcliffe. Since 1989, I have worked within Environmental Resources Management (ERM), where I am currently a Partner of the company.
- 1.2 My understanding of the atmosphere was gained initially at Reading University, where I obtained my BSc (Hons) in Physics and Meteorology. Subsequently, I worked for eight years in the UK Meteorological Office as a research scientist, studying turbulent flow around obstacles and agrometeorology, amongst other subjects.
- 1.3 I am currently the Vice Chair of the UK Institute of Air Quality Management, a member of the US Air and Waste Management Association, Environmental Protection UK and I am accredited as a Chartered Meteorologist by the Royal Meteorological Society.
- 1.4 For this Project, I supervised all work relating to the assessment of air quality and microclimate, which was carried out by colleagues in the Dublin and London offices of ERM.
- 1.5 My role was to:
 - Ensure that all assessment work was carried out using the most appropriate assessment criteria and assessment tools
 - Review all outputs from the assessment and ensure that the reporting fulfilled the requirements of legislation
 - Assume ultimate responsibility for ERM's work on the assessment of air quality and microclimatic impacts from this proposed development

2.0 EXPERIENCE

- 2.1 During my twenty years of consulting experience with ERM, I have worked on a wide variety of projects for clients, many of which have been environmental impact assessments. I have specialised in air quality and microclimate issues, becoming thoroughly familiar with best practice assessment techniques and acquiring knowledge of human health effects and other consequences of air pollution.

- 2.2 Within the UK, I have worked on many infrastructure projects including rail schemes such as the Jubilee Line extension, Crossrail, the Channel Tunnel Rail Link and light rail or tram schemes in Manchester, Birmingham, Edinburgh and on the Docklands Light Railway in London.
- 2.3 In Ireland, I have worked for the RPA on the Luas C1 line extension into the Docklands and I have recently presented evidence on air quality at Oral Hearings on the Lansdowne Road Stadium and the New Ross by pass proposals. In all these examples, I gave my evidence based on the work done for the EIA of these proposals, carried out by myself and colleagues.

3.0 GENERAL INTRODUCTION

- 3.1 Once operational, Metro North would have very few implications for air quality and microclimate, since it would be associated with almost no direct emissions to atmosphere and would have little or no influence on microclimate. During the construction stage, there is some potential for air quality impacts from dust generating activities, although these are capable of being controlled by conventional dust suppression techniques and good practices.
- 3.2 With respect to air quality, the assessment described in the EIS has verified this conclusion by considering the following aspects:
- The existing concentrations of the key pollutants and the future concentrations in a 'without development' scenario
 - Statutory air quality limit values, set out in Irish law and EU Directives
 - Construction activity and its consequences for air quality at nearby receptor locations
 - The effects on air quality of changes in traffic flows on the whole road network of Dublin, as consequence of constructing and operating Metro North, as modelled and using traffic flow data provided by MVA consultants.
- 3.3 For changes in air quality relating to traffic emissions, the key pollutants are nitrogen dioxide (NO₂) and particulate matter (PM₁₀ or PM_{2.5}).

4.0 RECEIVING ENVIRONMENT

- 4.1 Metro North would extend from the city centre of Dublin, through the northern suburbs to the airport and beyond. The air quality along this route is therefore variable, with highest concentrations of pollutants in the city centre and near to heavily trafficked roads, including motorways.
- 4.2 Across most of Dublin, air quality is compliant with air quality limit values at the present time, especially so now that coal burning has ceased in the city. Road traffic is now the major source of emissions.
- 4.3 A recent change in emphasis within EU legislation on air quality has had the effect of requiring air quality to be described in terms of PM_{2.5}, as well as PM₁₀. This is because it is recognised that smaller particles are more likely to be associated with the observed health effects of exposure to particles and because it is the smaller particles that are emitted by road traffic and other combustion sources.
- 4.4 To reflect this shift in legislation (which is not yet formally part of Irish law but will be), the EIS considered changes in particle concentrations primarily in terms of PM_{2.5}, not PM₁₀.
- 4.5 Metro North would exert minor effects on road traffic flows not just along the alignment but across the whole road network in Dublin. Thus, the receiving environment for air quality is not confined to the alignment itself. Nor can it be described by a single value for the concentrations of NO₂ or PM_{2.5}. Instead, the receiving environment will vary according to the traffic flows present on any given road and with distance from the road. The most meaningful way of describing the concentrations of PM_{2.5} and NO₂ in the absence of Metro North is to estimate them with the same dispersion modelling technique that is also used to predict impacts with Metro North.
- 4.6 The EIS classified receptors along the alignment according to their sensitivity to air quality changes, especially with regard to their sensitivity to construction dust emissions. Hospitals are considered to be among the most sensitive of receptors.

5.0 CHARACTERISTICS OF THE PROPOSAL WITH RESPECT TO AIRBORNE POLLUTANTS

- 5.1 The operation of Metro North would have almost no direct emissions to atmosphere; the power is generated elsewhere and any local effects its energy demand has on air quality would be experienced around power stations fired by coal or gas.
- 5.2 Once operational, the only mechanism by which the scheme could affect local air quality in Dublin is through small changes in traffic flows on the road network, as described in the EIS and in the evidence given by Ian Byrne. This would have potential implications for people living and working near roads where changes in road traffic were sufficient to change concentrations of NO₂ and PM₁₀ or PM_{2.5}.
- 5.3 During the construction phase, traffic flows will also be perturbed by the scheme through diversions and have the same consequences as described above. Construction also gives rise to the possibility that dust would be generated and deposited on nearby residential properties and other buildings. Any such effects are typically very localised and occur close to the point where dust is emitted.
- 5.4 The EIS also considered the implications for microclimate, ie the changes in air temperature and wind speed observed over distances of a few tens of metres. Measurable changes to microclimate can only occur when the scale of a change in land use is large, such that structures are sufficiently significant to alter airflows or natural surfaces are replaced by man-made materials such as concrete (and vice versa). An urban rail scheme such as Metro North rarely has implications for microclimate, as its footprint is very modest in the context of the land use types across a city. To evaluate changes in microclimate, the EIS considered the size of vegetated areas to be replaced by materials such as concrete, as a fraction of the overall area.

6.0 POTENTIAL IMPACTS OF THE PROPOSAL

6.1 The Proposal has the potential to cause impacts in respect of:

- Annoyance to people living and working near construction activity, such as the building of station stops;
- Small changes to roadside air quality across Dublin where traffic flows are altered during construction and operation; and
- Localised changes in microclimate.

6.2 I discuss the nature of these potential impacts below.

6.3 During the construction phase, the Proposal has the potential to create and emit dust through various types of activity. These activities are varied, but can include demolition, vehicles moving over unmade ground and cutting or grinding operations. If uncontrolled, such activities would cause neighbouring properties and buildings to experience dust deposition and possibly some localised increase in PM₁₀ concentrations. These impacts would tend to be episodic, since dust generating activities are discrete events and not continuous. They would also be partially dependent on weather conditions, since high winds would disturb materials in stockpiles and rain would damp down dusty surfaces.

6.4 It is not possible to eliminate entirely the emission of dust from a construction site. Nevertheless, effective mitigation can be implemented that would reduce substantially the impact on neighbouring residents and people in workplaces and community buildings. The impact of construction dust in the EIS has been assessed by considering the proximity of people likely to be particularly sensitive to those places where construction activity will occur and where construction compounds are planned. Naturally, those people living or working closest to construction activity will be most likely to experience annoyance should dust be deposited on prominent surfaces in sufficient quantities to make it noticeable. It is never possible in assessments of this kind to be able to define impacts on individual properties in precise numerical terms. In general, it can be said that people living and working within 50 m of construction activity are likely to experience a residual impact, while those at distances of 150 m and greater are unlikely to be affected. Rather more people are likely to experience an impact from construction dust in the city

centre than elsewhere, simply because the density of people living and working there is higher than for other parts of the route. The nature of any impact from construction dust will largely be on amenity, ie annoyance through the soiling of surfaces such as cars. There is a possibility that local concentrations of the fungal spore *Aspergillus* could be increased through disturbance of such spores residing in soils or buildings that are being demolished. The construction or demolition activity does not, of course, generate *Aspergillus* spores, but rather redistributes them in the environment, with transient and short lived increases in airborne concentrations close to the disturbance. The consequences of this outcome for human health are dealt with at this Hearing by Martin Hogan, on behalf of the RPA.

- 6.5 The EIS, and the evidence of Ian Byrne, describes how traffic flows on roads within Dublin's network will change, through diversion during construction and through modal shift when operational. These changes in traffic flows will have consequences for air quality alongside these roads, most notably for concentrations of NO₂ and PM_{2.5}.
- 6.6 Where vegetated surfaces or trees are removed and replaced with materials such as concrete or tarmac, the surface energy balance is distorted and the solar radiation that would otherwise have been used in the evapotranspiration of water by plants is diverted to heat the air, or is stored in the ground. This has the effect of locally raising air temperatures, especially in summer, and is the prime cause of the urban heat island effect.
- 6.7 Whilst microclimate could be unintentionally altered by the Proposal in other ways too, such as by increasing wind flows around large structures or by artificially creating 'frost' pockets', the likelihood of such changes occurring is remote. The Proposal does not introduce any features of sufficient size to cause such effects.
- 6.8 I have examined all of the amendments to the Railway Order since the publication of the EIS, further to discussion and agreement with third parties, and I am satisfied that none of these will have any material consequences for air quality or microclimate and certainly no consequences relative to the conclusions set out in the EIS.

7.0 REMEDIAL OR MITIGATION MEASURES

- 7.1 There are no realistic measures that can be applied to mitigate changes in roadside air quality caused by changes in traffic flows. The number of vehicles on the road network is not controlled by the Metro North project and any perturbation of the traffic flows is an unavoidable consequence of the Proposal. Management of traffic flows is the responsibility of the local authority. It should be noted that the Project itself is not contributing an increase in vehicles; the consequence is essentially a redistribution of traffic flows that would be using the road network in any event and is likely to lead to a reduction in vehicle use.
- 7.2 Construction dust can be substantially mitigated through the implementation of sound on-site practice and the adoption of commonly used techniques to prevent dust being generated and emitted. RPA will require its contractors to adopt and enforce specific measures that will minimise the deposition of dust on neighbouring properties and buildings. Examples of the mitigation measures were presented in Section 12.4.1.2 of Volume 2 of the EIS.
- 7.3 The EIS does not identify any significant changes to microclimate and no mitigation measures will be required.

8.0 PREDICTED RESIDUAL IMPACTS AND SUMMARY

- 8.1 Once operational, the Metro North development would have very little potential for changing local air quality; the Light Metro Vehicles using the track would emit no pollutants. Any changes in local air quality would be associated with changes in traffic flows on the whole of Dublin's road network that result directly from Metro North. Careful analysis and assessment has been made in the EIS of the effect that projected changes in traffic flows would have on concentrations of NO₂ and PM_{2.5} alongside roads. This assessment has shown that very small numbers of roads would experience meaningful changes, as a proportion of the wider network considered. These changes in air quality would be both positive and negative, with no net difference in air quality across Dublin. A small number of locations alongside busy roads would experience concentrations of NO₂ above those defined by air quality standards, but this would be the case with or without Metro North.

There would be a small reduction in emissions of carbon dioxide from traffic using Dublin's road network, in the event that Metro North becomes operational.

- 8.2 The construction phase would also lead to changes in road traffic flows on the road network across Dublin, although not as great as implied in the EIS. The effects of changes in traffic flows caused by construction were effectively considered as the 'unmitigated' scenario, prior to the effects of the Scheme Traffic Management Plan being taken into account in the modelling of traffic flows. Even in this worst case, presented within the EIS, the changes to air quality would be slight and the proposal does not materially compromise compliance with air quality standards.
- 8.3 With regard to the effect of dust generated by construction activity, the EIS identified those properties and locations that would be *at risk* of experiencing some impact. These are those within 50 m of construction activity, defined, on a worst case basis, as being from the boundary of any construction compound, rather than the activity itself. It cannot be assumed that all of the receptors listed in the EIS will, in fact, experience an impact, only that these are the places that *might* experience an impact, particularly if dust control measures are not adopted completely at all times.
- 8.4 The majority of submissions to the Hearing that cite dust as an issue appear to have done so in the context of dust causing annoyance, in conjunction with noise and other environmental aspects. This outcome cannot be discounted entirely, but any annoyance experienced should be confined to people spending considerable amounts of time in close proximity to the construction activity. Close proximity would typically be defined as 50 m or less.
- 8.5 Some of the submissions to the hearing have raised the possibility that airborne dust arising from construction will cause health problems for residents and, in particular, will cause diseases such as bronchitis and asthma. In my view, such an outcome is not possible. Firstly, any additional airborne concentrations of particulate matter arising from construction would be small and very local to the construction activity (minimising human exposure.) Secondly, the particles generated by most construction activities tend to be larger than 10 µm in diameter and are therefore not able to enter

the human lung. This matter is dealt with in more detail by the evidence of Martin Hogan.

8.6 The effectiveness of the mitigation measures in reducing the impact of dust on local air quality and amenity will be measured by a monitoring programme to be established and operated by RPA's contractor. Measurements will be made at places around construction activity where people might be affected. The results of this monitoring will be made available and should bolster confidence in the management of construction sites.

8.7 There would be no effects on microclimate that could be measured or detected, since the changes to the land use are too marginal to influence air temperature or wind speed.

9.0 CLOSING STATEMENT

9.1 I consider that the construction and operation of Metro North will have no material influence on local air quality and the microclimate of Dublin. Where any minor effects do occur, they will be confined to a very small number of locations in close proximity to construction activity.

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