THE MERSEY GATEWAY PROJECT

AIR QUALITY AND CLIMATE

CHAPTER 19.0

AIR QUALITY AND CLIMATE

C O N T E N T S

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19. AIR QUALITY AND CLIMATE

19.1 Introduction

19.1.1 This Chapter assesses the air quality effects of the Mersey Gateway Project (the “Project”) both operationally due to changes in road network layout and traffic flows, and during construction. The assessment has focused on nitrogen oxides and particulate matter (including construction dust), as well as the effects of the Project on carbon dioxide emissions which are recognised as being important to climate change.

19.1.2 The air quality effects have been assessed at receptors within Runcorn and Widnes, and include the consideration of effects upon ecosystems through links with terrestrial and aquatic ecology, as detailed in Chapters 10 and 11, respectively. Potential air quality effects have also been identified through the contaminated land and waste effect assessments (Chapters 14 and 15, respectively).

Overview of the Project

19.1.3 The Project aims to deliver a new crossing of the Estuary in Halton at the Runcorn Gap linking into the existing principal road network. In summary, the relevant aspects of the Project’s scope with regard to this air quality assessment include the following (further details on the Project’s scope are provided at Chapter 1 of this ES):

a. The delivery of the Mersey Gateway Bridge (the “New Bridge”);
b. Incorporation of the New Bridge in the existing highway network;
c. Modification and de-linking of the SJB;
d. Integration of the revised networks with public transport, cycle and pedestrian links across Halton; and
e. Implementation of tolling and development of associated infrastructure

19.1.4 The works that comprise the Project run from the North West of Widnes to a junction with the M56 to the South of Runcorn. They also include the SJB. The alignment of the Reference Design is described in greater detail at Chapter 2 of this ES. For the purposes of understanding and describing the works in the ES the construction works for the Project have been split into a number of parts (known as “Construction Areas”) (A to I as shown on Figure 2.1, Chapter 2).

19.2 Purpose of Study

19.2.1 The scope of the air quality assessment is described and the pollutants to be assessed are described. A review of relevant planning policy is provided, along with a detailed methodology for the air quality assessment including atmospheric dispersion modelling, and the assessment of significance of effects. The existing and future air quality with and without the Project is presented in tabular form and through the use of GIS, and the effects of the Project are described in detail. Finally, mitigation measures available to reduce any air quality effects are provided, followed by a description of any residual effects and requirements for monitoring of air quality.

19.3 Study Area

19.3.1 The study area of the air quality assessment has been determined based on the expected changes in traffic flows as provided in Chapter 16 and includes those roads with predicted changes in annual average daily traffic flows of greater than 10 percent. Applying this criterion to the traffic flows determined a study area that encompasses Widnes, Runcorn and sections of the M56 south of Runcorn. By assessing those links with greater than 10 percent change, as well as those contiguous links with less than 10 percent change in order to model the entirety of a particular road or junction, the study area assesses the effects of the Project with respect to air quality.

19.3.2 A full description of the roads modelled is provided in Section 19.1, however the general air quality study area is provided in Figure 19.1 (Appendix 19.1).

19.4 Legislation and Planning Policy

19.4.1 This section provides a summary of air quality related policies and guidance available at European, national, regional and local levels that are relevant for this Project. Policies related to climate change and construction dust are also described within this Section.

Air Quality

European Policy and Legislation

19.4.2 Air quality has been an important issue on the political agenda of Europe since the late 1970s. The main aim of the European Commission's (EC) policy on air quality has been to develop and implement suitable measures, focusing on reduction on emissions from mobile and stationary sources, in order to improve air quality. The policy also aims to integrate air quality considerations into other policy areas, particularly transport and energy use.

19.4.3 The Sixth Environment Action Programme (6^{th} EAP), "Environment 2010: Our future, Our choice" (Ref. 1) provides the EC's environmental policy up to 2012. The main objective of the 6^{th} EAP with regard to air quality is to achieve levels that do not cause harmful effects either on human health or the environment.

19.4.4 The 6th EAP requires the EC to produce seven Thematic Strategies including the Air Pollution Strategy. The Commission adopted the Thematic Strategy on Air Pollution (Ref. 2) in September 2005. The aim of the Strategy is to provide a coherent and integrated policy on air pollution that specifies the priorities for future action, reviews the existing legislation and sets out long-term environmental objectives. The Strategy also aims to integrate air quality concerns in other policy areas.

19.4.5 The Clean Air for Europe (CAFÉ) (Ref. 3) programme was launched in 2001 and underpins the policy framework presented in the Thematic Strategy on Air Pollution. The Commission's Directive on ambient air quality and cleaner air for Europe, also called the CAFÉ Directive, is currently in the final stages of consultation. The Directive is aimed to fulfil one of the objectives of the Thematic Strategy, that is, to streamline air quality legislation. The CAFÉ Directive will merge the existing legal instruments and will provide an up-to-date, clear and easy to understand legal framework to realise the objectives of the Thematic Strategy on Air Pollution.

National Policy and Legislation

19.4.6 The Environment Act 1995 (Ref. 4) and the associated Air Quality Strategy (AQS) (Ref. 5) sets out the strategic framework for air quality policy in the UK. Part IV of the Environment Act 1995 places a statutory duty on local authorities to periodically review and assess the current and the future air quality within their area. The Air Quality Standards (England) Regulations 2007 (Ref. 6) came into force on 15^{th} February 2007. This brings together in one statutory instrument the Governments requirements to transpose the separate EU Daughter Directives into national legislation through a single consolidated statutory instrument, which is fully aligned with proposed new EU Air Quality Directive (CAFÉ).

19.4.7 The EC has produced air quality legislation which is binding for member states. A summary of the relevant air quality legislation is provided below:

a. Council Directive 96/62/EC on ambient air quality assessment and management commonly referred as the 'Air Quality Framework Directive'. It provides the framework for the assessment and management of air quality in the Member States. It lists the air pollutants for which statutory standards and limit values will be developed and incorporated in the subsequent legislation called the 'Daughter Directives';
b. Council Directive 1999/30/EC, also called the 'First Daughter Directive', prescribes limit values for sulphur dioxide, nitrogen dioxide and oxides of nitrogen, particulate matter and

lead in ambient air. It deals with both PM_{10} and $PM_{2.5}$ only in terms of the monitoring requirements;

c. Directive 2000/69/EC, the 'Second Daughter Directive' prescribes limit values for benzene and carbon monoxide;

d. Directive 2002/3/EC, the 'Third Daughter Directive' established target values and long term objectives for ozone. As ozone is a secondary pollutant formed in the atmosphere by the chemical reaction of hydrocarbons and nitrogen oxides ion the presence of sunlight. Therefore, the directive also described monitoring requirements for volatile organic compounds and nitrogen oxides; and

e. Directive 2004/107/EC, the 'Fourth Daughter Directive', completes the list of pollutants initially described in the Framework Directive. It contains target values for arsenic, cadmium, nickel and polycyclic aromatic hydrocarbons (PAHs). The limit values for mercury are not yet defined and for PAHs the target value is defined in terms of benzo(a)pyrene, treated as a marker substance for PAHs. Monitoring requirements for mercury are specified.

Air Quality Strategy

19.4.8 The Air Quality Strategy (AQS) provides the over-arching strategic framework for air quality management in the UK and contains national air quality standards and objectives established by the Government to protect human health. The objectives for ten pollutants have been prescribed within the AQS (benzene, 1,3-butadiene, carbon monoxide, lead, nitrogen dioxide and oxides of nitrogen, ozone, sulphur dioxide, particulates - PM_{10} and $PM_{2.5}$, and PAHs – Polycyclic Aromatic Hydrocarbons). The objectives for NO_2 and PM_{10} which are to be assessed in this Chapter are shown below in Table 19.1.

Table 19.1 - Air Quality Objectives

Pollutant	Objective	Concentration measured as	Date to be achieved by and maintained thereafter
Nitrogen dioxide	200 $\mu g/m^3$, not to be exceeded more than 18 times a year	hourly mean	31st December 2005
	40 $\mu g/m^3$	annual mean	31st December 2005
Particles (PM_{10})	50 $\mu g/m^3$, not to be exceeded more than 35 times a year	24 hour mean	31st December 2004
	40 $\mu g/m^3$	annual mean	31st December 2004

Local Air Quality Management

19.4.9 All local authorities are required to assess air quality in relation to the objectives set out in the AQS and work to achieve these objectives. The regime is known as Local Air Quality Management (LAQM), and the process of assessment is referred to as Review and Assessment. Where the LAQM Review and Assessment process finds that pollutant concentrations are unlikely to meet the AQS objectives by their target dates in areas where the AQS objectives apply, the local authorities are required to declare an Air Quality Management Area (AQMA) under Section 83(1) of the Environment Act 1995, and produce an Action Plan to achieve the objectives. The current position of Halton Borough Council (the Council) in relation to the LAQM Review and Assessment process is detailed in Section 19.1.

19.4.10 The air quality objectives applicable to LAQM are set out in the Air Quality Regulations 2000 and the Air Quality (Amendment) Regulations 2002. The objectives for NO_2 and PM_{10} are shown in Table 19.1. The Air Quality Regulations 2007 include objectives for Arsenic, Cadmium and Nickel, and $PM_{2.5}$. However, the AQS does not contain objectives for these pollutants and local authorities are not currently required to assess against these. The UK Government and the Devolved Administrations have set new national air quality objectives for $PM_{2.5}$. These objectives have not been incorporated into LAQM Regulations, and authorities have no statutory obligation to review and assess air quality against them.

Planning and Air Quality

19.4.11 The Government has provided additional policy guidance (LAQM.PG(03)) (Ref. 7) that emphasises the integration of air quality considerations into other policy areas, particularly the land use planning. It clearly recognises land use planning to have a significant role in terms of reducing population exposure to elevated levels of pollution. It suggests that the decisions made on land use allocation could play a major role in improving the health of the population, particularly in the sensitive areas - where likelihood of exposure to pollutants is higher.

19.4.12 The planning guidance issued at national level such as the recent Planning Policy Statement 23 (PPS23) on Planning and Pollution Control explicitly states that air quality can be a material consideration in planning decisions. The following provides an extract of the existing planning policy context of such issues set down within the PPS23 and its Annex 1: “Pollution Control, Air and Water Quality”:

“…..Any air quality consideration that relates to land use and its development is capable of being a material planning consideration. Wherever a proposed development is likely to have significant air quality effects, close co-operation between Local Authorities and those with responsibilities for air quality and pollution control will be essential.”

“……More weight will generally need to be given to air quality considerations, for example, where a development would have a significant effect on air quality inside, or adjacent to, an AQMA. But air quality considerations can also be important even where existing levels of air pollution are not sufficient to justify AQMA designation.”

Regional Policy

19.4.13 In 2003, the North West Regional Assembly adopted the Regional Planning Guidance for the North West, RPG13 (RPG) (Ref. 8). The RPG provides a policy framework for sustainable development within the North West of England and contains *‘securing better air and water quality’*, as one of the core development principles. The specific policy on air quality, Policy EQ2, states:

“The NWRA and the Environment Agency (EA) will take measures to improve air quality in the North West and co-ordinate action to monitor air quality in line with the Regional Sustainable Development Framework 56. Development and local transport plans should:

a. *Include air quality criteria and proposals to reduce or reverse the growth in road traffic and encourage greater use of public transport, walking and cycling*;
b. *promote more sustainable and healthier patterns of development in line with the Core Development Principles; and be linked to any air quality action plans;*
c. *Local authorities should work together with their partners to tackle poor air quality and reduce emissions; and*
d. *Designate Air Quality Management Areas, where required, as part of the local air quality management process.”*

19.4.14 The RPG requires the development plans to integrate air quality considerations. It suggests that the availability of information regarding the effects would assist in more sustainable patterns of development. The strategy recognises the importance of road traffic in air pollution and suggests that modal change, lesser use of vehicles, cleaner fuels and technology could reduce the effects (Ref. 8).

19.4.15 Currently, a revised draft of the Regional Spatial Strategy for the North West (Ref. 9), called the North West Plan, has been published for consultation. Once adopted, it will replace the current RPG for the North West. The draft strategy recognises the need to improve the air quality in the region and as such air quality management is part of many policies contained within the document such as those listed below:

a. Regional Spatial Framework Policy RDF2: "*Plans and Strategies should give priority to the development of public transport community and demand responsive transport, in particular, those providing access from rural hinterlands to key service centres. A strategic approach to traffic management should be adopted which aims to improve safety on rural roads, maintain the tranquillity of the countryside, improve local air quality and protect the local environment*";
b. Regional Public Transport Framework Policy RT1: "*The Public Transport Framework provides the basis for a consistent approach to the development of a high quality, integrated public transport network for the region. Plans and strategies should aim to reduce overcrowding in the key regional public transport corridors* [including Runcorn and Widnes] *and to maintain and improve links which support the delivery of wider economic development and regeneration objectives*"; and
c. Environmental Enhancements and Protection Policy EM17: "*Local authorities should work with stakeholders in the preparation of sub regional studies of renewable energy resources so as to gain a thorough understanding of the supplies available and how they can best be used to meet national, regional and local targets. Proposals and schemes for renewable energy, whether for generation or heating, will be supported where they provide mitigation on the impacts of wider environmental, economic and social dis-benefits*".

19.4.16 The Regional Public Transport Framework Policy RT1, described above, is reflected in one of the objectives for the Project. That is to relieve the congested SJB, thereby removing the constraint on local and regional development and better provide for local transport needs. Regional NOx and PM_{10} emissions from the Project will be assessed to determine whether such changes in emissions are, in part, due to an improvement in congestion.

Sub-regional Policy

19.4.17 The first Local Transport Plan for Merseyside was jointly produced by Merseytravel and five local authorities Knowsley, Liverpool, Sefton, St. Helens and Wirral for the period 2000-2006. The second LTP has been submitted to the Department for Transport covering the period 2006-2011. The LTP recognises the effect of transport on air quality, and one of the objectives of the plan states '*Whilst the economic regeneration of Merseyside is a primary objective of the LTP, the need to balance this against the consideration of poor air quality and noise pollution is recognised'.* The LTP also outlines a number of measures to mitigate air and noise pollution from road traffic and sets out air pollution reduction targets in areas of already poor air quality by adopting appropriate transport policies. Overall, the aim of the LTP with regards to air quality is to "*manage demand for transport and the growth of traffic to limit the need for further AQMAs to be declared and to take actions to reduce the effects of traffic*". The outcome of this assessment will highlight whether such aims can be achieved (in part) by way of the Project, whilst additionally providing an assessment of associated changes in air quality (positive or negative) upon completion of the Project in 2015.

Local Policy

19.4.18 Local authorities were required under the provisions of the Town and Country Planning Act 1990 (as amended by the Planning and Compensation Act 1991) to produce Local Development Plans, also called Unitary Development Plans (UDP). The plans are required to provide a policy framework for local development, coordinating development and giving public and other stakeholders an opportunity to be involved with the local planning policies and decisions.

19.4.19 The Planning and Compulsory Purchase Act 2004 introduced a new planning system for the local authorities termed ‘Local Development Framework (LDF)’. Under this system local authorities are required to produce a number of Development Plan Documents. Many local are in the process of producing their LDFs. In many instances the Local Development Plan, produced under the previous regime, are saved and are treated as a Development Plan Document within the new regime.

19.4.20 In many instances the local authorities, in addition to Local Development Plans, also issue the ‘Supplementary Planning Guidance Notes’ to complement the policies in the Plan on issues of specific local interest and significance.

19.4.21 The following Section sets out the policies of the Council that are relevant to the assessment of air quality and which are expected to be applicable to the Project.

The Council’s Policies

19.4.22 The Halton Unitary Development Plan (UDP) (Ref. 10) was adopted in April 2005. The UDP provides the basis for development within the Borough to 2016. Air quality is included in the strategic policy, S4 Pollution and Health that states:

“Development will not be permitted if it is likely to have an unacceptable effect on levels of air, surface water or ground water pollution, or ground contamination or noise or visual intrusion by artificial light.”

19.4.23 Due to its strategic importance for Halton Borough and the region, the UDP also contains a strategic policy on the Project, S 14 New Crossing of The River Mersey that states:

“A scheme for a new crossing of the River Mersey, east of the existing Silver Jubilee Bridge will be promoted to relieve congestion on the existing bridge as part of an integrated transport system for Halton and the wider regional transport network. Any proposed route of the new crossing will be the subject of an environmental assessment.”

19.4.24 The UDP contains specific policies on air quality in ‘Pollution and Risk Policies’ and ‘Transport Policies’:

PR1 Air Quality

“Development will not be permitted where it is likely to have an unacceptable effect on air quality. The phrase 'unacceptable effect' includes consideration of the following:

a. *Emissions which are likely to have a significantly unacceptable effect on the amenity of the local environment*;
b. *Where there is the significant possibility that public health may be affected;*
c. *Where there is a significant possibility that any proposed development will affect air quality standards;*
d. *Where there is a significant possibility that investment confidence in respect of surrounding land uses may be affected; and*
e. *An air quality assessment may be required before determining applications with a potential to pollute.”*

TP19 Air Quality

“In areas where air quality is shown to be poor due to pollution from transport sources, new development that generates traffic which will create additional pollution or intensify the pollution problem will not be permitted.”

19.4.25 Such policies, as detailed in Halton's UDP, will be assessed in the context of predicted concentrations from the Project in 2015, as detailed in Section 19.1 of this assessment.

19.4.26 In 1998 the Council was granted Unitary Authority status and was made responsible for all the highways, except trunk roads and motorways, within Halton Borough. As one of its duties, the Council submitted its first Local Transport Plan (LTP) in 2000 to the Secretary of State covering the five year period from 2001-2006. The Plan described its overarching priority as *"to develop safe, efficient and inclusive integrated transport systems and infrastructure that encourage sustainable economic growth and regeneration"*. The LTP identified the congestion on the SJB as a major contributor to the air quality hotspots in adjacent areas, and proposed a major scheme of a new crossing of the River Mersey (the River) to tackle this *"the single biggest transport issue facing the Borough"*.

19.4.27 The Council produced its second LTP, covering the five-year period between 2006 and 2011. The Plan gives due consideration to the Government's guidance and policies issued since the first LTP on local and regional transport plans and strategies. The LTP includes "Better Air Quality" as one of the shared transport priorities alongside "Tackling Congestion", Delivering Accessibility" and "Safer Roads". The *"Better Air Quality Objective"* within the LTP states: *"To address air quality issues which have an effect on health and the environment, through the management of travel demand and the provision and encouragement of environmentally sustainable travel choices"*. The consideration to better air quality is an integral part of many of the policies delineated within the second LTP. The LTP recognised congestion within the Council resulting from the single bridge over the River as one of the major contributors to air quality at hotspots and considers that the New Bridge will greatly assist to relieve congestion and improve air quality.

Climate Change:

International Policy

19.4.28 The overarching international policy framework for intergovernmental action to deal with the climate change effects is set out in the UN Framework Convention on Climate Change (UNFCCC) (Ref. 11). The convention entered into force in March 1994 and has been ratified by 191 countries. The Convention requires the governments to:

a. Gather and share information on greenhouse gas emissions, national policies and best practices;
b. Launch national strategies for addressing greenhouse gas emissions and adapting to expected effects, including the provision of financial and technological support to developing countries; and
c. Cooperate in preparing for adaptation to the effects of climate change.

19.4.29 The UNFCCC gave rise to the 1997 Kyoto Protocol that came into force in February 2005. It is an international legally binding agreement to reduce greenhouse gases (GHGs). The first stage of the protocol governs international mitigation strategies until 2012. The protocol has been ratified by 175 Parties to date, of which 36 countries and the EC are required to reduce GHG emissions by targets stated in the treaty.

19.4.30 Currently a number of international bodies including UNFCCC, Post 2012 Regime, World Bank, G8 and Asia Pacific Partnership on Clean Development and Climate, are working together to provide a framework to reduce GHGs for the second commitment period, 2013-2017. This has initiated the work, discussion and input from national and regional bodies to produce the policies and targets for GHGs reduction.

European Policy

19.4.31 The Kyoto protocol requires 15 Member States (pre-2004) to cut GHG emissions by 8% below 1990 levels by 2008-2012. Drawing from the international agreement and from commitment to tackle climate change the EC has provided a number of initiatives laying down the general and sector specific policy framework, strategies and targets for action.

19.4.32 In 2000 the EC launched the European Climate Change Programme (ECCP). The programme has resulted in the adoption of a wide range of policies and measures including the pioneering EU Emissions Trading Scheme (ETS). ECCP II started in 2005 and reviews what has been achieved in ECCP I and focuses more on the measures such as carbon capture and storage, inclusion of transport sector in ETS and adaptation policies.

19.4.33 The following are the other important initiatives at EU level:

a. EU Directive on Energy Performance of Buildings;
b. EU Directive on the Promotion of Electricity from Renewable Energy Sources in the Internal Electricity Market;
c. Directive on Energy End-use Efficiency;
d. Combined Heat and Power (CHP) Directive; and
e. SEA (Strategic Environmental Assessment) Directive.

19.4.34 The EU has issued a Communication in 2007 "Limiting Global Climate Change to 2° Celsius: The way ahead for 2020 and beyond." The Communication outlines a number of EU proposals and actions for developed and developing countries to limit climate change. The document is also intended to be considered in the development of international policy for the second commitment period after the Kyoto Protocol expires in 2012.

National Policy

19.4.35 The Government, due to its international and European obligations aims to cut CO_2 emissions by 60% by 2050 based on current levels (Ref. 12). To achieve this and reductions for other climate pollutants, Greenhouse Gases, the Government has laid down a number of general and sector specific policy initiatives that encourage and guide a concerted action at the various levels, from individual to national.

19.4.36 Planning and Policy Statement 1 (PPS1): Delivering Sustainable Development outlines the over arching policies to achieve sustainable development through the planning system. Recognising the importance of climate change, the Government has recently produced 'Planning Policy Statement: Planning and Climate Change, Supplement to Planning Policy Statement 1'. This acknowledges the role of planning and sets out the policies to mitigate and adapt climate change through spatial planning. Through this PSS the Government aims to provide clear policy framework to achieve zero carbon development. The PPS sets out the role for regional and local spatial strategies to outline the framework for energy supply in their area. The local development plan documents (DPDs) are required to produce policies on the provision of low carbon and renewable sources of energy through building regulations. The PPS persuades the local planning authorities to engage with the developers to ensure the delivery of sustainable buildings. The PPS requires all the regional planning bodies and planning authorities to prepare spatial strategies that make a maximum contribution to the Government's Climate Change Programme and energy policies.

19.4.37 The PPS requires all the regional planning bodies and planning authorities to follow a number of decision-making principles. Some of the important principles are provided below:

a. The planned provision for new development and its spatial distribution should contribute to mitigating climate change through improvements in carbon performance;

b. In turn, planning authorities should prepare local development documents consistent with the regional spatial strategy (RSS);
c. New development should be located and designed to optimise its carbon performance and limit its likely contribution to carbon emissions. Specifically, substantial new development should be expected to consider and take into account the potential of decentralised energy supply systems based on renewable and low-carbon energy;
d. New development should be located and designed for the climate, and effects, it is likely to experience over its intended lifetime;
e. Climate change considerations should be integrated into all spatial planning concerns, including transport, housing, economic growth and regeneration, water supply and waste management, and not considered separately;
f. Mitigation and adaptation should not be considered in isolation of each other, and opportunities for their integration in the development of spatial strategies, and their delivery, should be maximised; and
g. Sustainability appraisal (incorporating strategic environmental assessment) should be applied so as to shape planning strategies and policies that support the Key Planning Objectives set out in this PPS. Weight should be given to securing benefits which, although not immediately available, would help deliver longer term sustainability.

19.4.38 The following are the important general and sector specific policy initiatives produced at the national level to mitigate and adapt the climate change effects:

a. Draft Climate Change Bill;
b. UK Climate Change Programme;
c. UK Climate Effects Programme;
d. UK Sustainable Development Strategy;
e. Climate Change & Sustainable Energy Act;
f. Emissions Trading;
g. The Energy White Paper;
h. Energy Efficiency Implementation Plan;
i. Renewables Obligation;
j. Planning Policy;
k. Climate Change Levy;
l. Home Energy Conservation Act;
m. Fuel Poverty Strategy;
n. Housing Act 2004; and
o. Building Regulations and Housing Standards.

Regional Policy

19.4.39 North West Regional Assembly and other regional partners have produced the policy and action framework ‘Rising to the Challenge – A Climate Change Action Plan for England’s North West 2007-2009’. The Plan set out the targets to be achieved by 2020 in terms of mitigating and adapting the climate change effects within the region.

19.4.40 The North West Sustainable Energy Strategy, produced in 2006, provides the policy framework to deal with the future energy demand in the region while considering the climate change effects.

19.4.41 Headed by Sustainability Northwest, a number of stakeholders including Environment Agency, the Government Office for the Northwest, Liverpool City Council, Manchester Airport, the Northwest Regional Development Agency, the North West Regional Assembly, Pilkington, Renewables Northwest and Siemens, have produced the Northwest Climate Change Charter in 2006. The Charter provides policy actions to cut carbon emissions and tackle climate change by public and private sector organisations in the region and contribute towards the national targets for CO_2 emissions reduction.

19.4.42 The impact of the Project will be assessed against these goals by way of a regional air quality assessment. This will compare annual CO_2 emissions predicted using the Do-Minimum and Do-Something assessment scenarios from the modelled road network.

Local Policy

19.4.43 The 'Nottingham Declaration' on climate change is one of the important milestones for the local authorities in the UK to show their commitment to tackle climate change. The declaration was launched in October 2000 at a conference in Nottingham, attended by approximately 200 delegates local authorities across the UK (and subsequently re-launched in 2005 at the Second National Council's Climate Conference). The declaration is a voluntary commitment to address the issues of climate change at the local scale. The main purpose of the declaration is to recognise the importance of climate change impacts and to raise the awareness and need for local action in order to assist the UK government (UK Climate Change Programme) to fulfil its international commitments (Kyoto Protocol) to reduce emissions of Green House Gases (GHGs). Additionally, the local action on climate change could bring social, environmental and financial benefits for the local authority. Currently, more than 200 local authorities in the UK are signatory to this declaration.

19.4.44 The Agenda 21 of the Rio Earth Summit in 1992 outlined 2500 actions for realising sustainable development. Two thirds of these actions relate to local authorities. Therefore, many of the local authorities have produced their Local Agenda 21 (LA21) strategies to achieve the objectives of Agenda 21.

19.4.45 All the local authorities in the region are required to act to realise the objectives of the 'Climate Change Action Plan for England's North West'.

The Council

19.4.46 The Council has committed itself in its Corporate Plan to employ the principles of sustainable development in all its work. The Council produced its Local Agenda 21 Strategy 'Action Plans for Halton 2000'. The Plan deals with the issues of sustainable development with inherent links to climate change.

19.4.47 The Council has signed the Nottingham Declaration and the Northwest Climate Change Charter. The Council is currently in the process of developing a local climate change strategy.

Construction Dust: Policy and Guidance

19.4.48 Dust is defined as airborne or deposited particulate matter up to 75 µm in diameter (according to BS6069 (Ref. 13)) and constitutes one of the most common forms of nuisance alongside noise and odour.

19.4.49 The Environmental Protection Act 1990 (Ref. 14) and Clean Air Act 1993 (Ref. 15) provide the statutory basis to protect the residents and the natural environment in the vicinity of development sites from pollution. Dust has been defined as a statutory nuisance under Part III of the Environmental Protection Act.

19.4.50 There are no nationally adopted UK, European, or World Health Organisation (WHO) assessment criteria for nuisance arising from the deposition of dust. Custom and practice criteria are applied in accordance with the monitoring methods used, which vary according to the specific requirements of any monitoring strategy put in place.

19.4.51 The Interim Advice Note 61/05 (Ref. 16), issued by the Highways Agency discusses the potential harmful effects of air pollution, including the dust generated from construction related activities, upon ecosystems and provides guidance on the effects assessment. The advice note requires the locations of any designated species or habitats within 200 m of a construction site to be clearly identified and rigorous mitigation measures applied.

19.4.52 The other main guidance and policy documents used for the assessment of nuisance dust and PM_{10} are listed below:

a. Planning Policy Statement (PPS) 23: Planning and Pollution Control, and its Annex 1: Pollution Control, Air and Water Quality. PPS 23 defines the Government's policies on planning and pollution control;
b. CIRIA (Construction Industry Research and Information Association) guidance C650 – Environmental good practice on site. The guidance describes the potential nuisance dust effects from developments on sensitive receptors, human and ecology, and identifies the best practice and mitigation measures to minimise the harmful effects;
c. NSCA (National Society for Clean Air and Environmental Protection, now Environmental Protection UK) – Development Control and Planning for Air Quality. The document provides the good practice guidance to minimise the environmental effects from construction and demolition activities; and
d. Other useful publications related to the assessment and minimising the dust effects from development related activities include the BRE (Building Research Establishment) publication 'Control of dust from construction and demolition activities' and the best practice guidance produced by GLA (Greater London Authority) and London Councils titled 'the control of dust and emissions from construction and demolition'.

19.5 Assessment Methodology

19.5.1 This Section sets out the methods followed to assess the air quality effects from the Project. This includes the methods used to determine the existing (baseline) conditions, the effects during construction in 2011, and the effect on air quality in 2015 with and without the Project (Do-Minimum and Do-Something), based on monitoring data, dispersion modelling and professional judgement. The model set-up is detailed, including the road traffic network, the source emissions, background concentrations and meteorological data used in the assessment.

Potential Effects during the Construction Phase of the Project

19.5.2 Construction sites have historically been a significant source of dust emissions at the local level, primarily due to mechanical handling operations and haulage of material on un-surfaced roads during a typical working day, but also from storage stockpiles over a 24-hour period. However, with improvements in understanding of dust occurrence from construction sites, and the use of appropriate mitigation methods, dust issues arising from construction-related activities can be significantly reduced.

19.5.3 Dust particles generated from some activities, such as tail-pipe emissions from construction traffic and onsite construction machinery can be much smaller in size than those particles associated with the mechanical break up of material. For example, particles smaller than 10 µm diameter are termed PM_{10} and have been associated with many harmful effects on human health, such as cardiovascular and respiratory diseases (Ref. 17). Statutory objectives have been prescribed in Regulations for this pollutant.

19.5.4 Mechanical processes result in a particle size distribution that is heavily weighted towards the larger particle sizes (> 75µm), and are consequently regarded as more a nuisance than a health hazard. A number of site-specific activities during construction can result in significant amounts of dust if appropriate mitigation measures are not employed. Generally, these dust emissions are uncontrolled and are termed as 'fugitive'. These emissions are not easily quantifiable and this assessment mainly draws upon practical experience gained from similar studies elsewhere.

19.5.5 Airborne dust can be deposited through gravitational settling, and known as "wash-out" during rainfall. Deposition of construction dust has the potential to cause nuisance and inconvenience through the soiling of sensitive surfaces such as windows, painted surfaces and cars. Dust deposition can also damage vegetation by affecting photosynthesis, respiration and transpiration thereby reducing the overall productivity of plants.

19.5.6 The PM_{10} fraction of dust can worsen pre-existing respiratory diseases, enhance sensitivity to allergens and may also have implications for cardiovascular health. Construction dust particles are generally larger in size and are therefore not as harmful as smaller particles, which can penetrate further into the lung. Dust particles are generally within the size range 1µm to 75µm diameter. According to a recent draft report by the Air Quality Expert Group (AQEG), typically 15 – 45% of construction dust is emitted as PM_{10} (less than 10µm diameter), with construction activities estimated to account for approximately 2% of the total PM_{10} emissions in 2001 in the UK (Ref. 18). The estimates for construction related PM_{10} emissions are relatively uncertain and are currently being investigated further to improve their accuracy. However, Defra's latest e-Digest of Environmental statistics recognises it as a major source for PM_{10} emissions (Ref. 19).

19.5.7 Re-suspension of dust from road transport constitutes a significant contributor to PM_{10} emissions. A review of emissions between 1970 and 2005 suggests that re-suspension of PM_{10} accounted for 21 kilo tonnes in 2005 compared to 150 kilo tonnes of PM_{10} emissions from all other sources in the UK (Ref. 20).

19.5.8 The potential area of effect of PM_{10} arising from construction sites is discussed in the current Technical Guidance (LAQM.TG(03)) on air quality assessment issued to local authorities throughout the UK . The approach is one that considers the uncontrolled (fugitive) emissions arising from quarries/landfill sites/opencast coal/handling of dusty cargoes at ports, etc. and is wholly applicable to the use of construction sites. The approach recognises that the key issue in identifying the risk of elevated PM_{10} levels is that of the local contribution (increment) made by local activities above that of naturally occurring background levels of PM_{10}.

Potential Effects during the Operational Phase of the Project

19.5.9 The main constituents of vehicle exhaust emissions, produced by the combustion of hydrocarbon fuel in the presence of air, are carbon dioxide (CO_2) and water vapour (H_2O). However, combustion engines are not perfectly efficient and partial combustion of fuel results in emissions of carbon monoxide (CO), particulates, hydrocarbons and Volatile Organic Compounds (VOCs). In addition, some of the nitrogen in the air is oxidised under the high temperature and pressure during combustion. This results in emissions of oxides of nitrogen (NOx). NOx emissions from vehicles predominately consist of nitric oxide (NO), but also contain nitrogen dioxide (NO_2). Once emitted, NO can be oxidised in the atmosphere to produce further NO_2.

19.5.10 The quantities of each pollutant emitted depend upon the type and quantity of fuel used, engine size, speed of the vehicle and the type of emissions abatement equipment fitted. Once emitted these pollutants disperse in the air; pollutant concentrations generally decrease further from the road until concentrations reach background levels.

19.5.11 The pollutants commonly associated with road traffic emissions are nitrogen dioxide (NO_2), fine particulates (PM_{10}), carbon monoxide (CO), 1,3-butadiene and benzene, as well as carbon dioxide (CO_2). This air quality assessment focuses on the pollutants NO_2 and PM_{10} as these are the least likely to meet their AQS objectives in the vicinity of roads. This is demonstrated by the LAQM review and assessment process. The latest statistics regarding AQMAs show that 214 Local Authorities in the UK have declared an AQMA for one or more pollutants (Ref. 21). The data for these AQMAs for various pollutants is provided in Table 19.2.

Table 19.2 - Number of Local Authorities Declaring AQMAs based on pollutant type

Pollutant	No. of Local Authorities declaring AQMA
NO_2	195
PM_{10}	72
SO_2	11
Benzene	1

19.5.12 Further details of the pollutants associated with road traffic emissions is provided below:

a. Nitrogen oxides (NOx). This term covers both nitric oxide (NO) and nitrogen dioxide (NO_2). Nitrogen dioxide is the pollutant of concern at the local level. It is an irritant gas, affecting the lungs. Asthmatics are considered to be the most sensitive to this pollutant, along with children and the elderly who may be at increased risk of respiratory infection. On a regional scale, NOx emissions contribute to the formation of photochemical smog, ozone and acid rain. Nitrogen oxides at a local level are mostly associated with the combustion of fossil fuels such as during power generation, and more significantly from road traffic emissions;
b. Fine Particles (PM_{10}). Fine particulate matter, often referred to as PM_{10} (particles less than 10 micrometers in diameter) can cause inflammation of the airways. Particles may aggravate existing heart and lung conditions, and may enhance the sensitivity of hay fever sufferers to allergens. On a local and regional scale, the main sources of

particulates are road transport (combustion and re-suspension), stationary sources (domestic coal burning), and industrial processes. However, long range transport and secondary formation of particulates are also known to be significant sources. Modern aircraft and petrol fuelled vehicles generally emit very low levels of particulates;

c. Carbon dioxide (CO_2). Carbon dioxide is the pollutant most widely recognised as a greenhouse gas and plays a major role in global warming and climate change. There are no known health effects of carbon dioxide at the local level; and
d. Hydrocarbons (HC). There are a wide range of compounds within this category, many of which contribute towards the formation of photochemical smog at the regional scale. On a local level, hydrocarbons such as benzene, are linked to human health effects and certain hydrocarbons may give rise to odours.

19.5.13 There are unlikely to be any significant effects at the local level arising from emissions of benzene, 1,3-butadiene, carbon monoxide, lead or sulphur dioxide. It is widely acknowledged that problems with these pollutants are only likely to occur in the vicinity of specific industrial sources. The local air quality has therefore focused upon the emissions of nitrogen oxides (NOx) and particulate matter (PM_{10}) including construction dust, whilst emissions of carbon and carbon dioxide (CO_2) have been estimated for the assessment of effects on regional air quality between the baseline (2006), future Do-Minimum (2015) and future Do-Something (2015) scenarios.

Assessment Scenarios

19.5.14 The scenarios to be assessed for air quality effects are as follows:

a. Existing scenario – representing the current baseline conditions for year 2006;
b. Do-Minimum future Scenario (2015) – the proposed scheme is not in place. The modelled road layout is the same as that modelled for 2006 but traffic growth due to committed development and regional growth are included; and
c. Do-Something future scenario (2015) – the proposed opening year for the Project, with the new road layout and the Project completed.

19.5.15 An existing (2006) scenario has been established in order to verify the model setup against monitored data in 2006. The results of the Do-Minimum and the Do-Something scenario have been compared in order to determine the air quality effect of the Project. The term “Do-Nothing” has been replaced with the term “Do-Minimum” throughout the air quality assessment to reflect the change in traffic flows in 2015 even without the Project.

19.5.16 The air quality assessment has not considered the effect of traffic emissions from the Project in 2030. This is because background concentrations and vehicle emission rates for both NOx and PM_{10} are currently only available until 2020. Moreover, the assessment on emissions in 2015 is considered to be worst case, with any increases in traffic in 2030 compared to 2015 likely to be offset by decreases in vehicle emission rates and background concentrations.

19.5.17 The rest of this Section sets out the methods followed to assess the air quality effect of the Project. This includes the methods used to determine the existing (baseline, 2006) and potential effects on air quality during construction (2011), as well as the future air quality (Do-Minimum and Do-Something, 2015), based on both monitoring data and dispersion modelling. The model set-up is detailed, including the road traffic network, the source emissions, background concentrations and meteorological data used in the assessment.

Assessment of Effects during Construction

19.5.18 The potential effects on air quality during the construction phase are:

a. Dust from construction activities;

b. Emissions from construction related traffic;
c. Disrupted traffic on the local road network may lead to increased emissions; and
d. Emissions to air as a result of contaminated land and waste.

19.5.19 In accordance with the procedure for assessing the effects from construction dust, as detailed in Volume 11 Section 3 of the DMRB (Ref. 22), the assessment of effects during construction has focused on those receptors and designated sites within 200m of the proposed activities. Such construction dust "footprints" will allow specific areas to be identified where there may be an increased likelihood for dust effects to occur as a result of the construction associated with the Project and the New Bridge. Furthermore, identifying such areas will provide focus in relation to mitigation measures and any ongoing monitoring requirements.

19.5.20 Emissions from construction activities have also considered the handling of contaminated and waste materials. Such emissions are mentioned here in the broader context of the potential effects on air quality as a result of construction. However, the direct risks to the environment and other receptors predicted to result from contaminated land and waste arising from the construction are dealt with more thoroughly in the Chapters 14 and 15, respectively.

19.5.21 In general, it is not possible to quantify the emissions from construction activities with reasonable certainty due to the varied nature of the emitting sources. Furthermore, as mentioned earlier, there are no statutory standards or guidelines relating to surface soiling effects. As such, a qualitative assessment has been carried out to determine the potential effects from construction dust upon local sensitive receptors based on professional judgement. To assist in this assessment, Table 19.3 has been derived from a large study, carried out on behalf of Associated British Ports (ABP), on construction effects (Ref. 23). The table sets out distances where a significant effect or dust nuisance may occur as a result of construction. The distances provided take account of mitigation measures which would be employed in order to reduce the potential effect of construction activities. As such, the distances over which effects may occur would be greatly increased (up to 500 m for soiling effects) if mitigation measures were not in place.

Table 19.3 - Assessment Criteria for Dust from Construction Activities, with Standard Mitigation in Place

Source		**Potential Distance for Significant Effects (Distance from Source)**		
Scale	**Description**	**Soiling**	**PM_{10}[(a)]**	**Vegetation effects**
Major	Large construction sites, with high use of haul routes	100 m	25 m	25 m
Moderate	Moderate sized construction sites, with moderate use of haul routes	50 m	15 m	15 m
Minor	Minor construction sites, with limited use of haul routes	25 m	10 m	10 m
Significance based on the 2004 objective, which allows 35 daily exceedences (per year) of 50 $\mu g/m^3$				

Emissions from Construction Related Traffic

19.5.22 The effects arising from construction traffic exhaust emissions have been assessed quantitatively by way of worst case estimates of construction traffic movements provided in Construction Methods Report (CMR). These construction traffic movements have been incorporated into a separate modelling scenario that assesses the effect in 2011 (the proposed start year for construction works). Construction access routes have been based on the access routes identified for each of the nine construction areas (Area A to Area I) discussed in Construction Methods Report.

19.5.23 The assessment of construction traffic emissions at those receptors identified adjacent to construction areas and relevant access routes has been undertaken using the DMRB (Ref. 23) local effects model. Receptors have been identified in relation to their proximity to the specific construction areas and/or access routes. As such, those receptors assessed represent a worst case assessment of emissions from construction related traffic, with equal or lower concentrations at all other receptors.

19.5.24 It has been assumed that the maximum number of vehicle movements on any one day is likely to be associated with the largest concrete pours at any of the construction areas. This would equate to approximately 150 vehicle movements within a 24 hour period. However, earthworks and demolition activities may involve up to 100 vehicle movements (tipper trucks) in a 10 hour day. As such, as a worst case assessment it has been assumed that construction activities would involve a maximum of 250 vehicle movements per day, including those vehicles involved in transporting waste materials.

19.5.25 The contribution of construction traffic emissions has been combined with the road-contributions predicted as part of the Local Air Quality assessment using ADMS-Roads. The road traffic contributions from the road network have been projected to 2011 using Defra projection factors. Background concentrations have also been considered and adjusted to 2011 as appropriate.

19.5.26 More generally, the effects arising from construction traffic exhaust emissions have also been assessed qualitatively in the context of the duration of works, the proximity to any sensitive locations and relevant mitigation measures.

19.5.27 It is understood that barges, hover barges and other similar inland shipping vessels may also be used to transport materials and/or personnel as part of the construction phase of the Project e.g. the Bridgewater Canal may be used during the construction of the Bridgewater Junction. However, emissions from these vessels have not been considered as part of this assessment since the total emissions from inland shipping are negligible in the UK in comparison to other sources (Ref. 24) and are required by the EC Directive on Standards for Inland Waterways Vessels (Ref. 25) to meet the latest emission standards. Where vessels are exempt from this Directive, emissions will be in line with equivalent UK standards for non-passenger vessels.

Disruption to Traffic on the Local Road Network

19.5.28 The effects arising as a result of disruption to traffic on the local road network have been assessed qualitatively in the context of existing traffic volumes and the implementation of traffic management measures throughout the construction phase of the Project.

Contaminated Land

19.5.29 The effect of contaminated land on air quality has been assessed qualitatively in the context of the proposed construction works. The key elements to this assessment have involved identifying the nature of the contaminated land, its proximity to sensitive receptors and/or construction work areas, and the methods employed to dispose of such wastes i.e. transportation issues. More detail regarding the issues of contaminated land at the Project are provided in the Chapter 14.

Waste and Recycling

19.5.30 The effect of waste and recycling on air quality has been assessed qualitatively in the context of the proposed construction works. Where necessary, the effect of waste has been considered in the context of any contaminated land issues, as well as in relation to more general issues regarding the storage and/or transportation of wastes off site or for reuse on site. More detail regarding the issues of waste and recycling for the Project are provided in Chapter 15.

Assessment of Effects during Operation

19.5.31 The assessment of effects during the operation of the Project has been based on both ambient monitoring data and modelled results. Monitoring data was considered when deriving background concentrations and was used to verify the model output. More details relating to air quality monitoring data, background concentrations, model inputs and model verification are provided in the following sections.

Ambient Air Quality Monitoring

19.5.32 Air quality monitoring data have been used to assess the existing ambient air quality within the study area. Both real-time continuous analysers and passive diffusion tubes (for nitrogen dioxide) have been used. Data have been collated from the existing air quality monitoring network managed by local authorities and also from a monitoring survey carried out specifically for the Project. Monitoring data have also been used to verify and adjust the dispersion results. All monitoring sites used in the assessment are described below.

The Project Diffusion Tube Survey

19.5.33 Although the Council and other neighbouring authorities have established on-going air quality monitoring sites, this effect assessment requires site-specific measurements of pollution. This was undertaken through the use of a single pollutant as a 'marker'. Nitrogen dioxide (NO_2) is the main pollutant associated with air quality problems and road traffic. The use of 23 Palmes-type diffusion tubes along the preferred route corridor (on the north and south of the River) has provided appropriate data for verification of model predictions. Palmes-type diffusion tubes are commonly used throughout the UK for indicative measurements of ambient NO_2. The Palmes-type passive sampler consists of a tube, open at one end, with an absorbent at the other (closed) end for absorption of a specific pollutant from the surrounding air (Ref. 26). Model verification can only be undertaken using roadside monitoring sites. Diffusion tubes were co-located with suitable continuous monitoring sites in the Borough in order to establish the uncertainty in measurement associated with their use.

19.5.34 Monitoring has been undertaken on a continuous basis since March 2005 with analysis undertaken by Bureau Veritas Laboratories using the 10% TEA (Triethanolamine) in water method. Diffusion tube data for all 23 monitoring locations is available for the base year (2006). The location of these diffusion tubes (expressed as Ordnance Survey grid coordinates) are provided in Table 19.4 and illustrated in Figure 19.2 (Appendix 19.1).

Table 19.4 - The Project Diffusion Tube Survey Locations

ID	Location	X	Y
MG1	48 Cholmondeley Street, Widnes	351089.8	383944.1
MG2	Queensway southbound, Widnes	351053.3	383879.5
MG3	Queensway northbound, Widnes	351030.5	383912.1
MG4	25 Wilkinson Close, Widnes	351055.0	384051.8
MG5	31 Wright Crescent, Widnes	351069.3	384013.6
MG6	West Bank Primary School, Widnes	351058.8	383835.6
MG7	13 Waterloo Road, Runcorn	350956.8	383019.0
MG8	28 Egerton Street, Runcorn	350922.7	383056.8
MG9	Opposite 23 Ashridge Street, Runcorn	350826.1	383018.8
MG10	42 Rutland Street, Runcorn	350833.9	382982.2
MG11	Castner Avenue 'Weston Point	350193.4	381357.5
MG12	Lower House Lane Depot, Widnes (co-located in triplicate with continuous analyser)	350660.6	385221.6
MG13	Lower House Lane Depot, Widnes (co-located in triplicate with continuous analyser)	350660.6	385221.6

ID	Location	X	Y
MG14		350660.6	385221.6
MG15	Ditton Roundabout, Widnes	350695.9	384933.4
MG16	Catherine Street, Widnes	351326.1	384998.5
MG17	69 Brookfield Avenue, Runcorn	353186.6	382824.1
MG18	36 Fenwick Lane, Runcorn	352850.5	380858.7
MG19	30 Millersdale Grove, Runcorn	352563.1	380534.6
MG20	26 Steventon, Runcorn	356146.0	383640.9
MG21	Traffic Sign, Weston Point Expressway	350262.6	381254.9
MG22	Traffic Sign (at top of steps), Bridgewater Expressway	352023.1	382867.3
MG23	Traffic Sign (bridge over canal), Bridgewater Expressway	352087.9	382889.6

19.5.35 It is common practice throughout the United Kingdom for diffusion tube concentrations to be bias adjusted. Diffusion tubes are often co-located with continuous monitors in order to determine the bias of the diffusion tube measurements relative to the continuous monitor. Co-locating the diffusion tubes in triplicate also allows the precision and accuracy of the diffusion tube measurements to be determined. Bias of diffusion tubes generally depends upon the laboratory and preparation method used. The data from NO_2 diffusion tube co-location studies across the UK is collated on behalf of the Department for Environment, Food and Rural Affairs (Defra), and is available through the Defra's Review and Assessment Helpdesk (Ref. 27). This allows the calculation of a default bias factor for the period under consideration based on the laboratory used to undertake the analysis, if no local bias factor is available.

19.5.36 For this survey, monitoring data have been adjusted based on a local bias factor. Bias adjustment has been derived from the co-located diffusion tubes at the Lower House Lane continuous analyser installed by the Council. Adjusted results from the Project diffusion tube survey are provided in Table 19.4. Details of the diffusion tubes precision and accuracy are also provided.

Local Authority Ambient Air Quality Monitoring

19.5.37 Ambient air quality monitoring data has been obtained from the Council as this is the administrative area which contains the modelled road network (Do-Minimum and Do-Something). Monitoring data for NO_2 and PM_{10} has been obtained from the local authority. Only monitoring data located within the study area are reported.

19.5.38 A total of 18 NO_2 diffusion tubes from the Council have been considered in this assessment (as within the modelled area). The locations of these diffusion tubes (expressed as Ordnance Survey grid coordinates) are provided in Table 19.5 and illustrated in Figure 19.2 (Appendix 19.1). The diffusion tubes have been bias adjusted based on the co-located diffusion tubes at the Lower House Lane continuous analyser. Adjusted results are provided in Section 19.1.

Table 19.5 - The Council Diffusion Tube Locations

ID	Location	X	Y
HBC1	Saxon Road 1	351775	386100
HBC2	Deacon Road 1	351726	386125
HBC3	Carey Street	351678	386129
HBC4	Shopping Centre exit	351788	386069
HBC5	Deacon Road 2	351798	386076
HBC6	Deacon Road 3 [(a)( ]	351823	386057

ID	Location	X	Y
HBC7	Deacon Road 4 [(a)]	351823	386057
HBC8	Deacon Road 5	351801	386061
HBC9	Saxon Terrace 2	351779	386090
HBC10	Lower House Lane [(b)]	350660.6	385221.6
HBC11			
HBC12			
HBC13	Peel House Lane 1	352038	386316
HBC14	Peel House Lane 2	352046	386325
HBC15	Peel House Lane 3	352044	386290
HBC16	Milton Road 1	351387	385644
HBC17	Milton Road 2	351343	385625
HBC18	Greenway Road	351137	382679
(a) HBC6 and HBC7 = co-located tubes			
(b) Lower House Lane triplicate co-located tubes			

19.5.39 The Council also undertakes monitoring of local air quality based on a continuous monitoring analyser near Lower House Lane. This monitoring station provides real-time data, which is more accurate than diffusion tube results. The location of the continuous analyser is provided in Table 19.6 (expressed as Ordnance Survey grid coordinates) and illustrated in Figure 19.2 (Appendix 19.1). Results of monitoring data for year 2006 are provided in Section 19.1.

Table 19.6 - Halton Borough Council Continuous Analyser Location

ID	Location	X	Y	Pollutant	Station Type
HBC0	Lower House Lane	350660.6	385221.6	NO_x, NO_2, PM_{10}	Urban Background

ADMS-Roads

19.5.40 The effect of the Project on local air quality (during operation) has been assessed using the methodology outlined in the DMRB (Ref. 23). However, rather than employing the DMRB local air quality assessment screening model to predict pollutant concentrations, detailed dispersion modelling has been undertaken, using the Cambridge Environmental Research Consultants (CERC) Ltd Atmospheric Dispersion Modelling Software (ADMS)-Roads advanced Gaussian air dispersion model (version 2.2). Further details relating to ADMS-Roads and the model inputs are provided below. The ADMS-Roads model has been used for the prediction of the local air quality effects because it allows for the consideration of variable heights of roads sources and receptor heights which are important considerations when assessing the effect of the Project.

19.5.41 ADMS-Roads is the latest model in the ADMS family from CERC. Based on the ADMS-Urban system, it can model up to 150 road sources and seven industrial sources at any one time. The model has been extensively used in local air quality management, and has formed the basis for many AQMA declarations. A considerable number of validation studies have been completed, showing overall excellent agreement between model outputs and observations at continuous monitoring sites.

19.5.42 Due to the large number of links requiring assessment (as detailed earlier in this section), it was necessary to run nine separate ADMS-Roads models. However, for each separate model, the same receptors were assessed. This meant that for each receptor the effect of each model (NO_x and PM_{10} contribution from the road sources only) would be determined and the overall contributions derived by summing the predicted road contributions from all nine models.

19.5.43 ADMS-Roads was used to predict the road contribution to NOx and then, in combination with background contributions, conversion to NO_2 was undertaken based on the updated method provided on behalf of Defra (2007) (Ref. 28). This is an updated method to that incorporated into the DMRB and the Local Air Quality Management Technical Guidance "TG(03) method" (Ref. 29).

Dispersion Modelling of Local Air Quality Effect

19.5.44 Dispersion modelling of the road traffic emissions has been carried out at a number of specific receptors across the area for the base year (2006) and future Do-Minimum and Do-Something (2015). Dispersion modelling allows the prediction of concentrations at any receptor, based on a series of input data such as traffic flows, emission factors of pollutants, background concentrations and meteorological data. The modelled results are also verified against available monitoring data and adjusted accordingly. The dispersion model used in this assessment and the description of all input data are summarised in the sections below.

Road Sources

19.5.45 Traffic data validated against observed flows has been provided for those links associated with the Project and local road network for the base year (2006). Traffic flows for future Do-Minimum (2015) and future Do-Something (2015) scenarios were based on traffic growth assumptions and reported in Chapter 16 based on the Variable Demand Model (VDM).

19.5.46 Using the criteria provided by the Design Manual for Roads and Bridges (DMRB) (Ref. 30), those links where traffic flows are predicted to change by less than ±10% between the Do-Minimum (2015) and Do-Something (2015) have been screened out of the assessment, except where they form part of a continuous road network where other links have been modelled. The modelled road links are illustrated in Figure 19.3 (Appendix 19.1) for the base year 2006 and Do-Minimum 2015, and Figure 19.4 (Appendix 19.1) for Do-Something 2015.

19.5.47 The road links considered in the base year (2006) and the Do-Minimum (2015) scenarios are identical and only differ in traffic flow assumptions, while the Do-Something (2015) scenario includes changes in existing junctions and roads, and therefore also differ in the total number of links.

19.5.48 All road links have been digitised and entered in the dispersion model. Parameters such as road width and road height have been estimated and averaged based on a Geographic Information System (GIS) for all links. In areas where road width or height varies rapidly, the road links have been split to allow a more accurate modelling of the road network. However the model has been simplified and only 3 different heights have been modelled (3m, 6m and 9m). Overall, the model includes 1,060 road links for the base year (2006) and Do-Minimum (2015) scenarios, and 1,071 road links for the Do-Something (2015) scenario.

Traffic Data

19.5.49 Modelled traffic flows on the M56 south of Runcorn and the surrounding road network have been provided in Chapter 16. The following traffic data was supplied for all the road links affected by the options and for all three scenarios:

a. Annual Average Daily Traffic Flows (AADT). These are the annualised average 24-hour volume of vehicles along a section of road;
b. The average vehicle speeds (in kilometres per hour) of vehicles travelling on a section of road; and
c. Proportion of Heavy Duty Vehicles (HDV). These include buses/coaches, as well as rigid and artic heavy goods vehicles (HGV), with 2 axles or more.

19.5.50 Figures 19.5, 19.6 and 19.7 (Appendix 19.1) illustrate the annual average daily traffic flows for each scenario (respectively Base year 2006, Do-Minimum 2015 and Do-Something 2015). Appendix 19.2 provides a tabular summary of all modelled traffic flows used within this assessment including the proportion of heavy duty vehicles (HDV) and speeds on each road link.

19.5.51 Annual average daily traffic (AADT) flows have been modelled on all roads included within the assessment area. The AADT was derived from the transportation modelling which incorporated peak hour traffic flows on all links. The hourly pattern of traffic flows on roads has not been included within the dispersion model. The dispersion modelling results are used to predict annual average pollutant concentrations and these in turn have been verified against baseline monitoring in order to ensure the output of dispersion modelling results provides representative air quality baseline predictions. Model verification is described later in this section.

Emission Factors

19.5.52 The emissions factors incorporated into ADMS-Roads (v2.2), which were used to calculate the NO_x and PM_{10} emissions for each road link in the assessment are the most up-to-date emission factors available. These factors, released in 2003 by Defra and Department for Transport (DfT), are the same as those calculated with the Emission Factors Toolkit (Ref. 31) and the DMRB (Ref. 32) and are widely used throughout the UK. The emissions factors are available for three different road types which act as a proxy for the differences in fleet composition of traffic in different conditions; urban, rural and motorway. The majority of roads modelled for this assessment were assigned the emissions factors for urban roads, with the exception of the M56 which was modelled as a motorway.

19.5.53 The built-in database of emissions factors in ADMS-Roads is also a function of vehicle speed and year, and was used to calculate the overall emission rate for each pollutant and each year of assessment (2006 and 2015).

Background Concentrations

19.5.54 It is important to consider the ‘background’ component of each pollutant when undertaking an air quality assessment of this type. That is, the general level of pollutants that occur as a result of natural and/or other activities which are not associated with any direct emission. Often, the background concentrations are associated with trans-boundary transportation of aerosols (in the case of PM_{10}) and/or emissions from some distance away (e.g. power stations).

19.5.55 Background concentrations can be derived from local monitoring data where available, or from Defra’s estimated background air pollution maps available on the UK Air Quality Archive website (Ref. 33). As there was no suitable local background monitoring station, background data for both NO_2 and PM_{10} for the baseline year 2006 and future year 2015 have been derived from national background maps and using national projection factors for future years as shown in Table 19.7. For PM_{10}, background concentrations have been split between primary and secondary backgrounds before projection, as factors are different for these contributions. Further details on the background values used in the assessment are provided in Section 19.1.

Table 19.7 - Background projection factors

Projection	NO_x	NO_2	PM_{10} (primary)	PM_{10} (secondary)
2005 to 2006	0.96	0.98	0.98	0.97
2005 to 2015	0.72	0.82	0.87	0.81

19.5.56 Background concentrations have been incorporated into the model. Concentrations from 2006 have been projected to get the estimated background for future Do-Minimum and Do-Something (2015). The background values for all modelled pollutants are described in Section 16.6, and the methodology used to determine these values is provided later in this section.

Meteorological Data

19.5.57 Dispersal of pollutant emissions is entirely dependent upon the prevailing meteorological conditions at the time of emissions release. Hourly sequential meteorological data for 2006 has been used from Hawarden meteorological station situated approximately 25 km southwest of the assessment area. Shawbury meteorological station, located 60km south of Runcorn, has also been used as part of sensitivity tests. Tests showed that concentrations were slightly lower with this meteorological data, although the difference was not significant. However, Hawarden meteorological data has been used as the site is within 50km of the assessment area and is considered to be more representative of the study area.

19.5.58 The wind rose for meteorological data is illustrated in Figure 19.8 (Appendix 19.1).

Other Model Input Parameters

19.5.59 A minimum Monin-Obukhov length of 10m has been selected to represent the stability of the atmosphere due to the characteristics of the local area. The model will consider this to be the minimum height above ground level above which vertical turbulence is inhibited. A variable surface roughness length has been assigned in the model, depending on the modelled area, as provided in Table 19.8, to reflect the differences between urban areas (Runcorn, Widnes) and more open areas (North of Widnes and South of Runcorn).

Table 19.8 - Surface roughness for dispersion modelling

Modelled Area	Surface Roughness (m)
1	1
2	1
3	0.75
4	1
5	1
6	1
7	1
8	0.75
9	1

Model Output

19.5.60 The ADMS-Roads dispersion model produces modelled concentrations of NO_x and PM_{10} at specific receptors, identified for the prediction of air quality effects. Receptors have been set at a range of heights relative to the road network, typically at 1.5m above ground level.

Model Verification

19.5.61 Model verification involves the comparison of modelled concentrations to monitored concentrations based on the model setup. A number of model scenarios, including consideration of the road widths, road heights, receptors heights and other input assumptions such as background concentrations, have been carried out in order to determine the best model setup. Where necessary, a model may be adjusted based on existing measurements in order to ensure the model provided predicted concentrations which are consistent with monitored baseline data. Both predicted NO_2 and PM_{10} results have been verified with the method used described below.

NO_x/NO_2 model verification

19.5.62 The model has been used to predict concentrations of NO_x (nitric oxide and nitrogen dioxide combined) at 30 monitoring locations (including Lower House Lane continuous analyser), in order to verify the model against monitored concentrations. These monitoring sites have been used as part of the model verification due to their proximity to modelled road sources. Their locations are shown in Figure 19.2 (Appendix 19.1).

19.5.63 Verified and adjusted annual average road traffic NOx and background NOx contributions are converted to annual average NO_2 based on the updated equation provided by Defra (Ref. 29).

19.5.64 The detailed model verification and adjustment for the Project area is provided in Appendix 19.3.

19.5.65 Modelled NO_2 concentrations for 2006 have been compared with the bias corrected annual average NO_2 diffusion tube results in order to verify the model output. The results of this comparison are provided in Section 19.1.

PM_{10} model verification

19.5.66 The model has been used to predict concentrations of PM_{10} at Lower House Lane continuous analyser as shown in Figure 19.2 (Appendix 19.1) in order to verify the model against monitored concentrations. The verification results are provided in Appendix 19.3.

Assessment of Regional Air Quality Effects

19.5.67 The DMRB regional air quality assessment method has been used to predict annual emissions of NOx and PM_{10} from the local road network. Total NOx and PM_{10} emissions have been estimated using the DMRB Regional Spreadsheet for the existing road network in 2006 and with and without the Project in the modelled opening year, 2015. This method is similar to the local assessment (as such AADT, average vehicle speeds and the proportion of heavy duty vehicles are required), except that the evaluation is not made in respect to any individual receptor, but rather the length of the modelled road. The road lengths for all road links for each junction option have been calculated based on the road layout using geographical information systems.

19.5.68 Whilst climate change is recognised as a global and national issue, the impact of the Project on climate change has been assessed based on a calculation of carbon and CO_2 emissions due to traffic flows on the road network within the air quality study area. Carbon emissions have been calculated using the DMRB Regional Spreadsheet, and CO_2 emissions derived manually by multiplying the carbon emissions by $44 \div 12$ (Ref. 34).

Receptors

Construction Receptors

19.5.69 Using the nine proposed construction areas described in Chapter 2 as a basis, construction “footprints” have been defined based on a radius of 200 m. These are the areas most likely to experience deterioration in air quality as a result of construction activities (without mitigation). A qualitative assessment has been undertaken which deals with the broader issues relating to construction effects which will be relevant to all those properties defined as being within 200 m of the relevant construction areas.

a. **Area A – Main Toll Plaza**: No sensitive receptors within 200 m of proposed construction footprint;

b. **Area B – Ditton Junction to Freight Line**: Sensitive receptors along Lower House Lane, Smith Road, Egypt Street and Moor Lane;

c. **Area C – Freight Line to St Helens Canal**: Sensitive receptors within 200 m have been identified along Catherine Street, Adelaide Court, Alforde Street, Sutton's Lane, Batherton Close and Ann Street West;

d. **Area D – The New Bridge**: Wigg Island has been identified as being within 200 m of this construction area;

e. **Area E – Astmoor Viaduct**: Wigg Island has been identified as being within 200 m of this construction area;

f. **Area F – Bridgewater Junction**: Sensitive receptors to the east and west of the Central Expressway (at the junction with the Daresbury Expressway), including Castlefields Avenue, Brookfield Avenue, Dudley Avenue, Renton Avenue and Halton Brow / Boston Avenue;

g. **Area G – Central Expressway, Lodge Lane Junction and Weston Link Junction**: Sensitive receptors adjacent to the Central Expressway, specifically those adjacent to the Lodge Lane and Weston Link junctions where extensive modifications are proposed;

h. **Area H – M56 Junction 12**: Sensitive receptors to the east of the Rocksavage Expressway (e.g. Solway Grove, Ingleton Grove), and isolated properties to the west (e.g. Cholmodeley Road); and

i. **Area I – the SJB and Widnes De-Linking**: Sensitive receptors immediately to the north (Widnes) and south (Runcorn) of the River and adjacent to the Queensway Expressway.

19.5.70 All specific receptors have been identified (for the purpose of modelling the effects of construction traffic emissions) on the basis of being the closest to the relevant construction area or the closest to one or more of its access routes. As such, all those receptors selected represent a worst case assessment of the impacts on construction traffic emissions on local receptors. Predicted effects from construction traffic emissions will therefore be lower at those receptors located further from each of the construction areas. Furthermore, all receptors have been identified on the basis of being "sensitive" to changes in air quality i.e. residential properties, schools, hospitals. Wigg Island has also been identified as a potential sensitive receptor given its use as a recreational area. There are no schools or hospitals within 200 m of the proposed construction areas.

19.5.71 Table 19.9 provides a summary of the sensitive receptors identified and these are also shown on Figure 19.9 (Appendix 19.1). Receptor IDs relate to those receptors identified as part of the local air quality assessment, as detailed in the following sections or in Appendix 19.4.

Table 19.9 - Construction Dust Receptors

Construction Area	Receptor ID	Receptor Name	Distance from Construction Area
Area A – Main Toll Plaza	No properties within 200 m		
Area B – Ditton Junction to Freight Line	103	Moor Lane	85 m
Area C – Freight Line to St Helens Canal	39	Batherton Close	70 m
Area D – The New Bridge	WI3	Wigg Island 3	5 m
Area E – Astmoor Viaduct	WI11	Wigg Island 11	120 m
Area F – Bridgewater Junction	473	Brookfield Avenue	55 m
	445	Warrington Road	20 m
Area G – Central Expressway, Lodge Lane Junction and Weston Link Junction	369	Cranage Close	40 m
	379	Danby Close	25 m
	390	Solway Grove	65 m
Area H – M56 Junction 12	394	Embleton Court	75 m

Construction Area	Receptor ID	Receptor Name	Distance from Construction Area
Area I – SJB and Widnes De-Linking	170	Speakman Street	10 m
	44	St Patricks Close	60 m

Sensitive Receptors

19.5.72 There are a number of sensitive receptors in proximity to the road network forming the Project which have been identified for the purposes of the local air quality assessment. Sensitive receptors are defined as locations where members of the public are regularly present and are likely to be exposed over the averaging period of the objective (which varies depending on the pollutant assessed). Typically for long-term Air Quality Strategy objectives (annual mean for both NO_2 and PM_{10}), this includes residential properties, schools, hospitals and care homes, where people are likely to be present for long periods. For short-term objectives (like the hourly mean for NO_2), this includes high streets and shopping streets. It is generally appropriate to consider the building façade to represent relevant exposure.

19.5.73 In total, 568 sensitive receptors have been included in the model set-up, of which 64 key receptors at the façade of properties have been selected to illustrate the effect of the Project on local air quality. The selected key receptors are provided in Figure 19.9 (Appendix 19.1) and in Table 19.10. As with the construction related receptors, Wigg Island has also been identified as a potential sensitive receptor given its use as a recreational area.

Table 19.10 - Location of Air Quality Key Receptors

ID	Name	X (m)	Y (m)
9	Near Unicorn Inn - Cronton Road	351801	386073
83	Ditchfield Road - Liverpool Road (Junction)	351256	385194
93	Prescot Road - Liverpool Road (Junction)	351197	384929
96	Dundalk Road - Hale Road (Junction)	351695	385075
102	Playground - Dundalk Road	351759	385633
127	Leigh Avenue - Highfield Road (Junction)	351072	383950
162	Gerrard Street - Alfred Street (Junction)	351144	382717
63	MacDermott Road	350120	382026
65	St Michael Jubilee Golf Course	350903	380310
67	Pond adjacent to Speke Road	351788	382659
105	3 Rose Street	351035	384183
147	Club - Croft Street	350905	383062
153	Victoria Road - Luton Street (Junction)	351110	382958
45	16 St Bridgets Close	353754	382967
49	52 Irwell Street	353749	379838
171	36 Egerton Street	353983	379731
192	High Street - Bridgewater Street (Junction)	354685	379647
230	49 Greenway Road	356422	380605
272	19 Percival Lane	351202	377924

ID	Name	X (m)	Y (m)
29	The Rowans - Moorfield Road	352790	381334
34	100 Page Lane	351907	382337
39	37 Batherton Close	350670	380498
275	61 Westfield Road	355853	383576
306	5 Bankes' Lane	349798	386300
309	215 Heath Road South	353475	380690
331	Adjacent Old Hall - Cavendish Farm Road	353856	380363
236	1 Sutton Street	352329	386280
242	38 Latham Avenue	352068	386299
316	Heath Road - Moughland Land (Junction)	348534	386348
346	Halton Lodge Avenue - Grangeway (Junction)	349729	385975
362	32 Handforth Lane	350403	385588
366	47 Fenwick Lane	349929	385002
371	22 Budworth Close	350711	384447
372	29 Tawny Court	348298	385236
376	35 Hawks Court	353337	382621
381	8 Danby Close	353171	382439
419	103 The Glen	353217	382756
444	198 Boston Avenue	353278	382442
446	Halton Brow - Warrington Road (Junction)	352979	380998
452	83 Calvers	352730	380787
455	24 LittleGate	353267	382175
470	26 Caesars Close	353147	381717
472	Brookfield Avenue - Between 83 and 103	353115	380696
477	Ivy House - Marsh Lane	353006	380712
505	8 Seneschal Court	352536	380551
487	36 Steventon - Sandymoor	356,071.62	383,616.78
513	Daresbury Lodge - Chester Road	353040	379977
412	Adjacent 11 Magnolia Drive	353188	381001
414	Adjacent Jericune - Wood Lane	352930	380889
417	Gladstan House - Chester Road	352425	380323
433	Aston Green - between 12 and 6	352166	380506
517	7 Williams Way	352548	387886
385	35 Lincoln Close	350916	386257
386	Close to Clifton Hall - Cholmondeley Road	350860	380527
388	Millersdale Grove - Between 34 and 44	351362	381559
392	15 Ingleton Grove	358142	383213
399	7 Dunmail Grove	350959	385255
401	17 Paddock Rise	349326	388236
HBC5	Deacon Road 2 (Diffusion Tube)	350731	382843

ID	Name	X (m)	Y (m)
142	138 Albert Road	352773	380204
WI3	Wigg Island 3	353257	383645
WI7	Wigg Island 7	353257	383645
WI9	Wigg Island 9	353446	383737
WI11	Wigg Island 11	352821	383426

Ecosystem and Designated Sites

19.5.74 The following designated sites have been identified within 200m of the modelled road network:

a. Flood Brook Clough – a deep wooded valley cutting through Keuper Marl (clay). Many of the plants present are characteristic of ancient woodland on base-rich soils, and are comparatively rare in Cheshire. This SSSI is located in Beechwood, approximately 800 m southeast of the Weston Point / Central / Central Expressway interchange; and
b. The Estuary – an internationally important site for wildfowl consisting of large areas of inter-tidal sand and mudflats, including areas of reclaimed marshland, salt-marshes, brackish marshes and boulder clay cliffs with freshwater seepages. The site extends east from St. Michaels Hamlet (Liverpool) to the western edge of the SJB.

19.5.75 In the context of those habitats described under Volume 11, Section 3 of the DMRB as requiring detailed assessment in terms of nitrogen deposition, a number of areas have been identified as falling under the following categories:

a. Temperate and boreal forests – a small stand of woodland on the south side of the Upper Mersey, planted apart from Flood Bank Clough SSSI which is some distance away;
b. Low and medium altitude hay meadows – there are no exact examples of this in the area but some of the grasslands such as those in the Haystack Lodge and Oxmoor area on the south side of the Upper Mersey are semi-improved and could be regarded as falling into this category; and
c. Pioneer and low-mid salt marshes – occurs in the SSSI/SPA downstream of the New Bridge.

19.5.76 Of the three habitats described above, only the pioneer and low-mid salt marshes fall within the Estuary SSSI and SPA sites. However, within these designations, the saltmarshes are over 200 m from the modelled road network. For the remaining two habitats, these are not associated with any particular designation and are over 200 m from the modelled road network. None of these designated sites contains those habitats described under Volume 11, Section 3 of the DMRB as requiring detailed assessment in terms of nitrogen deposition. As such, no further consideration has been given to these sites with respect to local air quality effects. However, where appropriate, they will be considered in relation to construction effects which may impact these sites.

19.5.77 As discussed earlier in this Section, Wigg Island has been identified as a receptor, both in the context of construction impacts and traffic emissions from the completed project.

Assessment of Significance

19.5.78 The significance of the changes in air quality due to the operation of the Project are described based on the changes in:

a. The annual average NO_2 concentrations;
b. The annual average PM_{10} concentrations; and
c. The change in the number of daily mean PM_{10} exceedences.

19.5.79 The NSCA (now Environmental Protection UK) guidance document (Ref. 35) on planning for air quality has been used to as a framework to determine the significance of the effects taking into account:

a. The concentration relative to the air quality objective both with and without the Project (above or below the relevant Air Quality objective);
b. The direction of change (positive or negative); and
c. The magnitude of the change (based on percentage change for annual means, number of days for daily mean).

19.5.80 The effect magnitude is a range between extremely small and very large, as commonly used by air quality professionals when describing magnitude of changes in air quality concentrations. Table 19.11 indicates how these descriptors relate to the general assessment of magnitude described within this Environmental Statement.

19.5.81 Significance assessment is assigned at each receptor where effects are quantified based on predicted changes in air quality which includes operational effects for the Do-Something (2015) scenario with the Project in operation, and the effects due to construction vehicle emissions.

19.5.82 Taking account of the change in concentrations at each receptor, and the position relative to the objective, the effect assessment is described as not significant, low, moderate or high, and whether the change is positive or negative. Table 19.11 shows how the air quality significance assessment descriptors relate to those used within this Environmental Statement.

19.5.83 For the purpose of assessing air quality effects, the significance of receptors is considered at the outset, and only relevant receptors are assessed. As such, there is no further consideration of the importance of the receptor in terms of effects as all locations are considered sensitive receptors.:

Table 19.11 - Assignment of Significance of Effects

Determine Effect Magnitude based on the change between Do-Minimum and Do-Something			
Annual Mean (NO_2 and PM_{10})	**Daily Mean (PM_{10})**		
Effect Magnitude		**Air Quality Descriptor**	**Environmental Statement Descriptor**
>25%	>15 Days	Very High	High
15 - 25%	10 - 15 Day	High	
10-15%	5 - 10 Days	Moderate	Moderate
5-10%	3 - 5 Days	Low	
1-5%	1-3 Days	Very Low	Low
<1%	1 Day	Extremely Low	
Effect Significance Descriptor			
Air Quality Effect Significance Descriptor		**Environmental Statement Effect Significance Descriptor**	
Very High Positive		High Positive	
High Positive			
Moderate Positive		Moderate Positive	
Low Positive		Low Positive	

Effect Significance Descriptor	
Air Quality Effect Significance Descriptor	**Environmental Statement Effect Significance Descriptor**
Not Significant	Not Significant
Low Negative	Low Negative
Moderate Negative	Moderate Negative
High Negative Very High Negative	High Negative

19.5.84 However, where the effects of activities are not quantified, an assessment has been made on a qualitative basis. Where this is the case e.g. construction dust effects, effects from disruption to existing traffic during construction, the effect significance descriptors have been assigned based on professional judgement, knowledge and experience. Such an approach is consistent with the NSCA guidance document.

19.6 Baseline and Results

19.6.1 This Section presents the results of the assessment of existing air quality, based on:

a. The review of Local Air Quality Management reports from the Council;
b. The results of monitoring data for the base year (2006);
c. The background concentrations for each pollutant and each year of assessment; and
d. The results of dispersion modelling for both the base year (2006) and the predicted baseline scenario 2015 (Do-Minimum without scheme).

Local Authority Review and Assessment

19.6.2 The LAQM regime has been described in Section 19.3.2 and the conclusions of the Review and Assessments carried out by the Council are provided below.

The Council

19.6.3 The First Round of Review and Assessment was completed in November 1999. The assessment concluded that the air quality objectives for carbon monoxide, benzene, 1,3-butadiene and lead would not be exceeded within the borough. However, two areas adjacent to the SJB were identified as being at risk of exceeding the air quality objectives for nitrogen dioxide, sulphur dioxide and particulates (PM_{10}), as a result of traffic and industrial emissions.

19.6.4 The Second Round of Review and Assessment commenced in 2003 with the completion of an Updating and Screening Assessment (USA). Monitoring of nitrogen dioxide, sulphur dioxide and PM_{10} were shown to meet the relevant air quality objectives. It was concluded that, as a result of the elevated and exposed nature of the approach roads to SJB, adequate dispersion and dilution of exhaust gases was ensured. It was also noted that low sulphur fuels had been adopted for steam generation by those industries located in the West Bank Dock Estate.

19.6.5 As part of the Third Round of Review and Assessment, an Updating and Screening Assessment was completed in 2006. The report concluded that there had been no considerable changes in either the industrial sector or transport network within the borough since the completion of the Second Round of Review and Assessment. However, increases in emissions of NO_2 from the Rocksavage power station and SO_2 from Ineos were noted, and it was decided that emissions from both these sources would be closely monitored in future years. In addition, concentrations of NO_2 recorded along Deacon Road and Hale Road in 2005 have exceeded the AQS annual mean objective. As such, it was deemed necessary for the council to proceed to a Detailed Assessment for NO_2 in these areas. The Council also intended to establish a more robust monitoring programme in the vicinity of Deacon Road, Hale Road, Milton Road and Peel House Lane in Widnes, and Greenway Road in Runcorn, including the installation of continuous analysers.

19.6.6 In November 2007, the Council released an air quality Progress Report, which reviewed new monitoring data at the sites mentioned above (based on diffusion tubes). Moreover, results of the detailed dispersion modelling of NO_2 and PM_{10} emissions in the borough, carried out by the University of Lancaster in 2006-2007, were included in the report. Monitoring data for year 2006 showed that the NO_2 annual mean concentrations were likely to exceed the Air Quality Strategy objective at these locations. However, several monitoring sites were not relevant to public exposure, and the modelling results did not show any exceedences at these sites. Consequently, the Council decided to carry out further monitoring prior to deciding whether an AQMA was required at these sites. The Council expects to install NO_x/ NO_2 continuous analysers at these sites to improve monitoring data accuracy. PM_{10} data from the Osiris monitoring station installed in Hale Road also showed that both the daily and annual mean Air Quality Strategy objectives for PM_{10} were likely to be breached. However, the Council decided to undertake further monitoring based on TEOM/FDMS monitoring prior to declaring an AQMA for this pollutant.

Ambient Air Quality Monitoring

The Project Diffusion Tube Survey

19.6.7 The Project diffusion tube survey undertaken by Bureau Veritas is discussed in Section 19.1. Results of the diffusion tube survey are provided in Table 19.12. All monitoring results have been bias adjusted using diffusion tubes that were co-located with the Lower House Lane continuous analyser. Results are presented for the base year (2006), as well as 2005 for comparison. The bias adjustment factor was 0.78 for year 2005, and 0.89 for 2006.

Table 19.12 - The Project NO_2 Diffusion Tube Survey - Bias Adjusted Results

ID	Location	NO_2 Annual Mean ($\mu g/m^3$, bias adjusted)		Data Capture 2006
		2005	2006	
MG1	48 Cholmondeley Street, Widnes	29.3	34.2	92%
MG2	Queensway southbound, Widnes	**58.9**	**69.6**	92%
MG3	Queensway northbound, Widnes	**52.6**	**61**	100%
MG4	25 Wilkinson Close, Widnes	31.7	**40.1**	92%
MG5	31 Wright Crescent, Widnes	31	35.8	92%
MG6	West Bank Primary School, Widnes	27.1	32.8	83%
MG7	13 Waterloo Road, Runcorn	28.5	31.4	100%
MG8	28 Egerton Street, Runcorn	28.3	31.9	75%
MG9	Opposite 23 Ashridge Street, Runcorn	26.5	29.8	92%
MG10	42 Rutland Street, Runcorn	25.6	34.6	92%
MG11	Castner Avenue 'Weston Point	25.1	31.3	75%
MG12	Lower House Lane Depot, Widnes (co-located in triplicate with continuous analyser)	26.8	29.9	100%
MG13		24.8	25.5	
MG14		25.9	28.7	
MG15	Ditton Roundabout, Widnes	**41.1**	**47.2**	100%
MG16	Catherine Street, Widnes	25.3	37.3	92%
MG17	69 Brookfield Avenue, Runcorn	19.7	23.7	83%
MG18	36 Fenwick Lane, Runcorn	23.1	23.8	100%
MG19	30 Millersdale Grove, Runcorn	24.3	24.1	75%
MG20	26 Steventon, Runcorn	19.6	22.3	100%
MG21	Traffic Sign, Weston Point Expressway	34.1	36.2	100%
MG22	Traffic Sign (at top of steps), Bridgewater Expressway	26.7	31	100%
MG23	Traffic Sign (bridge over canal), Bridgewater Expressway	27.7	32.2	92%

In bold: exceedence of NO_2 annual mean AQS objective

19.6.8 Table 19.12 shows that 4 sites exceeded the NO_2 annual mean Air Quality Strategy objective in 2006 (tubes MG2, MG3, MG4 and MG15 were above $40 \mu g/m^3$). Tubes MG2, MG3 and MG15 were also above the objective in 2005. Tubes MG2 and MG3 show very high values but are located on kerbside sites along the Queensway south of Widnes and are not relevant to public exposure. Tube MG15 is located near the Ditton Road roundabout in Widnes, and is not relevant to exposure as there are no residential properties nearby. However, tube MG4 in Wilkinson Close, Widnes is representative of exposure and is situated close to the SJB.

The Council Monitoring

19.6.9 The Council's air quality monitoring network is discussed in Section 19.1. NO_2 annual average concentrations based on diffusion tubes and data capture for year 2006 are provided in Table 19.13. 2005 concentrations from the Council's LAQM reports have also been included. All monitoring results have been bias adjusted based on a bias factor derived from results at Lower House Lane continuous analyser and triplicate co-located diffusion tubes. The bias adjustment factor was 0.78 for year 2005, and 0.89 for 2006.

Table 19.13 – The Council NO_2 Diffusion Tube - Bias Adjusted Results

ID	Location	NO_2 Annual Mean ($\mu g/m^3$, bias adjusted)		Data Capture 2006
		2005	2006	
HBC1	Saxon Road 1	38.0	35.0	100%
HBC2	Deacon Road 1	**47.0**	**41.0**	92%
HBC3	Carey Street	32.0	30.0	75%
HBC4	Shopping Centre exit	36.0	35.0	100%
HBC5	Deacon Road 2	39.0	39.0	88%
HBC6	Deacon Road 3 [(a)]	38.0	38.0	88%
HBC7	Deacon Road 4 [(a)]	--	**41.0**	40%
HBC8	Deacon Road 5	--	**51.0**	48%
HB9	Saxon Terrace 2	38.0	35.0	100%
HBC10	Lower House Lane [(b)]	30.0	29.0	100%
HBC11		30.0	28.0	100%
HBC12		27.0	27.0	96%
-	Lower House Lane (Average)	29.0	28.0	99%
HBC13	Peel House Lane 1	--	**40.0** [(c)]	100%
HBC14	Peel House Lane 2	--	30.0 [(c)]	94%
HBC15	Peel House Lane 3	--	**53.0** [(c)]	89%
HBC16	Milton Road 1	--	**48.0** [(c)]	100%
HBC17	Milton Road 2	--	**54.0** [(c)]	89%
HBC18	Greenway Road	--	**42.3** [(d)]	100%

(a) HBC3 and HBC4 = co-located tubes
(b) Lower House Lane co-located triplicate diffusion tubes
(c) 9 month-data, not annualised
(d) 6 month-data, annualised
In **bold**: exceedence of NO_2 annual mean AQS objective

19.6.10 Eight sites exceeded the NO_2 annual mean Air Quality Strategy objective in 2006 (tubes HBC2, HBC7, HBC8, HBC13, and HBC15 to HBC18). However, data capture at tubes HBC7 and HBC8 in Deacon Road were poor for 2006. Therefore, these monitoring sites have not been included in the model verification, as provided later in this section.

19.6.11 The exceedences at the Council diffusion tube locations have been reported in the latest LAQM Progress Report released in November 2007 and the Council is carrying out further monitoring prior to decide whether an AQMA is required at these locations.

19.6.12 Results for year 2006 from the continuous monitoring station located in Lower House Lane, Widnes, are provided in Table 19.14. The NO_2 annual average was 27.9µg/m^3, well below the AQS objective of 40 µg/m^3. There were no NO_2 daily mean above 200µg/m^3 in 2006, while the AQS objective allows 18 exceedences per year. The PM_{10} annual average was also well below the AQS objective (24.2 µg/m^3), and there were only 5 daily averages exceeding 50µg/m^3 (35 allowed per year). Data capture was good for both NO_2 and PM_{10}.

Table 19.14 - The Council – Lower House Lane Continuous Analyser –Results 2006

Name	Average NO_x - µg/m^3	Average NO_2 - µg/m^3	No. hourly NO_2 exceedences of 200 µg/m^3	Data Capture NO_2	Average PM_{10} - µg/m^3	No. daily PM_{10} exceedences of 50 µg/m^3	Data Capture PM_{10}
Lower House Lane	55.4	27.9	0	85%	24.2	5	88%
AQS Objectiv e	-	40	18	-	40	35	-

Background Pollutant Concentrations

19.6.13 The methodology used to identify background concentrations and projections is detailed in Section 19.1. Table 19.15 shows the background values used in the assessment for all modelled pollutants (NO_x, NO_2 and PM_{10}) and both years of assessment (2006 and 2015).

19.6.14 As the air quality assessment area covers a wide area, it was deemed more realistic to consider two different backgrounds for the assessment, one for receptors located in the Widnes and Runcorn urban areas, and another for receptors south of Runcorn near the M56.

19.6.15 As discussed in Section 19.1, the background levels have been based on Defra's national background maps, which provide estimated background for each 1km×1km grid square. Background can be difficult to determine, as it is easy to double count the contribution of a particular source such as a main road or an industrial facility. To avoid this, it is important to select the background away from the modelled road sources, which contribution will be already included in the modelled results. Guidance provided in the LAQM.TG(03) has been followed to determine adequate background values. For the Widnes/Runcorn urban area, background was derived from open area between Widnes and Warrington, while for the M56 area, the background was based on the average result from cells 4km further south of the motorway. The background maps for year 2006 and selected background values are also illustrated in Figures 19.10, 19.11 and 19.12 (Appendix 19.1) for NO_x, NO_2, and PM_{10}.

Table 19.15 - Estimated background concentrations

Area	Background 2006			Background 2015			Comment
	NO_x	NO_2	PM_{10}	NO_x	NO_2	PM_{10}	
Widnes / Runcorn	26.4	18.9	18.5	19.8	16.0	16.7	based on DEFRA Maps X=355500, Y=386500
M56 Area	17.6	14.8	16.5	13.2	12.4	14.9	based on DEFRA Maps, average of 9 cells 4km south from M56

Model Verification

NO_x/NO2 model verification

19.6.16 As described in Section 19.1, NO_x modelled results have been verified against monitoring data. Based on these monitoring results, the modelled NO_x roadside concentrations have been adjusted by an overall factor of 1.03. NO_2 predicted results have then been derived based on the latest NO_x to NO_2 relationship released in April 2007 on behalf of Defra (Ref. 28). The verified model results at the monitoring locations are provided in Table 19.16 along with the difference between monitored and modelled results. Further details of the model verification methodology are shown in Appendix 19.3.

19.6.17 Kerbside sites from the Project diffusion tube survey and from the Council diffusion tube network have been excluded from the model verification. In addition monitoring results in Milton Road, Widnes (diffusion tubes HBC16 and HBC17) have not been taken into account in the model verification process because traffic flows have been underestimated along this section of road.

19.6.18 During the verification process, Bureau Veritas aim to show that all final modelled NO_2 concentrations are within 25% of the monitored NO_2 concentrations. Modelled results may not compare as well at some locations for a number of reasons including:

a. Errors in traffic flow and speed data estimates;
b. Model setup (including street canyons, road widths, receptor locations);
c. Model limitations (treatment of roughness and meteorological data); and
d. Uncertainty in monitoring data (notably diffusion tubes, e.g. bias adjustment factors and annualisation of short-term data).

Table 19.16 - Verified NO_2 Results at Monitoring Locations

ID	Location	Monitored NO_2 2006 - $\mu g/m^3$	Modelled NO_2 2006 (verified) - $\mu g/m^3$	Difference (Modelled-Monitored) NO_2 - $\mu g/m^3$	Difference (Modelled-Monitored) NO_2 - (%)
HBC6	Deacon Road 3	38.0	37.4	-0.6	-2%
HBC1	Saxon Road 1	35.0	34.1	-0.9	-3%
HBC2	Deacon Road 1	**41.0**	35.5	-5.5	-13%
HBC3	Carey Street	30.0	29.6	-0.4	-1%
HBC4	Shopping Centre exit	35.0	32.1	-2.9	-8%
HBC5	Deacon Road 2	39.0	39.3	0.3	1%
HBC9	Saxon Terrace 2	35.0	38.4	3.4	10%
HBC10	Lower House Lane 1	28.0	30.2	2.2	8%
HBC13	Peel House Lane 1	**40.0**	32.2	-7.8	-19%
HBC14	Peel House Lane 2	30.0	33.8	3.8	13%
HBC15	Peel House Lane 3	**53.0**	37.0	-16.0	-30%
HBC18	Greenway Road	**42.3**	38.6	-3.7	-9%
MG1	48 Cholmondeley Street, West Bank, Widnes	34.2	32.8	-1.4	-4%
MG4	25 Wilkinson Close, West Bank, Widnes	**40.1**	35.5	-4.6	-11%
MG5	31 Wright Crescent, West Bank, Widnes	35.8	34.4	-1.4	-4%
MG6	West Bank Primary School (2nd Floor), Widnes	32.8	32.6	-0.2	-1%
MG7	13 Waterloo Road, Runcorn	31.4	34.9	3.5	11%
MG8	28 Egerton Street, Runcorn	31.9	37.8	5.9	19%

ID	Location	Monitored NO_2 2006 - µg/m^3	Modelled NO_2 2006 (verified) - µg/m^3	Difference (Modelled-Monitored) NO_2 - µg/m^3	Difference (Modelled-Monitored) NO_2 - (%)
MG9	Opposite 23 Ashridge Street, Runcorn	29.8	32.1	2.3	8%
MG10	42 Rutland Street, Runcorn	34.6	32.0	-2.6	-8%
MG11	Castner Avenue 'Weston Point	31.3	29.1	-2.2	-7%
HBC0	Lower House Lane CM	27.9	31.3	3.4	12%
MG15	Ditton Roundabout, Widnes	**47.2**	**45.0**	-2.2	-5%
MG16	Catherine Street, Widnes	37.3	36.7	-0.6	-2%
MG17	69 Brookfield Avenue, Runcorn	23.7	29.0	5.3	22%
MG18	36 Fenwick Lane, Runcorn	23.8	28.3	4.5	19%
MG19	30 Millersdale Grove, Runcorn	24.1	29.8	5.7	24%
MG20	26 Steventon, Runcorn	22.3	28.6	6.3	28%
MG22	Traffic Sign (at top of steps), Bridgewater Expressway	31.0	31.4	0.4	1%
MG23	Traffic Sign (on bridge over canal), Bridgewater Expressway	32.2	30.7	-1.5	-5%
Summary					
Number of sites	Within ±10%			18	
	Between ± 10-25%			10	
	Exceeds ±25%			2	
	Total			30	
In bold: exceedence of NO_2 annual mean AQS objective					

19.6.19 Overall, predicted concentrations are in good agreement with measurements, with only 2 sites out of 30 over or under predicting by more than 25%. Almost two thirds of predicted results are within ±10% of the monitored NO_2 concentration, while 10 sites are between ± 10-25%.

19.6.20 The model under predicted by more than 25% at one site only (HBC15). This site is located at the corner of the busy Peel House Lane junction in Widnes, where queuing traffic has been reported to be an issue in the latest LAQM Progress Report. Monitored NO_2 at this site is high and well above the AQS objective (53µg/m^3) compared to nearby tubes HBC13 and HBC14 (respectively 40µg/m^3 and 30µg/m^3) at the same junction. Model results are within 25% of monitored results at these nearby locations.

19.6.21 The model over predicted by more than 25% at one site (MG20), located along the A558 Daresbury Expressway. However, both predicted and monitored NO_2 annual mean are well below the AQS objective at this site (respectively 28.6µg/m^3 and 22.3µg/m^3).

PM_{10} model verification

19.6.22 As described in Section 19.1, PM_{10} modelled results have been verified against Lower House Lane PM_{10} monitoring data. Based on the monitoring results, the modelled PM_{10} roadside concentrations have been adjusted by an overall factor of 4.91. Further details of the model verification are shown in Appendix 19.3.

Predicted Baseline

19.6.23 This Section presents the predicted results for the base year 2006 and future baseline (Do-Minimum scenario 2015). As discussed in Section 19.1, NO_2 and PM_{10} concentrations have been predicted at 568 specific receptors. In order to provide an overview of the effect of the

Project, 64 key receptors have been selected and reported in detail in this assessment. These receptors have been chosen to reflect the difference in predicted effects across the modelled area, as well as the worst case effects across all 568 receptors. Results at these key receptors are presented and discussed below. Predicted concentrations at the remaining receptors have been provided in Appendix 19.4.

19.6.24 As the assessment area for air quality covers a wide area. To allow for more clarity the key receptors have been assigned to specific areas and results have been presented for each of them, as described below:

a. Widnes Centre (including Lunts Heath and Cronton);
b. A552 Speke Road/Ditton Junction);
c. SJB (including Widnes Loops junction and the SJB South junction);
d. A557 Ashley Way/Watkinson Way (Widness Eastern Bypass);
e. A557 West Point Expressway (Runcorn Western Bypass);
f. Runcorn Centre;
g. A533 Central Expressway and Whitehouse Expressway (including Castlefields, Halton Brook, Southgate and Palacefields);
h. A558 Daresbury Expressway (from Castlefield to Daresbury);
i. M56 motorway (South of Runcorn); and
j. Weston Link-M56 Junctions (including Rocksavage, Clifton and Beechwood).

19.6.25 Results in sensitive areas identified by the Council in Widnes and Runcorn which include Deacon Road and Peel House Lane as described in the LAQM Review and Assessment, have also been described separately. Figure 19.13 (Appendix 19.1) illustrates the areas defined above.

Existing (base year 2006)

19.6.26 Predicted NO_2 and PM_{10} annual average concentrations at key receptors for base year 2006 are presented in Table 19.17. Predicted exceedences of the PM_{10} daily mean are also provided. Analysis of UK continuous NO_2 monitoring data has shown that it is unlikely that the hourly mean NO_2 objective, of 18 hourly means over 200µg/m^3, would be exceeded where the annual mean objective is below 60µg/m^3 (Ref. 36). The maximum predicted annual average for NO_2 is below 60µg/m^3; therefore the NO_2 hourly mean AQS objective is expected to be met at all relevant locations. Consequently, where mentioned below, the NO_2 AQS objective refers to the annual mean AQS objective of 40µg/m^3.

Table 19.17 - Predicted NO_2 and PM_{10} Concentrations – Baseline 2006

Area	ID	Name	X (m)	Y (m)	Modelled annual average NO_2 2006 (verified) - µg/m^3	Modelled annual average PM_{10} 2006 (verified) - µg/m^3	Daily PM_{10} exceedences > 50µg/m^3 - µg/m^3
Widnes Centre	9	Near Unicorn Inn - Cronton Road	351801	386073	31.5	23.9	10
	83	Ditchfield Road - Liverpool Road (Junction)	351256	385194	29.5	23.6	9
	93	Prescot Road - Liverpool Road (Junction)	351197	384929	31.7	25.4	13
	96	Dundalk Road - Hale Road (Junction)	351695	385075	36.8	28.9	24
	102	Playground - Dundalk Road	351759	385633	28.5	22.9	8
	127	Leigh Avenue - Highfield Road (Junction)	351072	383950	29.1	23.9	10

Area	ID	Name	X (m)	Y (m)	Modelled annual average NO_2 2006 (verified) - µg/m³	Modelled annual average PM_{10} 2006 (verified) - µg/m³	Daily PM_{10} exceedences > 50µg/m³ - µg/m³
	162	Gerrard Street - Alfred Street (Junction)	351144	382717	32.6	24.9	12
A562 Speke Road/Ditton Junction	63	MacDermott Road	350120	382026	31.3	23.9	10
	65	St Michael Jubilee Golf Course	350903	380310	28.2	22.3	7
	67	Pond adjacent to Speke Road	351788	382659	30.9	23.4	9
	105	3 Rose Street	351035	384183	31.6	24.7	12
	147	Club - Croft Street	350905	383062	**45.4**	32.4	**37**
	153	Victoria Road - Luton Street (Junction)	351110	382958	32.4	24.8	12
SJB	45	16 St Bridgets Close	353754	382967	39.6	29.6	26
	49	52 Irwell Street	353749	379838	36.3	27.0	18
	171	36 Egerton Street	353983	379731	39.4	28.5	22
	192	High Street - Bridgewater Street (Junction)	354685	379647	**46.6**	34.1	**45**
	230	49 Greenway Road	356422	380605	**40.1**	29.5	26
	272	19 Percival Lane	351202	377924	35.4	26.7	17
A557 Ashley Way /Watkinson Way - Widnes Eastern Bypass	29	The Rowans - Moorfield Road	352790	381334	32.5	25.2	13
	34	100 Page Lane	351907	382337	33.4	25.2	13
	39	37 Batherton Close	350670	380498	36.4	26.7	17
A557 Weston Point Expressway	275	61 Westfield Road	355853	383576	33.5	25.0	12
	306	5 Bankes' Lane	349798	386300	35.7	25.8	14
	309	215 Heath Road South	353475	380690	31.4	23.8	10
	331	Adjacent Old Hall - Cavendish Farm Road	353856	380363	39.4	27.8	20
Runcorn Centre	236	1 Sutton Street	352329	386280	37.9	27.5	19
	242	38 Latham Avenue	352068	386299	32.2	24.5	11
	316	Heath Road - Moughland Land (Junction)	348534	386348	30.1	24.2	11
	346	Halton Lodge Avenue - Grangeway (Junction)	349729	385975	28.0	22.7	8
A533 Central Expressway (Castlefields / Halton Brook / Southgate)	362	32 Handforth Lane	350403	385588	29.3	23.0	8
	366	47 Fenwick Lane	349929	385002	28.2	21.9	6
	371	22 Budworth Close	350711	384447	28.2	22.5	7
	372	29 Tawny Court	348298	385236	28.9	22.8	8
	376	35 Hawks Court	353337	382621	32.4	24.7	12
	381	8 Danby Close	353171	382439	29.9	23.3	9
	419	103 The Glen	353217	382756	35.8	26.7	17
	444	198 Boston Avenue	353278	382442	33.3	25.8	14
	446	Halton Brow - Warrington Road (Junction)	352979	380998	32.7	25.5	14
	452	83 Calvers	352730	380787	30.4	24.0	10
	455	24 LittleGate	353267	382175	29.9	23.6	9
	470	26 Caesars Close	353147	381717	28.7	23.0	8
	472	Brookfield Avenue - Between 83 and 103	353115	380696	29.3	22.4	7

Area	ID	Name	X (m)	Y (m)	Modelled annual average NO_2 2006 (verified) - µg/m^3	Modelled annual average PM_{10} 2006 (verified) - µg/m^3	Daily PM_{10} exceedences > 50µg/m^3 - µg/m^3
	477	Ivy House - Marsh Lane	353006	380712	38.3	27.8	20
	505	8 Seneschal Court	352536	380551	29.6	23.2	8
	WI3	Wigg Island 3	353257	383645	24.1	20.5	4
	WI7	Wigg Island 7	353446	383737	23.7	20.4	4
	WI9	Wigg Island 9	352821	383426	25.9	21.1	5
	WI11	Wigg Island 11	353297	383593	24.3	20.6	4
A558 Daresbury Expressway (Castlefields to Daresbury)	487	36 Steventon - Sandymoor	356,071.62	383,616.78	30.9	23.8	10
	513	Daresbury Lodge - Chester Road	353040	379977	29.9	23.4	9
M56 Motorway	412	Adjacent 11 Magnolia Drive	353188	381001	**48.9**	34.0	**45**
	414	Adjacent Jericune - Wood Lane	352930	380889	**46.5**	32.6	**38**
	417	Gladstan House - Chester Road	352425	380323	**52.0**	36.0	**55**
	433	Aston Green - between 12 and 6	352166	380506	**50.7**	35.2	**51**
	517	7 Williams Way	352548	387886	**50.6**	34.7	**48**
Weston Link-M56 Junctions (Rocksavage / Clifton / Beechwood)	385	35 Lincoln Close	350916	386257	29.0	22.7	8
	386	Close to Clifton Hall - Cholmondeley Road	350860	380527	30.4	23.4	9
	388	Millersdale Grove - Between 34 and 44	351362	381559	30.8	23.7	9
	392	15 Ingleton Grove	358142	383213	38.5	27.5	19
	399	7 Dunmail Grove	350959	385255	37.7	27.6	19
	401	17 Paddock Rise	349326	388236	38.3	27.9	20
Deacon Road - Widnes	HBC5	Deacon Road 2 (Diffusion Tube)	350731	382843	39.3	30.3	29
Peel House Lane - Widnes	142	138 Albert Road	352773	380204	36.3	26.7	17

In **bold**: exceedence of NO_2 annual mean AQS objective

General assessment

19.6.27 The maximum predicted NO_2 annual average was 52.0µg/m^3 at receptor 417 in Gladstan House/Chester Road junction, which is above the AQS objective. This receptor is located at the façade of a residential property, about 30m from the M56 motorway. Overall, the predicted concentrations of annual average NO_2 are well below the AQS objective. The objective is predicted to be exceeded mainly along the M56 motorway, and at a few receptors along the SJB and in Widnes Centre.

19.6.28 The maximum PM_{10} concentration was 36.0µg/m^3 at receptor 417 in Gladstan House/Chester Road junction, which is below the PM_{10} annual mean AQS objective. However, the daily mean PM_{10} objective was exceeded at several receptors, mainly along the M56.

19.6.29 All predicted results for base year 2006 are shown in Figures 19.14, 19.15 and 19.16 (Appendix 19.1) for annual average NO_2, PM_{10}, and daily mean PM_{10}.

Widnes Centre including Lunts Heath / Cronton (North of Widnes)

19.6.30 The maximum predicted NO_2 annual mean in Widnes Centre was 36.8µg/m^3 at receptor 96 at Dundalk Road / Hale Road junction, which is below the NO_2 AQS objective. All other areas in Widnes Centre are predicted to be well below the AQS objective, except at Peel House Lane and Deacon Road, where concentrations are also between 36µg/m^3 and 40µg/m^3. These roads are currently closely monitored by the Council as part of LAQM review and assessment, and are discussed separately further below.

19.6.31 The maximum predicted PM_{10} annual mean was 28.9µg/m^3 at Dundalk Road/Hale Road junction (receptor 96), which is well below the AQS objective. The PM_{10} daily mean was also below the PM_{10} short-term AQS objective (24 exceedences while 35 are allowed). All other areas in Widnes Centre are predicted to be well below the PM_{10} AQS objectives.

A562 Speke Road / Ditton-Widnes Loops Junctions

19.6.32 The maximum predicted NO_2 annual mean was 45.4µg/m^3 at receptor 147 in Croft Street, which is above the NO_2 objective. This site is close to the A562 Ashley Way/Victoria Road junction in South Widnes. All other sites close to the A562 Speke Road/Ditton Junction are predicted to be well below the NO_2 AQS objective in this area.

19.6.33 The maximum predicted PM_{10} annual mean was 32.4µg/m^3 in Croft Street (receptor 147), which is well below the AQS objective. However, the PM_{10} daily mean AQS objective was predicted to be exceeded (37 exceedences while 35 are allowed).

SJB – including West Bank and SJB's South Junction

19.6.34 The maximum predicted NO_2 annual mean was 46.6µg/m^3 at the junction of High Street and Bridgewater Street in Runcorn (receptor 192). This site is located at the façade of a property about 120m North of the A557 Daresbury Expressway and 200m East of the A533 Queensway, near the SJB South Junction. The high predicted concentration at this location is due to the high proportion of Heavy Duty Vehicles (HDV) in Bridgewater Street.

19.6.35 The concentration at Greenway Road located close to the SJB south junction loops and the Daresbury Expressway is predicted to be above the AQS objective (receptor 230, 40.1µg/m^3). This area is currently closely monitored by the Council and is discussed separately further below.

19.6.36 However, key receptors close to the A533 Queensway just south of the SJB in Runcorn are predicted to be just below the AQS objective for NO_2, for example the concentration at receptor 171 (Egerton Street) is 39.4 µg/m^3 which is located a few meters from the elevated Queensway.

19.6.37 Close to the SJB in Widnes, concentrations are also predicted to be just below the AQS for NO_2. The highest concentrations in the area (39.6 µg/m^3) at Bridgets Close (receptor 45) are within a few meters of the Queensway where the road approaches ground level. Predicted concentrations close to the SJB are lower, for example at Receptor 49 (Irwell Street) are approximately 36 µg/m^3 due to increase dispersion of road traffic emissions on the elevated Sections of the SJB. The maximum predicted PM_{10} annual mean was 34.1µg/^{3} at the junction of High Street and Bridgewater Street in Runcorn (receptor 192). All key receptors were below the PM_{10} annual mean AQS objective. However, the daily mean objective was exceeded at the above mentioned site (receptor 192), with 45 exceedences predicted (35 allowed). All other sites were well below the short-term AQS objective for PM_{10}.

A557 Ashley Way/Watkinson Way (Widnes Eastern Bypass) – Simm's Cross / Crow Wood / Barrow's Green

19.6.38 The maximum predicted NO_2 annual mean was 36.4µg/m^3 at 37 Batherton Close, Widnes (receptor 39). This property is located approximately 25m north of the A562 Ashley Way near the junction with the A557 Ashley Way/Watkinson Way. All other key receptors along the A557 East of Widnes (Halton View, Barrow's Green) are well below the NO_2 AQS objective.

19.6.39 The maximum predicted PM_{10} annual mean was 26.7µg/3 at 37 Batherton Close, Widnes (receptor 39). All sites along the A557 East of Widnes are well below both the PM_{10} annual mean and daily mean AQS objectives.

A557 Weston Point Expressway (Runcorn Western Bypass) – Weston Point / Weston

19.6.40 The maximum predicted NO_2 annual mean was 39.4µg/m^3 near the Cavendish Farm Road/Heath Road South junction, South Runcorn (receptor 331). This site is located 20m North of the busy A557 Weston Point Expressway South of Runcorn Centre. All other key receptors along the A557 (Runcorn Western by-pass) are well below the NO_2 AQS objective.

19.6.41 The maximum predicted PM_{10} annual mean was 27.8µg/m^3 at receptor 331. All key receptors along the A557 (Runcorn Western by-pass) are well below both the PM_{10} annual mean and daily mean AQS objectives.

Runcorn Centre

19.6.42 The maximum predicted NO_2 annual mean in Runcorn Centre was 37.9µg/m^3 at 1 Sutton Street (receptor 236). This property is located 35m South of the A533 Daresbury Expressway. All other key receptors in Runcorn Centre are well below the NO_2 AQS objective.

19.6.43 The maximum predicted PM_{10} annual mean was 27.5µg/m^3 at receptor 236. All key receptors in Runcorn Centre are well below both the PM_{10} annual mean and daily mean AQS objectives.

A533 Central Expressway (Castlefields / Halton Brook / Southgate), Whitehouse Expressway (Palacefields) and the Mersey Gateway Bridge Corridor

19.6.44 The maximum predicted NO_2 annual mean was 38.3 µg/m^3 at Ivy House in Marsh Lane (receptor 477). This site is located in Castlefields, Halton, 35m North of the A533 Daresbury Expressway, and 400m from the Bridgewater Junction. However, the site is a listed building (Ref. 37) and is not inhabited. All other key receptors along the A533 Central Expressway and the A533 Whitehouse Expressway are well below the NO_2 AQS objective. The maximum predicted NO_2 annual mean on Wigg Island was 25.9 µg/m^3 (receptor WI9).

19.6.45 The maximum predicted PM_{10} annual mean was 27.8 µg/m^3 at receptor 477. All key receptors along the A533 Central Expressway and the A533 Whitehouse Expressway are well below both the PM_{10} annual mean and daily mean AQS objectives. The maximum predicted PM_{10} annual mean on Wigg Island was 21.1 µg/m^3 (receptor WI9).

A558 Daresbury Expressway (Castlefields to Daresbury)

19.6.46 The maximum predicted NO_2 annual mean was 30.9 µg/m^3 at 36 Steventon in Runcorn (receptor 487). This site is located approximately 20m South of the A533 Daresbury Expressway within the Sandymoor residential area. All key receptors along the A533 Daresbury Expressway are well below the NO_2 AQS objective.

19.6.47 The maximum predicted PM_{10} annual mean was 23.8 µg/m^3 at receptor 487. All key receptors along the A533 Daresbury Expressway are well below both the PM_{10} annual mean and daily mean AQS objectives.

M56 Motorway

19.6.48 The maximum predicted NO_2 annual mean was 52.0 µg/m^3 at Gladstan House on Chester Road, (receptor 417). This site is located approximately 40m north of the M56 motorway near Sutton Weaver in Runcorn. Several other sites were above the NO_2 AQS objective along the M56 (receptors 412, 414, 433 and 517). This is likely to be due to heavy traffic along the M56 (about 75,000 vehicles AADT) combined with close proximity of properties (these are typically within 20m-40m of the motorway).

19.6.49 The maximum predicted PM_{10} annual mean was 36 µg/m^3 at receptor 417. All key receptors along the M56 are below the PM_{10} annual mean AQS objective. However, they all exceed the PM_{10} daily mean objective.

Weston Link-M56 Junctions (Rocksavage / Clifton / Beechwood)

19.6.50 The maximum predicted NO_2 annual mean was 38.5 µg/m^3 at 15 Ingleton Grove (receptor 392). This site is located in Beechwood, approximately 50m of the A557 Weston Point Expressway, between the Weston Link Junction and the M56 Junction 12. All key receptors between those junctions are below the NO_2 AQS objective, although other receptors (receptors 399 and 401) along the A557 Weston Point Expressway have predicted concentrations of between 37 – 38 µg/m^3.

19.6.51 The maximum predicted PM_{10} annual mean was 27.5 µg/m^3 at receptor 487. All key receptors along the A533 Daresbury Expressway are well below both the PM_{10} annual mean and daily mean AQS objectives.

Local Authority sensitive areas

19.6.52 As described earlier in this section, the Council has identified several areas in Widnes and Runcorn where results from monitoring data are above the annual mean AQS objective for NO_2 and predicted results are discussed below.

Peel House Lane, Widnes

19.6.53 The maximum predicted NO_2 annual mean near the Peel House Lane/Albert Road junction was 36.3 µg/m^3 at 138 Albert Road (receptor 142). Although below the AQS objective, monitoring results presented in Table 19.13 showed that the AQS objective was exceeded at nearby sites HBC13 and HBC15 due to slow moving or queuing traffic and turning at the junction. Predicted results at other receptors suggest that the risk of exceeding the objective is likely to be confined at Peel House Lane/Albert Road junction.

19.6.54 The maximum predicted PM_{10} annual mean was 26.7 µg/m^3 at receptor 142. Predicted results suggest that both the PM_{10} annual mean and daily mean AQS objectives are unlikely to be exceeded at this junction.

Deacon Road, Widnes

19.6.55 The maximum predicted NO_2 annual mean in Deacon Road was 39.3µg/m^3 at diffusion tube installed near the property in 2 Deacon Road (receptor HBC5), which is consistent with the monitored NO_2 at this site (39µg/m^3 in 2006). Other monitoring results presented in Table 19.13 showed that the AQS objective was likely to be exceeded in Deacon Road. Predicted results suggest that exceedences are likely between the junction with Saxon Terrace and Albert Road.

19.6.56 The maximum predicted PM_{10} annual mean was 30.3µg/m^3 at receptor HBC5. Predicted results suggest that both the PM_{10} annual mean and daily mean AQS objectives are unlikely to be exceeded in Deacon Road.

Greenway Road, Runcorn

19.6.57 The predicted NO_2 annual mean in 49 Greenway Road was 40.1µg/m^3 (receptor 230). Monitoring result nearby at diffusion tube HBC18 outside 62 Greenway Road also showed an exceedence (42.3µg/m^3, see Table 19.13). This road is reported to be often congested during rush hour as it is connected to the main approach road to the SJB (A533 Queensway).

19.6.58 The predicted PM_{10} annual mean in 49 Greenway Road was 29.5µg/m^3 and there were 26 predicted daily mean exceedences of 50µg/m^3 at this receptor. Therefore, it is unlikely that the PM_{10} AQS objectives would be breached in Greenway Road.

Milton Road, Widnes

19.6.59 2006 monitoring data in Milton Road, Widnes also showed a risk of exceedence of the NO_2 AQS objective. However, the dispersion modelling did not reflect these levels as modelled traffic data on this road is not consistent with levels reported with HBC LAQM reports, as explained earlier in this section.

Do-Minimum (future year 2015)

19.6.60 Predicted NO_2 and PM_{10} results at key receptors for the future base year 2015 (Do-Minimum scenario) are presented in Figure 19.17, 19.18 and 19.19 (Appendix 19.1), and are provide in Table 19.18.

Table 19.18 - Predicted NO_2 and PM_{10} results – Do-Minimum 2015

Area	ID	Name	Modelled annual average NO_2 2015 (verified) - µg/m^3	Modelled annual average PM_{10} 2015 (verified) - µg/m^3	Daily PM_{10} exceedences > 50µg/m^3 - µg/m^3
Widnes Centre	9	Near Unicorn Inn - Cronton Road	24.8	19.8	3
	83	Ditchfield Road - Liverpool Road (Junction)	23.8	19.5	3
	93	Prescot Road - Liverpool Road (Junction)	24.6	20.7	4
	96	Dundalk Road - Hale Road (Junction)	28.0	22.5	7
	102	Playground - Dundalk Road	23.4	19.2	3
	127	Leigh Avenue - Highfield Road (Junction)	23.3	19.6	3
	162	Gerrard Street - Alfred Street (Junction)	24.6	19.8	3
A562 Speke Road/Ditton-Widnes Loops Junctions	63	MacDermott Road	24.2	19.7	3
	65	St Michael Jubilee Golf Course	23.1	18.8	2
	67	Pond adjacent to Speke Road	24.3	19.6	3
	105	3 Rose Street	24.6	20.3	4
	147	Club - Croft Street	33.4	23.4	9
	153	Victoria Road - Luton Street (Junction)	24.7	20.1	3
SJB	45	16 St Bridgets Close	30.6	23.0	8
	49	52 Irwell Street	27.9	21.5	5
	171	36 Egerton Street	29.6	22.0	6
	192	High Street - Bridgewater Street	33.1	23.2	8

Area	ID	Name	Modelled annual average NO_2 2015 (verified) - µg/m[3]	Modelled annual average PM_{10} 2015 (verified) - µg/m[3]	Daily PM_{10} exceedences > 50µg/m[3] - µg/m[3]
		(Junction)			
	230	49 Greenway Road	29.6	22.1	7
	272	19 Percival Lane	27.5	21.5	6
A557 Watkinson Way - Widnes Eastern Bypass	29	The Rowans - Moorfield Road	25.3	20.7	4
	34	100 Page Lane	25.6	20.4	4
	39	37 Batherton Close	27.8	21.0	5
A557 Weston Point Expressway	275	61 Westfield Road	26.1	20.7	4
	306	5 Bankes' Lane	27.2	20.8	4
	309	215 Heath Road South	24.1	19.5	3
	331	Adjacent Old Hall - Cavendish Farm Road	29.7	21.9	6
Runcorn Centre	236	1 Sutton Street	27.8	21.2	5
	242	38 Latham Avenue	23.6	19.5	3
	316	Heath Road - Moughland Land (Junction)	23.1	19.8	3
	346	Halton Lodge Avenue - Grangeway (Junction)	22.6	19.0	2
A533 Central Expressway (Castlefields / Halton Brook / Southgate) and the Mersey Gateway Bridge Corridor	362	32 Handforth Lane	23.8	19.2	2
	366	47 Fenwick Lane	21.7	18.5	2
	371	22 Budworth Close	22.8	18.9	2
	372	29 Tawny Court	23.3	19.1	2
	376	35 Hawks Court	24.8	20.2	4
	381	8 Danby Close	23.1	19.4	3
	419	103 The Glen	26.9	21.1	5
	444	198 Boston Avenue	25.3	20.6	4
	446	Halton Brow - Warrington Road (Junction)	25.1	20.5	4
	452	83 Calvers	23.8	19.9	3
	455	24 LittleGate	24.1	19.5	3
	470	26 Caesars Close	23.6	19.3	3
	472	Brookfield Avenue - Between 83 and 103	22.8	19.0	2
	477	Ivy House - Marsh Lane	29.6	22.2	7
	505	8 Seneschal Court	23.7	19.2	2
	WI3	Wigg Island 3	19.2	17.8	1
	WI7	Wigg Island 7	19.0	17.7	1
	WI9	Wigg Island 9	20.3	18.1	1
	WI11	Wigg Island 11	19.4	18.8	1
A558 Daresbury Expressway (Castlefields to Daresbury)	487	2 Kings Court	24.4	20.0	3
	513	Daresbury Lodge - Chester Road	23.6	19.7	3

Area	ID	Name	Modelled annual average NO_2 2015 (verified) - µg/m^3	Modelled annual average PM_{10} 2015 (verified) - µg/m^3	Daily PM_{10} exceedences > 50µg/m^3 - µg/m^3
M56 Motorway	412	Adjacent 11 Magnolia Drive	34.2	23.0	8
	414	Adjacent Jericune - Wood Lane	32.8	22.4	7
	417	Gladstan House - Chester Road	36.1	23.8	10
	433	Aston Green - between 12 and 6	35.4	23.4	9
	517	7 Williams Way	35.5	23.2	8
Weston Link-M56 Junctions (Rocksavage / Clifton / Beechwood)	385	35 Lincoln Close	23.6	19.0	2
	386	Close to Clifton Hall - Cholmondeley Road	23.5	19.4	3
	388	Millersdale Grove - Between 34 and 44	23.8	19.6	3
	392	Ingleton Grove - Between 15 and 19	28.9	21.6	6
	399	7 Dunmail Grov	28.3	21.5	5
	401	17 Paddock Rise	27.6	20.5	4
Deacon Road -Widnes	HBC5	Deacon Road 2 (Diffusion Tube)	28.7	22.6	7
Peel House Lane - Widnes	142	138 Albert Road	27.8	22.2	7

General assessment

19.6.61 The maximum predicted NO_2 annual average is 36.1 µg/m^3 at receptor 417 in Gladstan House/Chester Road junction in Runcorn south, near the M56 motorway. All receptors are predicted to be below the NO_2 AQS objective for this scenario. As illustrated by Figure 19.17 (Appendix 19.1) the highest NO_2 concentrations are found at sites along the M56.

19.6.62 The maximum predicted PM_{10} annual average is 23.8 µg/m^3 at receptor 417 in Gladstan House/Chester Road junction. This site shows a maximum of 10 predicted PM_{10} daily means above 50 µg/m^3. All key receptors are predicted to be well below both the PM_{10} annual mean and daily mean AQS objectives.

19.6.63 Overall, concentrations predicted for the 2015 Do-Minimum scenario are lower compared to the 2006 existing baseline. Whilst there are increased traffic flows due to expected traffic growth (even without the Project) the levels of NOx and PM_{10} are expected to reduce considerably due to the implementation of more stringent emissions controls for vehicles in future years. In addition, national measures are aimed to reduce the emissions from other sources which contribute to general background levels of pollutants across the UK and these reductions also lead to predictions of much lower concentrations in future years.

Widnes Centre including Lunts Heath / Cronton (North of Widnes)

19.6.64 The maximum predicted NO_2 annual mean in Widnes Centre is 28.0 µg/m^3 at receptor 96 at Dundalk Road / Hale Road junction. All areas in Widnes Centre are predicted to be well below the AQS objective, with most receptors being below 25 µg/m^3.

19.6.65 The maximum predicted PM_{10} annual mean is 22.5 µg/m^3 at Dundalk Road/Hale Road junction (receptor 96), and there are 7 exceedences of the daily mean threshold (50 µg/m^3). This is well below both PM_{10} AQS objectives. All other sites assessed in Widnes Centre are predicted to be well below the PM_{10} AQS objectives.

A562 Speke Road / Ditton-Widnes Loops Junctions

19.6.66 The maximum predicted NO_2 annual mean is 33.4 µg/m^3 at receptor 147 in Croft Street. All other sites near the A562 are predicted to be below the AQS objective, most of them being below 25 µg/m^3.

19.6.67 The maximum predicted PM_{10} annual mean is 23.4 µg/m^3 in Croft Street (receptor 147). The number of PM_{10} daily means above 50 µg/m^3 is well below the AQS objective (9 exceedences). All other sites nearby are predicted to be well below the PM_{10} AQS objectives.

SJB – including West Bank and SJB's South Junction

19.6.68 The maximum predicted NO_2 annual mean is 33.1 µg/m^3 at the junction of High Street and Bridgewater Street in Runcorn (receptor 192). All key receptors close to the SJB are predicted to be well below the NO_2 AQS objective.

19.6.69 The maximum predicted PM_{10} annual mean is 23.2 µg/m^3 at receptor 192. The number of PM_{10} daily means above 50 µg/m^3 at this site is well below the AQS objective (8 exceedences). All other key receptors are well below both the PM_{10} annual mean and daily mean AQS objectives.

A557 Ashley Way/Watkinson Way (Widnes Eastern Bypass) – Simm's Cross / Crow Wood / Barrow's Green

19.6.70 The maximum predicted NO_2 annual mean is 27.8 µg/m^3 at 37 Batherton Close, Widnes (receptor 39). All receptors along the A557 East of Widnes (Halton View, Barrow's Green) are well below the NO_2 AQS objective, with most of them within 25 – 30 µg/m^3.

19.6.71 The maximum predicted PM_{10} annual mean is 21.0 µg/m^3 at 37 Batherton Close, Widnes (receptor 39). All sites along the A557 East of Widnes are well below both the PM_{10} annual mean and daily mean AQS objectives.

A557 Weston Point Expressway (Runcorn Western Bypass) – Weston Point / Weston

19.6.72 The maximum predicted NO_2 annual mean is 29.7 µg/m^3 near Cavendish Farm Road/Heath Road South junction, in South Runcorn (receptor 331). All other key receptors along the A557 (Runcorn Western bypass) are well below the NO_2 AQS objective, with most of them within 25 – 30 µg/m^3.

19.6.73 The maximum predicted PM_{10} annual mean is 21.9 µg/m^3 at receptor 331. All key receptors along the A557 (Runcorn Western by-pass) are well below both the PM_{10} annual mean and daily mean AQS objectives.

Runcorn Centre

19.6.74 The maximum predicted NO_2 annual mean in Runcorn Centre is 27.8 µg/m^3 at 1 Sutton Street (receptor 236). All key receptors in Runcorn Centre are well below the NO_2 AQS objective.

19.6.75 The maximum predicted PM_{10} annual mean is 21.2 µg/m^3 at receptor 236. All key receptors in Runcorn Centre are well below both the PM_{10} annual mean and daily mean AQS objectives.

A533 Central Expressway (Castlefields / Halton Brook / Southgate), Whitehouse Expressway (Palacefields) and the Mersey Gateway Bridge Corridor

19.6.76 The maximum predicted NO_2 annual mean is 29.6.µg/m^3 at Ivy House in Marsh Lane, Castlefield (receptor 477). All key receptors along the A533 Central Expressway and the A533

Whitehouse Expressway are well below the NO_2 AQS objective, between 20µg/m^3 and 30µg/m^3. The maximum predicted NO_2 annual mean on Wigg Island is 20.3 µg/m^3 (receptor WI9).

19.6.77 The maximum predicted PM_{10} annual mean is 22.2 µg/m^3 at receptor 477. All key receptors along the A533 Central Expressway and the A533 Whitehouse Expressway are well below both the PM_{10} annual mean and daily mean AQS objectives. The maximum predicted PM_{10} annual mean on Wigg Island is 18.1 µg/m^3 (receptor WI9).

A558 Daresbury Expressway (Castlefields to Daresbury)

19.6.78 The maximum predicted NO_2 annual mean is 24.4.µg/m^3 at 36, Steventon in Runcorn within the Sandymoor residential area (receptor 487). All key receptors along the A533 Daresbury Expressway are well below the NO_2 AQS objective.

19.6.79 The maximum predicted PM_{10} annual mean is 20.0 µg/m^3 at receptor 487. All key receptors along the A533 Daresbury Expressway are well below both the PM_{10} annual mean and daily mean AQS objectives.

M56 Motorway

19.6.80 The maximum predicted NO_2 annual mean is 36.1 µg/m^3 at Gladstan House on Chester Road, (receptor 417). Several other sites along the motorway are within 30 – 35µg/m^3 (receptors 412, 414, 433 and 517). However, all sites are below the NO_2 AQS objective.

19.6.81 The maximum predicted PM_{10} annual mean is 23.8 µg/m^3 at receptor 417, This site shows a maximum of 10 predicted PM_{10} daily means above 50 µg/m^3. All key receptors along the M56 motorway are below both the PM_{10} annual mean and daily mean AQS objectives.

Weston Link-M56 Junctions (Rocksavage / Clifton / Beechwood)

19.6.82 The maximum predicted NO_2 annual mean is 28.9 µg/m^3 at 15 Ingleton Grove (receptor 392) between the Weston Link and M56 Junctions. All key receptors between those junctions are well below the NO_2 AQS objective.

19.6.83 The maximum predicted PM_{10} annual mean is 21.6 µg/m^3 at receptor 392. All key receptors along the Weston Link and M56 Junctions are well below both the PM_{10} annual mean and daily mean AQS objectives.

Local Authorities sensitive areas

19.6.84 As described earlier in this section, the Council has identified several areas in Widnes and Runcorn where results from monitoring data are above the annual mean AQS objective for NO_2. Predicted results for the Do-Minimum 2015 scenario in these areas are discussed below.

Peel House Lane, Widnes

19.6.85 The maximum predicted NO_2 annual mean near the Peel House Lane/Albert Road junction is 27.8µg/m^3 at 138 Albert Road (receptor 142)., which is well below the AQS objective.

19.6.86 The maximum predicted PM_{10} annual mean is 22.2 µg/m^3 at receptor 142, also well below the PM_{10} annual mean AQS objective. All receptors near Peel House Lane are predicted to be well below both the PM_{10} annual mean and daily mean AQS objectives.

Deacon Road, Widnes

19.6.87 The maximum predicted NO_2 annual mean in Deacon Road is 28.7µg/m^3 at diffusion tube installed near the property in 2 Deacon Road (receptor HBC5). All sites along Deacon Road are predicted to be well below the NO_2 AQS objective.

19.6.88 The maximum predicted PM_{10} annual mean is 22.6 µg/m^3 at receptor HBC5. All sites along Deacon Road are predicted to be well below both the PM_{10} annual mean and daily mean AQS objectives.

Greenway Road, Runcorn

19.6.89 The predicted NO_2 annual mean in 49 Greenway Road is 29.6 µg/m^3 (receptor 230). It is unlikely that the NO_2 AQS objectives would be breached in Greenway Road.

19.6.90 The predicted PM_{10} annual mean in 49 Greenway Road is 22.1 µg/m^3. This site shows a maximum of 7 predicted PM_{10} daily means above 50µg/m^3. Both annual mean and daily mean are well below the PM_{10} AQS objectives.

Milton Road, Widnes

19.6.91 The maximum predicted NO_2 annual mean on Milton Road is 24.0 µg/m^3 (receptor 109). However as mentioned in earlier in this section, the model under-predicts at this location. Based on the pattern of reduction of predicted results for Do-Minimum 2015 at other highlighted areas in Widnes (Deacon Road, Peel House Lane), the NO_2 or PM_{10} AQS objectives are not expected to be exceeded at Milton Road in 2015.

Regional Air Quality

19.6.92 This Section presents the predicted regional air quality effects for the base year 2006 and future baseline (Do-Minimum scenario 2015). As discussed in Section 19.1, annual emissions of NOx, PM_{10} and carbon have been predicted based on the length of the modelled road network. As such, results are presented as annual emissions for the study area included in the local air quality assessment. Emissions of CO_2 have been derived from carbon by multiplying by 44 ÷ 12 (Ref. 34).

19.6.93 The results of the existing and future baseline regional air quality assessment are provided in Table 19.19.

Table 19.19 - Annual NOx, PM_{10}, Carbon and CO_2 Emissions for Existing (2006) and Future (2015) Do-Minimum

Tonnes/annum	Do-Minimum		Difference between Existing (2006) and Future (2015)	
	Existing (2006)	Future (2015)	Change Tonnes/Annum	Change %
NOx	1,096	649	-447	-40.8
PM_{10}	33	17	-17	-50.1
Carbon	70,376	72,965	2,589	3.7
CO_2	258,046	267,537	9,492	3.7

19.6.94 Predicted annual mean concentrations for NOx and PM_{10} decrease between the existing (2006) traffic flows and Do-Minimum (2015) traffic flows. This large decrease in emissions reflects improvements in vehicle emissions technology and stricter emissions standards, which offsets the increases in traffic flows in future years.

19.6.95 Predicted annual mean concentrations of carbon and CO_2 increase between the existing (2006) traffic flows and Do-Minimum (2015) traffic flows. This 3.7% increase is due to the predicted growth in traffic flows on some roads which leads to an overall increase in CO_2 emissions. Furthermore, unlike NOx and PM_{10}, emissions of carbon and CO_2 are also linked to fuel use. As such, while advances in vehicle emissions technology results in an improvement in NOx and PM_{10} emissions, overall fuel use will increase across the network due to the additional vehicles. Overall fuel consumption would also increase if the roads became more congested. One aim of the Project would be to improve congestion across the network such that fuel use would not increase due to worsening congestion in future years.

19.6.96 A detailed analysis of the road network links indicates that the main increases in CO_2 are calculated on the M56 motorway (southbound towards junction J12, and both directions south of J12), A562 Speke Road, A557 Watkinson Way, parts of the Weston-Point-Expressway and the A533 Daresbury Expressway.

19.7 Effect Assessment

Effects during Construction

Construction Dust

19.7.1 Construction activities such as those associated with the Project can generate dust and thus lead to poor air quality on a temporary basis. Such effects may occur as a result of the following:

a. Land clearing, ground excavation, site preparation and laying of foundations;
b. Material handling e.g. cut and fill, earth moving using bulldozers and scrapers, compacting;
c. Vehicle movements on unpaved surfaces. This is usually the greatest source of dust at construction sites;
d. Bund creation using topsoil and subsoil. Proximity to off-site sensitive locations can be significant;
e. Storage of aggregate materials in open stockpiles and resulting wind blow, with re-entrainment of settled particles (secondary emissions, often off-site due to dust exported on vehicle wheels). Proximity to off-site sensitive locations can be significant; and
f. Direct emissions from cutting, drilling, mixing etc. and vehicle exhausts.

19.7.2 Significant effects from airborne particles and deposited dust are most likely to be experienced within 200m of construction activity. However, the likelihood for significant effects to occur greater than 200m from the construction activities will increase should construction activities become elevated e.g. during the construction of elevated road sections of bridges and viaducts. With controlled operational procedures and good site practices, the effect from elevated dust sources should be minimised.

19.7.3 Table 19.20 provides details relating to both construction and demolition activities associated with the Project. Only those activities that are likely to generate dust have been included. Nine work areas have been identified. These are consistent with the Construction Methods Report which divides the works into a number of areas to better explain the process of constructing the works.

Table 19.20 - Summary of Demolition and Construction Activities

	Site Clearance / Demolition	Construction
Area A	(a) Clearance of existing vegetation (no topsoil strip) (b) No existing buildings/structures to be demolished	(a) Improved carriageway support and carriageway construction (b) Concrete drainage channels (c) Tolling infrastructure
Area B	(a) Excavation of existing embankment (b) Demolition of existing bridge decks (c) Demolition of existing business premises	(a) New bridge structure and decking (b) Imported fill by road (c) Improved embankment support (d) New highway constructed on embankment (e) Realignment of Ditton Road beneath new bridge
Area C	(a) Demolition of existing Victoria Road properties (b) Arisings from demolition would probably be used as fill at the Widnes Loop areas (c) Demolition of light industrial units at	(a) Freight Line Bridge (Garston to Timperley Rail) (b) Victoria Road Viaduct (c) Two bridges over new Widnes Loops junction carriageways (d) Embankments for new highway

	Site Clearance / Demolition	Construction
	Catalyst Trade Park, removal of foundations – Contamination of ground below Catalyst Trade Park, excavation would be kept to a minimum (d) Demolition of existing bridge decks	(e) Toll plaza connecting the Project to Widnes Eastern Bypass (f) St. Helens Canal Bridge
Area D	(a) Clearance of existing vegetation (b) Demolition of buildings in Astmoor Industrial Estate	(a) Approach viaducts (b) Towers (c) Cable-stayed spans
Area E	(a) Clearance of existing vegetation (b) Demolition of industrial buildings	(a) Construction of the viaduct
Area F	(a) Clearance of existing vegetation (b) Demolition of existing slip road bridges and carriageway (c) No existing buildings/structures to be demolished	(a) Construction of a two-level interchange and new road linking to the Central Expressway
Area G	(a) Clearance of existing landscaping along Central Expressway (b) Extension of footbridges (c) No existing buildings to be demolished	(a) Partial carriageway reconstruction (b) New bridge at Lodge Lane (c) Modification of Lodge Lane and Weston Link junction layouts
Area H	(a) Minor site clearance on southeast and northwest sides of existing roundabout (b) No existing buildings/structures to be demolished	(a) Modification of existing roundabout to the north of the M56 Junction 12
Area I	(a) Existing surfacing and verges on SJB would be removed (b) No existing buildings/structures to be demolished	(a) Downgrading of carriageway on existing bridge from two lanes to a single lane (b) Reintroduce footpaths and cycle paths (c) Tolling infrastructure

19.7.4 Within the context of this qualitative construction dust assessment, each of those construction areas contained in Table 19.20 has been assessed in terms of their locality to sensitive receptors. Since the effects from airborne particles and deposited dust are most likely to be experienced within 200 m of construction activity, only those properties within 200 m of the construction sites are likely to be at risk. The construction "footprint" for Areas A to I have been identified in Figure 19.20 (Appendix 19.1) with any relevant receptors clearly highlighted.

19.7.5 Effects during the demolition of existing infrastructure would be two-fold. The initial effect would be from the demolition itself e.g. demolition of the existing bridges at the Ditton junction. However, once demolished, material will require transportation off site for disposal and will consequently have an effect on traffic emissions (although in some cases there is the possibility for material to be re-used). The demolition and removal of waste materials is further complicated by the presence of hazardous materials – either as part of the demolished structures or contaminated land on which they are sited. Such effects are dealt with later in this Section.

19.7.6 Any dust incidents would be highly dependent on the weather, requiring dry conditions and winds blowing towards a receptor. Such conditions would also need to coincide with any dust generating activities in order for a potential dust nuisance to occur. With a predominant wind direction from the south southeast (based on Hawarden meteorological data for 2006 as shown in Figure 19.8 (Appendix 19.1), receptors which are northwest of a potential dust source have a greater risk of experiencing dust effects than those to the southwest based on frequency of occurrence of winds from the more southerly directions.

19.7.7 Furthermore, the generation of dust is significantly reduced when surfaces are damp. As such, damping down of surfaces and regular clearance of material will be used to reduce the frequency with which receptors may experience dust nuisance.

19.7.8 Standard mitigation measures adopted as part of an overarching Construction Environmental Management Plan (CEMP) and contained in Appendix 2.1 of Chapter 23, would be employed to minimise dust soiling (e.g. on cars and windows), the effect to vegetation and local designated sites due to reduced photosynthesis, respiration and transpiration, and harm to human health arsing from increased exposure to particulates. By instigating such measures, the likelihood of these construction dust effects will be reduced. The mitigation measures are discussed in detail in Section 0.

Emissions from Construction Related Traffic

19.7.9 Access to the majority of the site would be directly from the public highway. Temporary haul routes during the construction would avoid residential areas and follow the line of existing motorways and trunk roads, therefore reducing the risk of exposure to emissions from the construction lorries. The distance travelled by the haulage lorries would also be minimised as far as practicable.

19.7.10 Table 19.21 provides details relating to the approximate number of construction vehicles associated with each of the nine construction areas A to I. Further details are provided in the Construction Methods Report. These vehicle movements are specific to each construction area of the Project and the proposed duration of the works for each area. As such, the estimated 250 daily construction vehicle movements used is a worst case assessment of the effect of emissions from construction traffic.

Table 19.21 - Approximate Number of Construction Vehicles for each Proposed Construction Area

	Vehicle Movements	**Estimated Duration of Works**
Area A: **Main Toll Plaza**	Approx 6,000 tipper trucks Approx 3,300 concrete mixer trucks	270 days
Area B: **Ditton Junction to Freight Line**	Approx 7,520 tipper trucks Approx 2,500 concrete mixer trucks	550 days
Area C: **Freight Line to St Helens Canal**	Approx 11,600 tipper trucks Approx 4,500 concrete mixer trucks Approx 50 trucks for scaffolding Approx 50 trucks for shutters Approx 120 trucks for steel reinforcement Approx 50 concrete pump trucks	
Area D: **Mersey Gateway Bridge**	Approx 500 tipper trucks Approx 8,000 concrete mixer trucks Approx 400 trucks for steel reinforcement Approx 60 concrete pump trucks Approx 150 trucks for piled jetty installation Approx 300 trucks for fabricated steel delivery Approx 150 trucks for cable stand deliveries	1,420 days
Area E: **Astmoor Viaduct**	Approx 150 tipper trucks Approx 5,000 concrete mixer trucks Approx 100 trucks for scaffolding Approx 50 trucks for shutters Approx 300 trucks for steel reinforcement	440 days

	Vehicle Movements	Estimated Duration of Works
	Approx 50 concrete pump trucks	
Area F: **Bridgewater Junction**	Approx 25 tipper trucks Approx 350 concrete mixer trucks Approx 20 trucks for shutters Approx 30 trucks for steel reinforcement Approx 20 concrete pump trucks	310 days
Area G: **Central Expressway, Lodge Lane Junction and Weston Link Junction**	Approx 350 tipper trucks Approx 150 concrete mixer trucks Approx 10 trucks for scaffolding Approx 15 trucks for steel reinforcement Approx 10 concrete pump trucks Approx 25 trucks for clearance of landscaping	350 days
Area H: **M56 Junction 12**	Approx 175 tipper trucks Approx 250 concrete mixer trucks Approx 5 trucks for shutters Approx 70 trucks for steel reinforcement	
Area I: **SJB and Widnes De-Linking**	The works would only require a small number of vehicles	180 days

19.7.11 Based on a maximum of 250 construction traffic movements per day for each construction area, Table 19.22 presents the predicted contribution for year 2011 of construction traffic emissions (the first year of the construction programme and therefore the worst case in terms of traffic emissions and background concentrations) at ten key receptors identified as being within 200 m of the Project construction works. These predicted contributions have been compared to the contribution from all other traffic modelled at the same receptor locations as part of the Local Air Quality Assessment. The contributions do not take account of the background concentrations of NOx, NO_2 and PM_{10}, as they are a means of showing the difference in predicted contributions of emissions between construction traffic and all other traffic using the local road network.

Table 19.22 - Contribution of Construction Traffic and All Other Traffic Emissions, excluding Background Concentrations (2011)

Receptor ID	Receptor	Construction Area	Contribution from Construction Traffic Only (µg/m^3)			Contribution from All Other Traffic (µg/m^3)		
			NOx	NO_2	PM_{10}	NOx	NO_2	PM_{10}
103	Moor Lane	Area B	0.5	0.2	0.1	29.7	9.2	5.2
39	Batherton Close	Area C	0.7	0.3	0.1	46.2	13.8	7.4
WI3	Wigg Island 3	Area D	3.5	1.3	0.3	11.1	3.5	1.8
WI11	Wigg Island 11	Area E	0.2	0.1	0.1	11.5	3.7	1.8
473	Brookfield Avenue	Area F	1.0	0.4	0.1	22.0	6.9	3.7
445	Warrington Road	Area F	2.4	0.9	0.2	33.3	10.2	6.1
369	Cranage Close	Area G	1.5	0.5	0.2	21.9	6.9	3.6
379	Danby Close	Area G	2.1	0.8	0.2	25.1	7.8	4.1
390	Solway Grove	Area G	0.8	0.3	0.1	44.1	13.2	6.8
394	Embleton Court	Area H	0.7	0.2	0.1	49.7	14.7	7.9

Receptor ID	Receptor	Construction Area	Contribution from Construction Traffic Only (µg/m³)			Contribution from All Other Traffic (µg/m³)		
			NOx	NO_2	PM_{10}	NOx	NO_2	PM_{10}
170	Speakman Street	Area I	3.2	1.2	0.3	56.4	16.4	9.2
44	St Patricks Close	Area I	0.9	0.3	0.1	53.2	15.6	9.0

19.7.12 The predicted contribution from construction traffic emissions has been combined with the contribution from non-construction traffic and added to background concentrations for 2011. Using the annual mean concentration for PM_{10}, the number of days exceeding 50µg/m³ (as relevant for the air quality objectives which allow 35 days) has also been estimated.

Table 19.23 - Total Predicted Concentrations from Construction and Non-Construction Related Traffic, including Background Concentrations (2011)

Receptor ID	Receptor	Construction Area	Total Concentration including construction and non-construction traffic, and Background (µg/m³)			Estimated daily PM_{10} exceedences >50µg/m³
			NOx	NO_2	PM_{10}	
103	Moor Lane	Area B	51.5	26.0	22.1	7
39	Batherton Close	Area C	68.3	30.7	24.4	11
WI3	Wigg Island 3	Area D	36.0	21.5	19.0	2
WI11	Wigg Island 11	Area E	33.1	20.4	18.8	2
473	Brookfield Avenue	Area F	44.3	23.9	20.7	4
445	Warrington Road	Area F	57.0	27.8	23.2	8
369	Cranage Close	Area G	44.8	24.0	20.6	4
379	Danby Close	Area G	48.6	25.3	21.2	5
390	Solway Grove	Area G	66.2	30.1	23.8	10
394	Embleton Court	Area H	71.8	31.6	24.8	12
170	Speakman Street	Area I	80.9	34.3	26.4	16
44	St Patricks Close	Area I	75.4	32.6	26.0	15

19.7.13 Predicted NO_2 and PM_{10} concentrations (including construction traffic and background concentrations) are not predicted to exceed any of the relevant AQS objectives in 2011. The highest concentrations are expected to occur at Speakman Street (construction area I). Predicted concentrations on Wigg Island are the lowest of those receptors reported in Table 19.23.

19.7.14 Table 19.24 shows the change in concentrations as a result of additional contributions to NOx and PM_{10} due to construction traffic emissions when compared to Do-Minimum concentrations in the year 2011 (the first year of the construction programme and therefore the worse case in terms of traffic emissions and background concentrations). Table 19.24 also provides the effect magnitude and the overall assessment of effect significance due to the emissions from construction traffic.

Table 19.24 - Effect Significance of Construction Traffic Emissions

Receptor ID	Receptor	Change due to Construction Emissions				Magnitude of Change			Significance Assessment		
		NOx	NO_2	PM_{10}	PM_{10} Daily	NO_2	PM_{10}	PM_{10} Daily	NO_2	PM_{10}	PM_{10} Daily
103	Moor Lane	1.0%	0.7%	0.4%	<1	Extremely Low	Extremely Low	Extremely Low	Not Significant	Not Significant	Not Significant
39	Batherton Close	1.1%	0.8%	0.4%	<1	Extremely Low	Extremely Low	Extremely Low	Low Negative	Not Significant	Not Significant
WI3	Wigg Island 3	10.8%	6.6%	1.6%	<1	Low	Very Low	Extremely Low	Low Negative	Not Significant	Not Significant
WI11	Wigg Island 11	0.7%	0.3%	0.3%	<1	Extremely Low	Extremely Low	Extremely Low	Not Significant	Not Significant	Not Significant
473	Brookfield Avenue	2.4%	1.6%	0.6%	<1	Very Low	Extremely Low	Extremely Low	Not Significant	Not Significant	Not Significant
445	Warrington Road	4.4%	3.4%	1.0%	<1	Very Low	Extremely Low	Extremely Low	Not Significant	Not Significant	Not Significant
369	Cranage Close	3.4%	2.3%	0.7%	<1	Very Low	Extremely Low	Extremely Low	Not Significant	Not Significant	Not Significant
379	Danby Close	4.5%	3.2%	1.0%	<1	Very Low	Extremely Low	Extremely Low	Not Significant	Not Significant	Not Significant
390	Solway Grove	1.2%	1.0%	0.4%	<1	Extremely Low	Extremely Low	Extremely Low	Low Negative	Not Significant	Not Significant
394	Embleton Court	0.9%	0.7%	0.4%	<1	Extremely Low	Extremely Low	Extremely Low	Low Negative	Not Significant	Not Significant
170	Speakman Street	4.1%	3.6%	1.1%	<1	Very Low	Very Low	Extremely Low	Low Negative	Not Significant	Not Significant
44	St Patricks Close	1.2%	1.0%	0.4%	<1	Extremely Low	Extremely Low	Extremely Low	Low Negative	Not Significant	Not Significant

19.7.15 Access to the majority of the site would be directly from the public highway. Temporary haul routes during the construction would avoid residential areas and follow the line of existing motorways and trunk roads, therefore reducing the risk of exposure to emissions from the construction lorries. The distance travelled by the haulage lorries would also be minimised.

Disruption to Traffic during Construction

19.7.16 During the construction of the New Bridge, traffic flows on the surrounding roads may be disrupted. If congestion occurs due to the road works this may result in an increase in vehicle emissions. Construction traffic may also increase vehicle emissions from the area.

19.7.17 For each of the construction areas identified in Section 19.1, the possible effects on existing traffic flows have been identified and the potential effect on air quality within 200 m of the area assessed, and specifically those receptors identified in Table 19.9. This has been summarised in the Table 19.25.

Table 19.25 - Potential Air Quality Effects as a Result of Disruption to Traffic

	Disruption and potential effect to existing traffic flows	Potential Air Quality Effects
Area A: **Main Toll Plaza**	Traffic using Speke Road will be disrupted and diverted on to a temporary alignment while existing carriageway upgraded Increase in congestion along Speke Road	No sensitive receptors within 200 m of construction area
Area B: **Ditton Junction to Freight Line**	Re-modelling of Ditton junction requiring temporary road diversions on existing and new carriageways Increase in congestion around Ditton junction	Increase in congestion may result in increased concentrations at Moor Lane. However, due to distance from Ditton junction this is unlikely.
Area C: **Freight Line to St Helens Canal**	Bridges within Widnes Loops junction would not require traffic management No disruption to exiting traffic flows	No effect on air quality due to traffic management
Area D: **Mersey Gateway Bridge**	No interfaces with existing carriageway flows during construction No disruption to existing traffic flows north or south of the Project	No sensitive receptors within 200 m of construction area
Area E: **Astmoor Viaduct**	Traffic on Astmoor Road and Astmoor Busway diverted locally may result in increased congestion elsewhere	No sensitive receptors within 200 m of construction area
Area F: **Bridgewater Junction**	Re-modelling of Bridgewater junction will require multi-phase traffic management Increase in congestion around the junction as a result of traffic management and diversions	Increase in congestion may result in increased concentrations at Brookfield Avenue and Warrington Road

	Disruption and potential effect to existing traffic flows	Potential Air Quality Effects
Area G: **Central Expressway, Lodge Lane Junction and Weston Link Junction**	Re-modelling of junctions requiring temporary road diversions on existing and new carriageways Increase in congestion on local network as a result of diversions	Increase in congestion may result in increased concentrations at Danby Close and Solway Grove
Area H: **M56 Junction 12**	Re-modelling would require temporary traffic measures and minor diversions Increase in congestion around junction as a result of diversions	Increase in congestion may result in increased concentrations at Embleton Court
Area I: **SJB and Widnes De-Linking**	Closure of Widnes Eastern Bypass and Queensway embankments would require major traffic diversions, including diversions on to Ashley way Increase in congestion as a result of diversions Increase in traffic flows along Ashley Way Disruption to traffic during construction of cycle paths and walkways	Increase in congestion may result in increased concentrations at Speakman Street and St Patricks Close Increase in traffic using Ashley Way may result in increased concentrations at receptors adjacent to Ashley Way e.g. Batherton Close

19.7.18 It has not been possible to quantify the effect of those traffic management measures discussed above on local air quality. As such, the assessment of effects as a result of disruption to traffic during construction has been qualitative in nature. This is because the predicted effect on traffic flows as a result of the disruption to existing traffic flow cannot be readily quantified. However, effects on air quality as a result of disruption to existing traffic will be over the short-term.

Contaminated Land

19.7.19 As described in the contaminated land assessment (Chapter 14) desk studies and site investigations have identified widespread evidence for potentially contaminating land uses within Widnes and to a lesser extent within the northern part of the project area in Runcorn.

19.7.20 Widespread evidence of ‘Galligu’, a chemical waste/by-product from the former alkali industry was encountered in Widnes between the St Helens Canal and on St Michaels Golf Course/Speke Road. Waste from the alkali industry was also encountered in localised areas on the salt marshes; Wigg Island Landfill in Runcorn and former area of tipping adjacent to the Woodend Works on Widnes Warth.

19.7.21 Soil testing for land based areas outside the salt marshes and estuary was undertaken and was found to contain asbestos, arsenic, lead, petroleum hydrocarbons, VOCs (including BTEX and chlorinated solvents at the Catalyst Trade Park and localised areas on the Golf Course and Gussion Transport). Such contaminants, if released to air during the construction phases of the Project, could cause significant health risks to construction workers and/or local residents. The migration of ground gas or vapours into excavations or buildings could also cause a significant risk in terms of indoor air quality and increased explosive potential.

19.7.22 Monitoring during construction and operational phases will be required to ensure the effectiveness of the mitigation measures.

Waste and Recycling

19.7.23 The transportation of waste materials for on-site reuse or recycling, or off site recycling or disposal is a major generator of construction traffic.

19.7.24 Table 19.26 presents the four different types of waste associated with the Project, and the materials characterised within each of these categories that may have an effect of local air quality when handled. A more detailed description of these wastes is provided in Chapter 15.

Table 19.26 - Potential Air Quality Effects from Waste

Category	Material	Potential Air Quality Effects
Enabling Wastes	Contaminated fill, general fill, asphalt, inert general fill material, green waste, topsoil	Handling, storage (on site only), transportation on site and on local road network, deposition (on site only as fill material) and potential effects to air from contamination
Demolition Wastes	Demolition of brick and framed buildings, demolition of de-linking works (including structural concrete, reinforcement steel, granular fill, cut/fill spoil, contaminated spoil), demolition of Rock Savage Bridge and Lodge Lane Bridge (including structural concrete, reinforcement steel)	Handling, storage (on site only) and transportation on site and on local road network
Construction (Site) Wastes	Mixed site wastes, catering wastes, office waste, waste from construction methods	Handling, storage and transportation on site and on local road network
Operational Phase Wastes	Wastes generated due to maintenance, wastes associated with maintenance of local environmental quality, end of life wastes	Handling, storage and transportation on site and on local road network

19.7.25 Waste transportation has been assessed quantitatively by way of the assessment of construction traffic emissions described in Section 19.1. As described in the Chapter 15, it has been estimated that approximately 8,580 vehicle movements would be expected through the duration of the Project. This equates to an average of six vehicle movements per day relating to the handling of waste arisings which is considered to be negligible. Such vehicle movements represent less than 4% of the worst case assessment of construction traffic movements (250 vehicles) undertaken above.

19.7.26 Given the negligible effect of construction traffic emissions associated with the transportation of waste materials, air quality effects are more likely to arise as a result of the handling, storage and disposal of the waste materials. As such, those mitigation measures described in the next Section are key to minimising the potential air quality effects as a result of the transportation of waste materials.

Local Air Quality

19.7.27 This Section presents the operational effects of the Project on air quality based on dispersion modelling results for year 2015. The methodology followed to assess the effect of the Project based on the comparison of results from the Do-Something scenario (with the Project in operation) and the Do-Minimum scenarios (baseline 2015, without the Project).

Results of the baseline 2015 have been presented in the following sections. The following Section first presents the predicted results for year 2015 assuming the new road network layout and the Project is in place and operational. The difference in pollutant concentrations between the two scenarios is then used to assess the effect of the Project based on the significance criteria described in Table 19.28 to Table 19.30.

Predicted Results – Do-Something 2015 scenario

19.7.28 Predicted NO_2 and PM_{10} annual average concentrations at the 64 key receptors are presented in Table 19.27 for each area. Predicted exceedences of the PM_{10} daily mean are also provided. The results at key receptors are also illustrated in Figure 19.21, 19.22 and 19.23 (Appendix 19.1) for annual average NO_2, PM_{10}, and daily mean PM_{10} respectively. Predicted concentrations at the remaining receptors have been provided in Appendix 19.4.

19.7.29 Analysis of UK continuous NO_2 monitoring data has shown that it is unlikely that the hourly mean NO_2 objective, of 18 hourly means over 200 µg/m^3, would be exceeded where the annual mean objective is below 60 µg/m^3 (Ref. 36). The maximum predicted annual average for NO_2 is below 60 µg/m^3; therefore the NO_2 hourly mean AQS objective is expected to be met at all relevant locations. Consequently, where mentioned below, the NO_2 AQS objective refers to the annual mean AQS objective of 40 µg/m^3.

Table 19.27 - Predicted NO_2 and PM_{10} results – Do-Something 2015

Area	ID	Name	Modelled annual average NO_2 2015 (verified) - µg/m^3	Modelled annual average PM_{10} 2015 (verified) - µg/m^3	Daily PM_{10} exceedences > 50µg/m^3 - µg/m^3
Widnes Centre	9	Near Unicorn Inn - Cronton Road	25.1	19.8	3
	83	Ditchfield Road - Liverpool Road (Junction)	23.5	19.3	3
	93	Prescot Road - Liverpool Road (Junction)	24.5	20.7	4
	96	Dundalk Road - Hale Road (Junction)	28.1	22.6	7
	102	Playground - Dundalk Road	22.8	19.0	2
	127	Leigh Avenue - Highfield Road (Junction)	23.2	19.5	3
	162	Gerrard Street - Alfred Street (Junction)	25.3	20.2	4
A562 Speke Road/Ditton-Widnes Loops Junctions	63	MacDermott Road	21.3	18.2	2
	65	St Michael Jubilee Golf Course	22.5	18.6	2
	67	Pond adjacent to Speke Road	23.6	19.2	3
	105	3 Rose Street	24.4	20.1	4
	147	Club - Croft Street	36.0	24.9	12
	153	Victoria Road - Luton Street (Junction)	25.4	20.3	4
SJB	45	16 St Bridgets Close	21.8	18.3	2
	49	52 Irwell Street	22.0	18.4	2
	171	36 Egerton Street	22.8	18.4	2

	192	High Street - Bridgewater Street (Junction)	28.5	20.6	4
	230	49 Greenway Road	23.8	19.1	2
	272	19 Percival Lane	21.0	18.1	1
A557 Watkinson Way - Widnes Eastern Bypass	29	The Rowans - Moorfield Road	25.4	20.7	4
	34	100 Page Lane	25.9	20.6	4
	39	37 Batherton Close	28.7	21.4	5
A557 Weston Point Expressway	275	61 Westfield Road	20.2	18.0	1
	306	5 Bankes' Lane	22.1	18.4	2
	309	215 Heath Road South	23.2	18.8	2
	331	Adjacent Old Hall - Cavendish Farm Road	24.0	18.9	2
Runcorn Centre	236	1 Sutton Street	24.2	19.6	3
	242	38 Latham Avenue	22.6	18.9	2
	316	Heath Road - Moughland Land (Junction)	23.3	19.4	3
	346	Halton Lodge Avenue - Grangeway (Junction)	22.8	19.1	2
A533 Central Expressway (Castlefields / Halton Brook / Southgate) and the Mersey Gateway Bridge Corridor	362	32 Handforth Lane	24.2	19.7	3
	366	47 Fenwick Lane	22.1	18.6	2
	371	22 Budworth Close	23.3	18.9	2
	372	29 Tawny Court	24.8	19.9	3
	376	35 Hawks Court	24.3	19.9	3
	381	8 Danby Close	23.9	19.2	2
	419	103 The Glen	26.4	20.9	5
	444	198 Boston Avenue	26.8	21.2	5
	446	Halton Brow - Warrington Road (Junction)	27.4	21.5	5
	452	83 Calvers	25.8	20.5	4
	455	24 LittleGate	24.4	19.9	3
	470	26 Caesars Close	25.3	20.4	4
	472	Brookfield Avenue - Between 83 and 103	23.6	19.6	3
	477	Ivy House - Marsh Lane	30.0	22.1	6
	505	8 Seneschal Court	23.8	19.1	2
	WI3	Wigg Island 3	24.3	19.7	3
	WI7	Wigg Island 7	21.4	18.4	2
	WI9	Wigg Island 9	20.3	18.1	1
	WI11	Wigg Island 11	24.3	19.7	3
A558 Daresbury Expressway (Castlefields to Daresbury)	487	2 Kings Court	24.2	19.8	3
	513	Daresbury Lodge - Chester Road	23.7	19.7	3
M56 Motorway	412	Adjacent 11 Magnolia Drive	34.2	22.8	8
	414	Adjacent Jericune - Wood Lane	32.7	22.2	7
	417	Gladstan House - Chester Road	36.2	23.7	9

	433	Aston Green - between 12 and 6	35.5	23.3	9
	517	7 Williams Way	35.3	23.0	8
Weston Link-M56 Junctions (Rocksavage / Clifton / Beechwood)	385	35 Lincoln Close	21.7	18.3	2
	386	Close to Clifton Hall - Cholmondeley Road	23.6	18.9	2
	388	Millersdale Grove - Between 34 and 44	25.1	19.9	3
	392	Ingleton Grove - Between 15 and 19	28.9	21.4	5
	399	7 Dunmail Grov	28.2	21.3	5
	401	17 Paddock Rise	27.6	20.4	4
Deacon Road - Widnes	HBC5	Deacon Road 2 (Diffusion Tube)	29.0	22.8	8
Peel House Lane - Widnes	142	138 Albert Road	28.0	22.4	7

General assessment

19.7.30 The maximum predicted NO_2 annual average is 36.2 µg/m^3 at receptor 417 at the Gladstan House / Chester Road junction. Overall, all sites are predicted to be below the NO_2 AQS objective, with most of the sites being under 30µg/m^3 except along the M56 motorway, where a few sites are within 35-37 µg/m^3.

19.7.31 The maximum PM_{10} concentration is 24.9 µg/m^3 in Croft Street (receptor 147), which is well below the PM_{10} annual mean AQS objective. The maximum number of PM_{10} daily means above 50 µg/m^3 is also well below the objective of 35 exceedences (12 exceedences at that same receptor). All other sensitive sites are predicted to be well below the PM_{10} AQS objectives.

Widnes Centre including Lunts Heath / Cronton (North of Widnes)

19.7.32 All sensitive sites in Widnes Centre are predicted to be well below the AQS objective. The maximum predicted NO_2 annual is 28.1 µg/m^3 at receptor 96 at Dundalk Road / Hale Road junction.

19.7.33 All sensitive sites in Widnes Centre are predicted to be well below the PM_{10} AQS objectives. The maximum predicted PM_{10} annual mean is 22.6 µg/m^3 at Dundalk Road / Hale Road junction (receptor 96). There is a maximum of 7 daily means exceeding 50 µg/m^3 at this receptor, which is also well below the daily mean AQS objective.

A562 Speke Road / Ditton-Widnes Loops Junctions

19.7.34 The maximum predicted NO_2 annual mean is 36.0 µg/m^3 at receptor 147 in Croft Street, which is below the NO_2 AQS objective. All other sites close to the A562 Speke Road / Ditton Junction are predicted to be well below the objective.

19.7.35 The maximum predicted PM_{10} annual mean is 24.9 µg/m^3 in Croft Street (receptor 147), which is well below the AQS objective. All sites are predicted to be well below both PM_{10} objectives.

SJB – including West Bank and SJB's South Junction

19.7.36 The maximum predicted NO_2 annual mean is 28.5 µg/m^3 at the junction of High Street and Bridgewater Street in Runcorn (receptor 192). The maximum predicted PM_{10} annual mean is 20.6 µg/m^3 at the same junction in Runcorn. All key receptors close to the A533 Queensway in Widnes and Runcorn are predicted to be well below the PM_{10} and NO_2 AQS objectives.

A557 Ashley Way/Watkinson Way (Widnes Eastern Bypass) – Simm's Cross / Crow Wood / Barrow's Green

19.7.37 All other key receptors along the A557 East of Widnes (Halton View, Barrow's Green) are well below the NO_2 AQS objective. The maximum predicted NO_2 annual mean is 28.7 µg/m^3 at 37 Batherton Close, Widnes (receptor 39). The maximum predicted PM_{10} annual mean is 21.4 µg/m^3 at this same receptor. All sites along the A557 East of Widnes are well below the PM_{10} AQS objectives.

A557 Weston Point Expressway (Runcorn Western Bypass) – Weston Point / Weston

19.7.38 The maximum predicted NO_2 annual mean is 24.0 µg/m^3 near the Cavendish Farm Road / Heath Road South junction, South Runcorn (receptor 331). The maximum predicted PM_{10} annual mean is 18.9 µg/m^3 at the same receptor. All key receptors along the A557 (Runcorn Western by-pass) are well below the NO_2 and PM_{10} AQS objectives.

Runcorn Centre

19.7.39 The maximum predicted NO_2 annual mean in Runcorn Centre is 24.2 µg/m^3 at 1 Sutton Street (receptor 236). All other key receptors in Runcorn Centre are well below the NO_2 AQS objective. The maximum predicted PM_{10} annual mean is 19.6 µg/m^3 at the same receptor. All key receptors in Runcorn Centre are well below the NO_2 and PM_{10} AQS objectives.

A533 Central Expressway (Castlefields / Halton Brook / Southgate), Whitehouse Expressway (Palacefields) and the Mersey Gateway Bridge Corridor

19.7.40 The maximum predicted NO_2 annual mean is 30.0 µg/m^3 at Ivy House in Marsh Lane (receptor 477). The maximum predicted PM_{10} annual mean is 22.1 µg/m^3 at the same receptor. As discussed in Section 19.1, this site is a listed building and is not inhabited. All other key receptors along the A533 Central Expressway and the A533 Whitehouse Expressway are well below the NO_2 and PM_{10} AQS objectives. Maximum predicted NO_2 and PM_{10} annual mean concentrations on Wigg Island are 24.3 µg/m^3 and 19.7 µg/m^3, respectively.

A558 Daresbury Expressway (Castlefields to Daresbury)

19.7.41 The maximum predicted NO_2 annual mean is 24.2 µg/m^3 at 36 Steventon in Runcorn (receptor 487). The maximum predicted PM_{10} annual mean is 19.8 µg/m^3 at the same receptor. All key receptors along the A533 Daresbury Expressway are well below the NO_2 and PM_{10} AQS objectives.

M56 Motorway

19.7.42 The maximum predicted NO_2 annual mean is 36.2 µg/m^3 at Gladstan House on Chester Road, (receptor 417). Several other sites are within 34 to 36 µg/m^3 along the M56 (receptors 412, 433 and 517). The maximum predicted PM_{10} annual mean is 23.7µg/m^3 at receptor 417. All key receptors along the M56 are below the PM_{10} AQS objectives.

Weston Link-M56 Junctions (Rocksavage / Clifton / Beechwood)

19.7.43 The maximum predicted NO_2 annual mean is 28.9 µg/m^3 at 15 Ingleton Grove (receptor 392) near Beechwood. The maximum predicted PM_{10} annual mean is 21.4 µg/m^3 at the same receptor. All key receptors between those junctions are well below the NO_2 and PM_{10} AQS objectives.

Local Authorities sensitive areas

19.7.44 As described in Section 19.1, the Council has identified several areas in Widnes and Runcorn where results from monitoring data are above the annual mean AQS objective for NO_2. Predicted results for the Do-Something 2015 scenario in these areas are discussed below.

Peel House Lane, Widnes

19.7.45 The maximum predicted NO_2 annual mean near the Peel House Lane/Albert Road junction is 28.0 µg/m^3 at 138 Albert Road (receptor 142).The maximum predicted PM_{10} annual mean is 22.4 µg/m^3 at the same receptor. Predicted results suggest that both NO_2 and PM_{10} AQS objectives are unlikely to be exceeded at this junction.

Deacon Road, Widnes

19.7.46 The maximum predicted NO_2 annual mean in Deacon Road is 29.0 µg/m^3 at diffusion tube installed near the property in 2 Deacon Road (receptor HBC5). The maximum predicted PM_{10} annual mean is 22.8 µg/m^3 at the same receptor. Predicted results suggest that both the NO_2 and PM_{10} AQS objectives are unlikely to be exceeded in Deacon Road.

Greenway Road, Runcorn

19.7.47 The predicted NO_2 annual mean in 49 Greenway Road is 23.8 µg/m^3 (receptor 230). The predicted PM_{10} annual at this site is 19.1 µg/m^3. Therefore, it is unlikely that NO_2 or PM_{10} AQS objectives would be breached in Greenway Road.

Milton Road, Widnes

19.7.48 As discussed in Section 19.1, baseline modelled traffic data on this road is not consistent with levels reported with HBC LAQM reports and therefore predicted concentrations are low at receptors located in Milton Road. Based on the pattern of reduction of predicted results for Do-Something 2015 at other highlighted areas in Widnes (Deacon Road, Peel House Lane), the NO_2 or PM_{10} AQS objectives are not expected to be exceeded along Milton Road in 2015. Traffic flows on this road are not significantly affected by the Project.

Effects on Local Air Quality

19.7.49 This Section presents the comparison between the Do-Something and the Do-Nothing scenarios and the assessment of effect significance on air quality, based on NO_2 and PM_{10} concentration differences. Results of the comparison are provided in Table 19.28, Table 19.29 and Table 19.30.

19.7.50 Results are expressed both in terms of absolute difference (for NO_2 annual mean, PM_{10} annual and daily means) and percentage difference (for NO_2 and PM_{10} annual means only) in pollutant concentration at each key receptor. The difference between the Do-Minimum and Do-Something 2015 scenarios are also illustrated in Figures 19.24, 19.25, and 19.26 (Appendix 19.1) for annual mean NO_2, annual mean PM_{10} and daily mean PM_{10} respectively.

19.7.51 Table 19.28, Table 19.29 and Table 19.30 also provide the description of the effect magnitude and the overall description of the significance of the effect for each key receptor. A detailed description of the method for assigning the effect magnitude and significance is provided in Section 19.1. Figures 19.27 to 19.32 (Appendix 19.1) show the effect magnitude and the overall significance of the air quality effects on annual mean NO_2, annual mean PM_{10} and daily mean PM_{10} concentration at receptors within the air quality study.

Table 19.28 - Effect significance – NO_2 annual mean

Area	ID	Name	Modelled annual average NO_2 DoSome-DoMin 2015 - µg/m^3	Modelled annual average NO_2 DoSome-DoMin 2015 - %	Effect Magnitude	Significance
Widnes Centre	9	Near Unicorn Inn - Cronton Road	0.2	0.9%	Extremely Low	Not Significant
	83	Ditchfield Road - Liverpool Road (Junction)	-0.3	-1.1%	Very Low	Not Significant
	93	Prescot Road - Liverpool Road (Junction)	0.0	-0.2%	Extremely Low	Not Significant
	96	Dundalk Road - Hale Road (Junction)	0.2	0.7%	Extremely Low	Not Significant
	102	Playground - Dundalk Road	-0.6	-2.8%	Very Low	Not Significant
	127	Leigh Avenue - Highfield Road (Junction)	-0.1	-0.6%	Extremely Low	Not Significant
	162	Gerrard Street - Alfred Street (Junction)	0.7	3.0%	Very Low	Not Significant
A562 Speke Road	63	MacDermott Road	-2.9	-12.0%	Moderate	Moderate Positive
	65	St Michael Jubilee Golf Course	-0.6	-2.6%	Very Low	Not Significant
	67	Pond adjacent to Speke Road	-0.7	-2.9%	Very Low	Not Significant
	105	3 Rose Street	-0.3	-1.1%	Very Low	Not Significant
	147	Club - Croft Street	2.6	7.6%	Low	High Negative
	153	Victoria Road - Luton Street (Junction)	0.6	2.6%	Very Low	Not Significant
SJB	45	16 St Bridgets Close	-8.8	-28.7%	Very High	High Positive
	49	52 Irwell Street	-5.9	-21.2%	High	High Positive
	171	36 Egerton Street	-6.8	-23.0%	High	High Positive
	192	High Street - Bridgewater Street (Junction)	-4.6	-14.0%	Moderate	Moderate Positive
	230	49 Greenway Road	-5.7	-19.4%	High	High Positive
	272	19 Percival Lane	-6.6	-23.9%	High	High Positive
A557 Watkinson Way - Widnes Eastern Bypass	29	The Rowans - Moorfield Road	0.1	0.3%	Extremely Low	Not Significant
	34	100 Page Lane	0.3	1.4%	Very Low	Not Significant
	39	37 Batherton Close	0.9	3.2%	Very Low	Not Significant
A557 Weston Point Expressway	275	61 Westfield Road	-5.9	-22.6%	High	Moderate Positive
	306	5 Bankes' Lane	-5.0	-18.5%	High	High Positive
	309	215 Heath Road South	-0.9	-3.8%	Very Low	Not Significant
	331	Adjacent Old Hall - Cavendish Farm Road	-5.7	-19.3%	High	High Positive
Runcorn Centre	236	1 Sutton Street	-3.6	-13.1%	Moderate	Moderate Positive
	242	38 Latham Avenue	-1.0	-4.1%	Very Low	Not Significant
	316	Heath Road - Moughland Land (Junction)	0.1	0.5%	Extremely Low	Not Significant
	346	Halton Lodge Avenue - Grangeway (Junction)	0.2	0.9%	Extremely Low	Not Significant
A533 Central Expressway (Castlefields / Halton Brook / Southgate) and the Mersey Gateway	362	32 Handforth Lane	0.4	1.7%	Very Low	Not Significant
	366	47 Fenwick Lane	0.4	1.9%	Very Low	Not Significant
	371	22 Budworth Close	0.5	2.1%	Very Low	Not Significant
	372	29 Tawny Court	1.4	6.1%	Low	Low Negative
	376	35 Hawks Court	-0.5	-2.1%	Very Low	Not Significant
	381	8 Danby Close	0.8	3.4%	Very Low	Not Significant

	419	103 The Glen	-0.5	-1.8%	Very Low	Not Significant
	444	198 Boston Avenue	1.5	6.0%	Low	Low Negative
	446	Halton Brow - Warrington Road (Junction)	2.3	9.2%	Low	Low Negative
	452	83 Calvers	2.1	8.8%	Low	Low Negative
	455	24 LittleGate	0.4	1.6%	Very Low	Not Significant
	470	26 Caesars Close	1.6	6.9%	Low	Low Negative
	472	Brookfield Avenue - Between 83 and 103	0.8	3.6%	Very Low	Not Significant
	477	Ivy House - Marsh Lane	0.4	1.5%	Very Low	Low Negative
	505	8 Seneschal Court	0.0	0.2%	Extremely Low	Not Significant
	WI3	Wigg Island 3	5.1	26.4%	Very High	Moderate Negative
	WI7	Wigg Island 7	2.5	13.0%	Moderate	Low Negative
	WI9	Wigg Island 9	0.0	0.0%	Extremely Low	Not Significant
	WI11	Wigg Island 11	5.0	25.6%	Very High	Moderate Negative
A558 Daresbury Expressway (Castlefields to Daresbury)	487	2 Kings Court	-0.2	-1.0%	Extremely Low	Not Significant
	513	Daresbury Lodge - Chester Road	0.1	0.5%	Extremely Low	Not Significant
M56 Motorway	412	Adjacent 11 Magnolia Drive	0.0	0.1%	Extremely Low	Low Negative
	414	Adjacent Jericune - Wood Lane	0.0	-0.1%	Extremely Low	Not Significant
	417	Gladstan House - Chester Road	0.1	0.2%	Extremely Low	Low Negative
	433	Aston Green - between 12 and 6	0.1	0.2%	Extremely Low	Low Negative
	517	7 Williams Way	-0.2	-0.6%	Extremely Low	Not Significant
Weston Link-M56 Junctions (Rocksavage / Clifton / Beechwood)	385	35 Lincoln Close	-1.9	-7.9%	Low	Low Positive
	386	Close to Clifton Hall - Cholmondeley Road	0.2	0.7%	Extremely Low	Not Significant
	388	Millersdale Grove - Between 34 and 44	1.4	5.8%	Low	Low Negative
	392	Ingleton Grove - Between 15 and 19	0.0	0.0%	Extremely Low	Not Significant
	399	7 Dunmail Grov	-0.1	-0.2%	Extremely Low	Not Significant
	401	17 Paddock Rise	0.0	0.0%	Extremely Low	Not Significant
Deacon Road - Widnes	HBC5	Deacon Road 2 (Diffusion Tube)	0.4	1.2%	Very Low	Low Negative
Peel House Lane - Widnes	142	138 Albert Road	0.2	0.8%	Extremely Low	Not Significant
Summary						
Number of sites		Very High Positive			0	
		High Positive			7	
		Moderate Positive			4	
		Low Positive			1	
		Not Significant			37	
		Low Negative			12	
		Moderate Negative			2	
		High Negative			1	
		Very High Negative			0	
		Total			64	

Table 19.29 - Effect significance – PM_{10} annual mean

Area	ID	Name	Modelled annual average PM_{10} DoSome-DoMin 2015 - µg/m^3	Modelled annual average PM_{10} DoSome-DoMin 2015 - %	Effect Magnitude	Significance
Widnes Centre	9	Near Unicorn Inn - Cronton Road	0.1	0.3%	Extremely Low	Not Significant
	83	Ditchfield Road - Liverpool Road (Junction)	-0.1	-0.6%	Extremely Low	Not Significant
	93	Prescot Road - Liverpool Road (Junction)	0.0	0.1%	Extremely Low	Not Significant
	96	Dundalk Road - Hale Road (Junction)	0.1	0.4%	Extremely Low	Not Significant
	102	Playground - Dundalk Road	-0.2	-1.1%	Very Low	Not Significant
	127	Leigh Avenue - Highfield Road (Junction)	0.0	-0.2%	Extremely Low	Not Significant
	162	Gerrard Street - Alfred Street (Junction)	0.4	1.9%	Very Low	Not Significant
A562 Speke Road	63	MacDermott Road	-1.5	-7.7%	Low	Not Significant
	65	St Michael Jubilee Golf Course	-0.2	-1.2%	Very Low	Not Significant
	67	Pond adjacent to Speke Road	-0.3	-1.7%	Very Low	Not Significant
	105	3 Rose Street	-0.2	-1.1%	Very Low	Not Significant
	147	Club - Croft Street	1.4	6.1%	Low	Low Negative
	153	Victoria Road - Luton Street (Junction)	0.3	1.5%	Very Low	Not Significant
SJB	45	16 St Bridgets Close	-4.7	-20.4%	High	Moderate Positive
	49	52 Irwell Street	-3.1	-14.5%	Moderate	Low Positive
	171	36 Egerton Street	-3.6	-16.4%	High	Moderate Positive
	192	High Street - Bridgewater Street (Junction)	-2.6	-11.1%	Moderate	Low Positive
	230	49 Greenway Road	-3.1	-13.8%	Moderate	Low Positive
	272	19 Percival Lane	-3.4	-16.0%	High	Moderate Positive
A557 Watkinson Way - Widnes Eastern Bypass	29	The Rowans - Moorfield Road	0.0	-0.2%	Extremely Low	Not Significant
	34	100 Page Lane	0.2	0.8%	Extremely Low	Not Significant
	39	37 Batherton Close	0.3	1.5%	Very Low	Not Significant
A557 Weston Point Expressway	275	61 Westfield Road	-2.7	-13.1%	Moderate	Low Positive
	306	5 Bankes' Lane	-2.4	-11.7%	Moderate	Low Positive
	309	215 Heath Road South	-0.7	-3.7%	Very Low	Not Significant
	331	Adjacent Old Hall - Cavendish Farm Road	-3.1	-14.0%	Moderate	Low Positive
Runcorn Centre	236	1 Sutton Street	-1.6	-7.6%	Low	Low Positive
	242	38 Latham Avenue	-0.6	-3.0%	Very Low	Not Significant
	316	Heath Road - Moughland Land (Junction)	-0.4	-2.0%	Very Low	Not Significant
	346	Halton Lodge Avenue - Grangeway (Junction)	0.1	0.3%	Extremely Low	Not Significant
A533 Central Expressway (Castlefields / Halton Brook /	362	32 Handforth Lane	0.4	2.3%	Very Low	Not Significant
	366	47 Fenwick Lane	0.1	0.3%	Extremely Low	Not Significant
	371	22 Budworth Close	0.0	0.2%	Extremely Low	Not Significant

Area	ID	Name	Modelled annual average PM_{10} DoSome-DoMin 2015 - µg/m³	Modelled annual average PM_{10} DoSome-DoMin 2015 - %	Effect Magnitude	Significance
Southgate) and the Mersey Gateway Bridge Corridor	372	29 Tawny Court	0.8	4.2%	Very Low	Not Significant
	376	35 Hawks Court	-0.4	-1.8%	Very Low	Not Significant
	381	8 Danby Close	-0.2	-1.2%	Very Low	Not Significant
	419	103 The Glen	-0.2	-1.0%	Extremely Low	Not Significant
	444	198 Boston Avenue	0.6	2.7%	Very Low	Not Significant
	446	Halton Brow - Warrington Road (Junction)	0.9	4.5%	Very Low	Not Significant
	452	83 Calvers	0.6	3.0%	Very Low	Not Significant
	455	24 LittleGate	0.5	2.5%	Very Low	Not Significant
	470	26 Caesars Close	1.1	5.8%	Low	Low Negative
	472	Brookfield Avenue - Between 83 and 103	0.6	3.2%	Very Low	Not Significant
	477	Ivy House - Marsh Lane	-0.1	-0.6%	Extremely Low	Not Significant
	505	8 Seneschal Court	0.0	-0.1%	Extremely Low	Not Significant
	WI3	Wigg Island 3	1.9	10.9%	Moderate	Low Negative
	WI7	Wigg Island 7	0.7	3.9%	Very Low	Not Significant
	WI9	Wigg Island 9	0.0	-0.2%	Extremely Low	Not Significant
	WI11	Wigg Island 11	1.9	10.7%	Moderate	Low Negative
A558 Daresbury Expressway (Castlefields to Daresbury)	487	2 Kings Court	-0.3	-1.3%	Very Low	Not Significant
	513	Daresbury Lodge - Chester Road	0.0	0.0%	Extremely Low	Not Significant
M56 Motorway	412	Adjacent 11 Magnolia Drive	-0.2	-0.7%	Extremely Low	Not Significant
	414	Adjacent Jericune - Wood Lane	-0.1	-0.6%	Extremely Low	Not Significant
	417	Gladstan House - Chester Road	-0.1	-0.5%	Extremely Low	Not Significant
	433	Aston Green - between 12 and 6	-0.1	-0.4%	Extremely Low	Not Significant
	517	7 Williams Way	-0.2	-0.8%	Extremely Low	Not Significant
Weston Link- M56 Junctions (Rocksavage / Clifton / Beechwood)	385	35 Lincoln Close	-0.7	-3.7%	Very Low	Not Significant
	386	Close to Clifton Hall - Cholmondeley Road	-0.5	-2.6%	Very Low	Not Significant
	388	Millersdale Grove - Between 34 and 44	0.4	1.9%	Very Low	Not Significant
	392	Ingleton Grove - Between 15 and 19	-0.3	-1.3%	Very Low	Not Significant
	399	7 Dunmail Grov	-0.1	-0.6%	Extremely Low	Not Significant
	401	17 Paddock Rise	-0.1	-0.6%	Extremely Low	Not Significant
Deacon Road - Widnes	HBC5	Deacon Road 2 (Diffusion Tube)	0.2	0.9%	Extremely Low	Not Significant
Peel House Lane - Widnes	142	138 Albert Road	0.2	0.7%	Extremely Low	Not Significant

Area	ID	Name	Modelled annual average PM_{10} DoSome-DoMin 2015 - µg/m³	Modelled annual average PM_{10} DoSome-DoMin 2015 - %	Effect Magnitude	Significance
Summary						
Number of sites		Very High Positive			0	
		High Positive			0	
		Moderate Positive			3	
		Low Positive			7	
		Not Significant			50	
		Low Negative			4	
		Moderate Negative			0	
		High Negative			0	
		Very High Negative			0	
		Total			64	

Table 19.30 - Effect significance – PM_{10} daily mean

Area	ID	Name	Modelled daily mean PM_{10} DoSome-DoMin 2015 - µg/m³	Effect Magnitude	Significance
Widnes Centre	9	Near Unicorn Inn - Cronton Road	0	Extremely Low	Not Significant
	83	Ditchfield Road - Liverpool Road (Junction)	0	Extremely Low	Not Significant
	93	Prescot Road - Liverpool Road (Junction)	0	Extremely Low	Not Significant
	96	Dundalk Road - Hale Road (Junction)	0	Extremely Low	Not Significant
	102	Playground - Dundalk Road	0	Extremely Low	Not Significant
	127	Leigh Avenue - Highfield Road (Junction)	0	Extremely Low	Not Significant
	162	Gerrard Street - Alfred Street (Junction)	0	Extremely Low	Not Significant
A562 Speke Road	63	MacDermott Road	-1	Very Low	Low Positive
	65	St Michael Jubilee Golf Course	0	Extremely Low	Not Significant
	67	Pond adjacent to Speke Road	0	Extremely Low	Not Significant
	105	3 Rose Street	0	Extremely Low	Not Significant
	147	Club - Croft Street	3	Low	Low Negative
	153	Victoria Road - Luton Street (Junction)	0	Extremely Low	Not Significant
SJB	45	16 St Bridgets Close	-6	Moderate	Moderate Positive
	49	52 Irwell Street	-4	Low	Low Positive
	171	36 Egerton Street	-5	Low	Low Positive
	192	High Street - Bridgewater Street (Junction)	-4	Low	Low Positive
	230	49 Greenway Road	-4	Low	Low Positive
	272	19 Percival Lane	-4	Low	Low Positive
A557 Watkinson Way - Widnes	29	The Rowans - Moorfield Road	0	Extremely Low	Not Significant
	34	100 Page Lane	0	Extremely Low	Not Significant
	39	37 Batherton Close	0	Extremely Low	Not Significant

Area	ID	Name	Modelled daily mean PM_{10} DoSome-DoMin 2015 - µg/m^3	Effect Magnitude	Significance
Eastern Bypass					
A557 Weston Point Expressway	275	61 Westfield Road	-3	Very Low	Low Positive
	306	5 Bankes' Lane	-3	Very Low	Low Positive
	309	215 Heath Road South	-1	Extremely Low	Not Significant
	331	Adjacent Old Hall - Cavendish Farm Road	-4	Low	Low Positive
Runcorn Centre	236	1 Sutton Street	-2	Very Low	Low Positive
	242	38 Latham Avenue	-1	Extremely Low	Not Significant
	316	Heath Road - Moughland Land (Junction)	0	Extremely Low	Not Significant
	346	Halton Lodge Avenue - Grangeway (Junction)	0	Extremely Low	Not Significant
A533 Central Expressway (Castlefields / Halton Brook / Southgate) and the Mersey Gateway Bridge Corridor	362	32 Handforth Lane	0	Extremely Low	Not Significant
	366	47 Fenwick Lane	0	Extremely Low	Not Significant
	371	22 Budworth Close	0	Extremely Low	Not Significant
	372	29 Tawny Court	1	Extremely Low	Not Significant
	376	35 Hawks Court	0	Extremely Low	Not Significant
	381	8 Danby Close	0	Extremely Low	Not Significant
	419	103 The Glen	0	Extremely Low	Not Significant
	444	198 Boston Avenue	1	Extremely Low	Not Significant
	446	Halton Brow - Warrington Road (Junction)	1	Very Low	Low Negative
	452	83 Calvers	1	Extremely Low	Not Significant
	455	24 LittleGate	1	Extremely Low	Not Significant
	470	26 Caesars Close	1	Very Low	Low Negative
	472	Brookfield Avenue - Between 83 and 103	1	Extremely Low	Not Significant
	477	Ivy House - Marsh Lane	0	Extremely Low	Not Significant
	505	8 Seneschal Court	0	Extremely Low	Not Significant
	WI3	Wigg Island 3	2	Very Low	Low Negative
	WI7	Wigg Island 7	1	Extremely Low	Not Significant
	WI9	Wigg Island 9	0	Extremely Low	Not Significant
	WI11	Wigg Island 11	2	Very Low	Low Negative
A558 Daresbury Expressway (Castlefields to Daresbury)	487	2 Kings Court	0	Extremely Low	Not Significant
	513	Daresbury Lodge - Chester Road	0	Extremely Low	Not Significant
M56 Motorway	412	Adjacent 11 Magnolia Drive	0	Extremely Low	Not Significant
	414	Adjacent Jericune - Wood Lane	0	Extremely Low	Not Significant
	417	Gladstan House - Chester Road	0	Extremely Low	Not Significant
	433	Aston Green - between 12 and 6	0	Extremely Low	Not Significant
	517	7 Williams Way	0	Extremely Low	Not Significant
Weston Link-M56 Junctions (Rocksavage / Clifton /	385	35 Lincoln Close	-1	Extremely Low	Not Significant
	386	Close to Clifton Hall - Cholmondeley Road	-1	Extremely Low	Not Significant
	388	Millersdale Grove - Between 34 and 44	0	Extremely Low	Not Significant

Area	ID	Name	Modelled daily mean PM_{10} DoSome-DoMin 2015 - µg/m^3	Effect Magnitude	Significance
Beechwood)	392	Ingleton Grove - Between 15 and 19	0	Extremely Low	Not Significant
	399	7 Dunmail Grov	0	Extremely Low	Not Significant
	401	17 Paddock Rise	0	Extremely Low	Not Significant
Deacon Road - Widnes	HBC5	Deacon Road 2 (Diffusion Tube)	0	Extremely Low	Not Significant
Peel House Lane - Widnes	142	138 Albert Road	0	Extremely Low	Not Significant
Summary					
Number of sites	Very High Positive			0	
	High Positive			0	
	Moderate Positive			1	
	Low Positive			10	
	Not Significant			48	
	Low Negative			5	
	Moderate Negative			0	
	High Negative			0	
	Very High Negative			0	
	Total			64	

General assessment

19.7.52 Overall, the difference in concentrations between the Do-Something and Do-Minimum scenarios is not significant. The difference at most of the key receptors is within ±2 µg/m^3 for NO_2 and ±1 µg/m^3 for PM_{10} (in terms of annual mean concentrations). As expected, the most affected areas are the SJB (positive), the A557 Weston Point Expressway (positive), the A533 Central Expressway (negative) in Runcorn and Wigg Island (negative).

19.7.53 The highest decrease in concentrations is found near the SJB at receptor 45 in St Bridgets Close, Widnes (reduction of 8.8 µg/m^3 and 4.7 µg/m^3 respectively for NO_2 and PM_{10} annual mean, and a reduction of 6 PM_{10} daily mean exceedences). The significance assessment at this site is moderate positive.

19.7.54 The highest increase in concentrations occurs on Wigg Island (receptors WI3 and WI11). Concentrations of annual average NO_2 are predicted to increase by 5.1 µg/m^3 and 5.0 µg/m^3, respectively, at these receptors. The significance at these sites for NO_2 is moderate negative. For PM_{10}, concentrations increase by 1.9 µg/m^3 for both receptors. The significance at these sites for PM_{10} is low negative. However, predicted concentrations on Wigg Island are well below the relevant objectives.

19.7.55 Whilst predicted increases in NO_2 and PM_{10} (between Do-Minimum and Do-Something) in some areas would appear to conflict with Regional, Sub-Regional and Local policies relating specifically to the improvement of air quality, predicted concentrations in all locations remain below the relevant AQS objectives in 2015. Furthermore, there are also some areas where air quality is predicted to improvement due to the Project. As such, the overall effect of the Project is considered to be compliant with the relevant policies discussed in Section 19.3.2 and the AQS objectives for NO_2 and PM_{10} detailed in Table 19.1.

Widnes Centre including Lunts Heath / Cronton (North of Widnes)

19.7.56 The overall effect of the Project on Widnes centre is not significant for both pollutants. The highest increase in concentrations is at the junction of Gerrard Street / Alfred Street (receptor 162), with a maximum of +0.7 µg/m^3 (+3%) in NO_2 and +0.4 µg/m^3 (+2%) in PM_{10} annual means. These receptors represent the worst case effect (not significant) in this area. The highest decrease is predicted at the playground in Dundalk Road (receptor 102) with a maximum reduction of 0.6 µg/m^3 (-3%) in NO_2 and 0.2 µg/m^3 (-1%) in PM_{10} annual means.

A562 Speke Road / Ditton-Widnes Loops Junctions

19.7.57 The overall effect on sites along the A562 Speke Road / Ditton-Widnes Loops Junctions area varies between high negative and moderate positive for NO_2, and low negative and low positive for PM_{10}, however at most receptors in this the effect is not significant. The highest increase in concentrations is in Croft Street (receptor 147), with a maximum of +2.6 µg/m^3 (+8%) in NO_2 and +1.4 µg/m^3 (+6%) in PM_{10} annual means. It also shows an increase of 3 PM_{10} daily mean exceedences. This site represents a high negative effect for both pollutants. The highest decrease is found in MacDermott Road (receptor 63) with a maximum reduction of 2.9 µg/m^3 (-12%) in NO_2 and 1.5µg/m^3 (-8%) in PM_{10} annual means, which represents a moderate positive effect for NO_2 and low positive effect for PM_{10}.

SJB – including West Bank and SJB's South Junction

19.7.58 The overall effect on sites along the SJB area is high positive for NO_2, and moderate positive for PM_{10}. All sites in this area show a decrease in NO_2 and PM_{10} annual and daily mean concentrations. The highest decrease is in St Bridgets Close in Widnes (receptor 45) with a maximum reduction of 8.8µg/m^3 (-29%) in NO_2 and 4.7 µg/m^3 (-20%) in PM_{10} annual means. There is also a reduction of 3 to 4 PM_{10} daily mean exceedences at this site. This is due to the large decrease in annual average traffic flows expected with the Project (nearly -85%, from more than 80,000 to less than 10,000 vehicles per day).

A557 Ashley Way/Watkinson Way (Widnes Eastern Bypass) – Simm's Cross / Crow Wood / Barrow's Green

19.7.59 The overall effect on the sites along the Widnes Eastern Bypass (A557) is not significant for both pollutants. The highest increase in concentrations is in Batherton Close (receptor 39), with a maximum of +0.9 µg/m^3 (+3%) in NO_2 and +0.3 µg/m^3 (+1.5%) in PM_{10} annual means. With the exception of the annual mean PM_{10} concentration at The Rowans, Moorfield Road (receptor 29), there is no decrease in NO_2 or PM_{10} concentrations at key receptors. However, Figure 19.24 (Appendix 19.1) for NO_2 and Figure 19.25 (Appendix 19.1) for PM_{10} show a decrease at a few sensitive sites along the bypass in Appleton and Crow Wood (between -1% and -5% for NO_2).

A557 Weston Point Expressway (Runcorn Western Bypass) – Weston Point / Weston

19.7.60 The overall effect on sites along the Weston Point Expressway (A557) is not moderate positive for NO_2, and low positive for PM_{10}. Together with the SJB, this area is the one that shows the most positive effect on sensitive sites. All receptors in this area show a decrease in NO_2 and PM_{10} annual or daily mean concentrations. The highest decrease for NO_2 is at receptor 275 (61 Westfield Road in west Runcorn), with a maximum reduction of 5.9 µg/m^3 (-22.6%) in NO_2. For PM_{10}, the highest decrease of 3.1 µg/m^3 (-14%) occurs at receptor 331, near Cavendish Farm Road in Runcorn Southwest. There is also a reduction of 4 PM_{10} daily mean exceedences at this site. This is due to the significant decrease in traffic flows expected with the Project (about -75% reduction, from more than 40,000 to less than 9,000 vehicles per day).

Runcorn Centre

19.7.61 The overall effect on Runcorn centre is not significant for NO_2, and not significant for PM_{10}. There is no significant increase in annual or daily mean concentrations at any sensitive receptor. The highest decrease is found in Sutton Street (receptor 236), 40m South of the A533 Daresbury Expressway, with a maximum reduction of 3.6 $\mu g/m^3$ (-13%) in NO_2 and 1.6 $\mu g/m^3$ (-7.5%) in PM_{10} annual means. There is also a reduction of 2 PM_{10} daily mean exceedences at this site.

A533 Central Expressway (Castlefields / Halton Brook / Southgate), Whitehouse Expressway (Palacefields) and the Mersey Gateway Bridge Corridor

19.7.62 The overall effect on sites along the Central Expressway (A533) in Runcorn is low negative for NO_2, and not significant for PM_{10}. Most of the sites in this area show an very small increase in NO_2 and PM_{10} annual mean concentrations, although mainly below +1 $\mu g/m^3$ (for NO_2) and +0.5 $\mu g/m^3$ (for PM_{10}). The sites with the highest effects are on Wigg Island, where two receptors show a moderate negative effect for NO_2 and a low negative effect for PM_{10}, and near the A533 / Halton Brow junction, near Halton Brook, where several receptors show a low negative significance for NO_2 and PM_{10}. The highest increase in the NO_2 annual mean is at receptor WI3 on Wigg Island with a maximum of 5.1 $\mu g/m^3$ (+26.4%). The highest increase in the PM_{10} annual mean is also at WI3 with a maximum of 1.9 $\mu g/m^3$ (+10.9%). This is due to the introduction of emissions from traffic using the New Bridge which crosses over parts of Wigg Island.

A558 Daresbury Expressway (Castlefields to Daresbury)

19.7.63 The overall effect on most of the sites along the Daresbury Expressway (between Castlefield and Daresbury) is not significant for both pollutants. However, Figure 19.24 (Appendix 19.1) shows a slight increase (between 1 and 5% in NO_2 annual mean) at a few sites in Castlefields near the junction with Astmoor Road exchanger. Further east along the expressway, the effect is either not significant or low positive at sites just before Keckwick. The highest increase in concentrations is in Batherton Close (receptor 39), with a maximum of +0.9 $\mu g/m^3$ (+3%) in NO_2 and +0.3 $\mu g/m^3$ (+1.5%) in PM_{10} annual means. The change in annual mean concentrations at all sites is less then 1 $\mu g/m^3$ for both NO_2 and PM_{10} and there is no change in predicted PM_{10} daily mean exceedences.

M56 Motorway

19.7.64 The overall effect on sensitive receptors along the M56 motorway is low negative for NO_2 and not significant for PM_{10}. The maximum increase is found at receptors 409 and 410 on the A557 Clifton Road near the M56 Junction where the NO_2 annual mean increases by 0.4 $\mu g/m^3$ (+1.5%). However, these have not been identified as key receptors since predicted concentrations are lower than those predicted at key receptors 412, 414, 417, 433 and 517 provided in the tables above. There is less than 1% change in annual mean concentrations at all other sensitive receptors along the M56 for both pollutants, and no change in PM_{10} daily mean exceedences.

Weston Link-M56 Junctions (Rocksavage / Clifton / Beechwood)

19.7.65 The overall effect on sites along the A557 Weston Point Expressway between the Weston Link and the M56 junctions varies between low negative, not significant, and low positive for NO_2, and not significant for PM_{10}. The highest increase in concentrations is in Millersdale Grove (receptor 388), with a maximum increase of +1.4 $\mu g/m^3$ (+6%) in NO_2 and +0.4 $\mu g/m^3$ (+2%) in PM_{10} annual means. The effect at this site is low negative for NO_2 and not significant for PM_{10}. The highest decrease is found in Lincoln Close (receptor 385) with a maximum reduction of 1.9 $\mu g/m^3$ (-7.9%, low positive significance) in NO_2 and 0.7 $\mu g/m^3$ (-3.7%, not significant) in PM_{10} annual means.

Local Authorities sensitive area

19.7.66 As described Section 19.1, the Council has identified several areas in Widnes and Runcorn where results from monitoring data are above the annual mean AQS objective for NO_2. Predicted changes between the Do-Minimum 2015 and Do-Something 2015 scenarios in these areas are discussed below.

Peel House Lane, Widnes

19.7.67 The effect on the Peel House Lane junction in Widnes is not significant for both pollutants. The change in annual mean concentrations is less than 1%, and there is no change in the PM_{10} daily mean exceedences.

Deacon Road, Widnes

19.7.68 The effect on Deacon Road in Widnes is low negative for NO_2 and not significant for PM_{10}. The highest increase in concentrations is at the diffusion tube HBC5, with a maximum increase of +0.4 $\mu g/m^3$ (+1.2%) in NO_2 and +0.2 $\mu g/m^3$ (+1%) in PM_{10} annual means. There is no change in the PM_{10} daily mean exceedences.

Greenway Road, Runcorn

19.7.69 The effect on the Greenway Road in Runcorn is high positive for NO_2 and low positive for PM_{10} (receptor 230). The reduction in annual mean concentrations is 5.7 $\mu g/m^3$ (-19%) in NO_2 and 3.1 $\mu g/m^3$ (-14%) for PM_{10}. There is also a reduction of 4 PM_{10} daily mean exceedences at this site. Greenway Road benefits from the dramatic reduction of traffic on the SJB.

Milton Road, Widnes

19.7.70 The effect on Milton Road in Widnes is not significant for both pollutants. Annual average NO_2 concentrations at sensitive receptors closer to the junction with Lower House Lane are predicted to increase by less than 0.5 $\mu g/m^3$.

Effects on Regional Air Quality

19.7.71 This Section presents the predicted regional air quality effects for the future (2015) Do-Something scenario. As discussed in Section 19.1, annual emissions of NOx, PM_{10} and carbon have been predicted based on the length of the modelled road network. As such, results are presented as annual emissions for the entire modelled road network. Emissions of CO_2 have been derived from carbon by multiplying by 44 ÷ 12 (Ref. 34).

19.7.72 The results of the future (2015) Do-Something regional air quality assessment are provided in Table 19.31 and compared to the results of the existing and future (2015) baseline results previously presented.

Table 19.31 - Annual NOx, PM10, Carbon and CO2 Emissions for Future (2015) Do-Something

Tonnes/ annum	Do-Minimum		Do-Something				
	Existing (2006)	Future (2015)	Future (2015)	Difference compared with Existing (2006)		Difference compared with Do-Minimum (2015)	
				Change Tonnes/ Annum	Change %	Change Tonnes/ Annum	Change %
NOx	1,096	649	617	-479	-43.7	-31	-4.8
PM_{10}	33	17	15	-18	-53.6	-1	-7.0

Tonnes/ annum	Do-Minimum		Do-Something				
	Existing (2006)	Future (2015)	Future (2015)	Difference compared with Existing (2006)		Difference compared with Do-Minimum (2015)	
Carbon	70,376	72,965	68,236	-2,140	-3.0	-4,729	-6.5
CO_2	258,046	267,537	250,199	-7,846	-3.0	-17,338	-6.5

19.7.73 As discussed in Section 19.1, carbon and carbon dioxide emissions increase without the Project between 2006 and 2015 due to the predicted growth in traffic flows across the assessment area. However, the Do-Something (2015) emissions for carbon and carbon dioxide are lower than both the Existing (2006) and Do-Minimum (2015) scenarios, along with further reductions in NOx and PM_{10} emissions. Comparing the Do-Minimum (2015) and the Do-Something (2015) the emissions of NOx, PM_{10} and CO_2 are predicted to decrease. Decreases in the emissions of NOx and PM_{10} across the modelled network are consistent with the Regional and Sub-Regional policies (detailed in Section 19.3.2) relating to improvements in air quality by, in part, the relieving of congestion though improving the connectivity of the existing road network.

19.7.74 The overall decrease of 6.5% for CO_2 is mainly due to the changes in traffic flow patterns that are expected due to the use of the New Bridge. There are significant reductions in traffic across the SJB and on the Weston-Point-Expressway as well as on many roads within the assessment area. CO_2 emissions are expected to reduce on the Weston-Point Expressway between the SJB and the Weston Link Junction as traffic flows on these roads are reduced as traffic is expected to use the New Bridge and the Central Expressway between Lodge Lane and Bridgewater Junction. There are also reductions in CO_2 emissions associated with the southbound carriageway of the M56 motorway (north of J12), and with flows on both directions on the M56 south of J12.

19.7.75 Emissions of NOx and PM_{10} in 2005 from UK road transport were 550 and 39 kilo tonnes, respectively. Using approximate figures provided by DfT (Ref. 38), it has been possible to derive approximate emissions of NOx and PM_{10} in 2015. Using these projections, emissions of NOx and PM_{10} in 2015 are estimated at approximately 280 and 22 kilo tonnes, respectively. The Project emissions estimates for the air quality assessment area represent less than 0.5% of total UK emissions projected for 2015.

19.7.76 It is estimated the total emissions of CO_2 from road transport throughout the UK in 2006 was 122 Mtonnes (33.3 Mtonnes of carbon), representing 22% of UK total CO_2 emissions (Ref. 39). Forecast CO_2 emissions for road transport have been published by the Department for Transport (DfT), projected emissions vary between 515 and 527 Mtonnes of CO_2 depending on fuel prices. As such, emissions from the air quality assessment area for the Project represent approximately 0.2% of these projected figures. Furthermore, a reduction in CO_2 emissions between the Do-Minimum (2015) and Do-Something (2015) reflects Government policy on climate change and reduction in CO_2 emissions, as implemented through the UK Climate Change Bill introduced on 14 November 2007, as well as the Council's commitment to reducing emissions of carbon dioxide within the Borough (as discussed in Section 19.4).

Summary of Potentially Significant Air Quality Effects

19.7.77 A summary of the potentially significant air quality effects are presented in Table 19.32 which includes those related to construction dust, construction traffic emissions, disruption to traffic during construction, local air quality and regional air quality.

Table 19.32 – Summary of Potentially Significant Air Quality Effects

Effect	Receptor and importance	Nature of Effect	Significance (High, Moderate, Low and Positive/Negative)
Construction Phase			
Construction Dust	Human and ecological receptors identified within 200 m of construction areas A to I, as identified in Table 19.9. High local importance.	Nuisance and Health Short to medium term Temporary Direct High magnitude	High negative significance
Construction Traffic Emissions	Human and ecological receptors identified within 200 m of construction areas A to I, as identified in Table 19.9. High local importance.	Health Short to medium term Temporary Direct Very low magnitude	Low negative significance
Disruption to Traffic during Construction	Human and ecological receptors identified within 200 m of construction areas A to I, as identified in Table 19.9. High local importance.	Health Short term Temporary Indirect High magnitude	High negative significance
Operation Phase			
Widnes Centre	Key sensitive receptors identified in Table 19.10. High local importance.	Health Long term Direct Extremely low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})
A562 Speke Road	Key sensitive receptors identified in Table 19.10. High local importance.	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})
Silver Jubilee Bridge	Key sensitive receptors identified in Table 19.10. High local importance.	Health Long term Direct High magnitude (NO_2 and PM_{10})	High positive significance (NO_2) Moderate positive significance (PM_{10})
A557 Watkinson Way – Widnes Eastern Bypass	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})
A557 Weston Point Expressway	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Moderate magnitude (NO_2 and PM_{10})	Moderate positive significance (NO_2) Low positive significance (PM_{10})

Effect	Receptor and importance	Nature of Effect	Significance (High, Moderate, Low and Positive/Negative)
Runcorn Centre	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})
A533 Central Expressway (Castlefields / Halton Brook / Southgate), Whitehouse Expressway (Palacefields) and the Mersey Gateway Bridge Corridor	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Low negative significance (NO_2) Not significant (PM_{10})
A558 Daresbury Expressway (Castlefields to Daresbury)	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})
M56 Motorway	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Extremely low magnitude (NO_2 and PM_{10})	Low negative significance (NO_2) Not significant (PM_{10})
Weston Link-M56 Junctions (Rocksavage / Clifton / Beechwood)	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Extremely low magnitude (NO_2) Very low magnitude (PM_{10})	Not significant (NO_2 and PM_{10})
Peel House Lane, Widnes	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})
Deacon Road, Widnes	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Very low magnitude (NO_2) Extremely low magnitude (PM_{10})	Low negative significance (NO_2) Not significant (PM_{10})
Greenway Road, Runcorn	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct High magnitude (NO_2) Moderate magnitude (PM_{10})	High positive significance (NO_2) Low positive (PM_{10})
Changes in regional NOx, PM_{10} and CO_2 emissions from the	High regional importance	Health and climate change Long term Direct	Low positive significance

Effect	Receptor and importance	Nature of Effect	**Significance** (High, Moderate, Low and Positive/Negative)
modelled road network		Very low magnitude	

19.8 Mitigation, Compensation, Enhancement and Monitoring

Mitigation of Construction Effects

Construction Dust

19.8.1 In practice, many of the potential dust emissions are controlled by sensible operational procedures, good site practices and Best Available Techniques (BAT), therefore minimising the likelihood of a negative effect on the local air quality. Appropriate regard to the control of dust during all those demolition and construction works detailed in Table 19.20 would form part of the Construction Environmental Management Plan (CEMP), contained in Appendix 2.1 of Chapter 23, including the handling of contaminated and waste materials, which would involve liaison with the local planning authority Environmental Health departments. The following mitigation measures would be incorporated into the CEMP:

a. The damping down of exposed soils, loose materials or unmade surfaces close to sensitive locations during dry weather;
b. The sheeting of vehicles transporting earthworks materials to or from site;
c. Limiting vehicle speeds over unmade surfaces;
d. Controls applied to the cutting and grinding of materials;
e. Restrictions on the burning of materials;
f. The use of cleanable hard standings and the provision of wheel washing facilities where appropriate;
g. Regular use of sweepers on local roads if visible amounts of soil material from the works are carried onto the public highway;
h. Operation of a complaint and investigative response procedure;
i. Compliance with relevant legislation and British Standards;
j. Haul routes to be located away from off-site sensitive properties as far as practicable and to be watered regularly (wet suppression of dust);
k. Where possible, all site vehicles and plant to have upward-facing exhausts to minimise surface dust re-suspension;
l. Bunds or screens may be constructed as wind breaks, to reduce wind speeds. Earth bunds would be seeded as soon as possible, prior to which they are to be maintained damp;
m. The aggregate stocking area would be located away from sensitive areas and residential properties;
n. Stockpiles should also be watered and water curtains may additionally be used at the site boundaries near sensitive properties;
o. Off-site vehicles should have their wheels and bodies cleaned on a regular basis and the access road to be hard-surfaced and maintained damp;
p. Early paving of permanent roads;
q. Minimisation of drop heights, and the use of chutes to discharge material close to where it is required; and
r. Consolidation and bulking of wastes to minimise transportation and handling requirements.

19.8.2 During construction and demolition, consideration would need to be given to the passage of vehicles entering and leaving the site, re-suspended dust, and the operation of site vehicles, and temporary traffic diversions. The Building Research Establishment (BRE) publication 'Control of dust from construction and demolition activities' sets out a simple method for undertaking a risk assessment to identify intended construction activities which are potential generators of dust and PM_{10}. This method uses checklists to determine which site activities are likely to be the largest component sources of PM_{10} emissions at the site. This type of approach can facilitate project planning and enable priorities for the control of on site particle emissions to be drawn up at an early stage.

19.8.3 More specific mitigation measures relating to the handling of contaminated and waste materials are provided in the Chapters 14 and 15, respectively.

Construction Traffic Emissions

19.8.4 Appropriate regard to the exhaust emissions of all construction works would form part of the CEMP, which would involve liaison with the local planning authority Environmental Health departments. The following mitigation measures would be incorporated into the CEMP:

a. Where possible, all non-road mobile machinery (NRMM) should use fuel equivalent to ultra low sulphur diesel (ULSD);
b. All NRMM should comply with either the current EU Directive Staged Emission Standards (97/98/EC, 2002/88/EC, 2004/26/EC) now transposed into UK regulations (Ref. 40);
c. NRMM with power outputs greater than 37kW should be fitted with suitable after-treatment devices stated on the approved list managed by the Energy Saving Trust (Ref. 41);
d. No vehicles or plant should be left idling unnecessarily;
e. All vehicles and plant should be well maintained and regularly serviced according to the manufacturers recommendations;
f. Vehicle exhausts should be placed as far from sensitive properties as practicable;
g. Utilisation of existing power sources rather than temporary power generators where practicable;
h. Haul routes to be located away from off-site sensitive properties as far as practicable with appropriate speed limits enforced;
i. Consider the use of consolidation centres to manage site deliveries; and
j. Where constructions are located near to waterways and/or railways, consider delivering and removing materials from the site using these means, rather than by road.

Disruption to Traffic during Construction

19.8.5 The CEMP, contained in Appendix 2.1 of Chapter 23, would outline the following measures to limit disruption to traffic flows on the local road network and therefore minimise the risk of increased vehicle emissions due to congested traffic:

a. Scheduling operations affecting traffic for off-peak hours whenever possible;
b. Minimising obstructions to through traffic lanes; and
c. Development of a traffic management plan to minimise traffic flow interference from construction activities.

19.8.6 Specific mitigation (or traffic management) measures relating to each of those construction areas identified in Section 19.1 is provided in Table 19.33.

Table 19.33 - Traffic Management Measures Proposed for each Construction Area

	Traffic Management
Area A: **Main Toll Plaza**	a) Works would probably be constructed towards the end of overall construction period b) Traffic using Speke Road would be maintained by a phased system of construction

	Traffic Management
Area B: **Ditton Junction to Freight Line**	a) Are likely to be undertaken late in the overall construction programme to minimise disruption b) Traffic would be diverted off existing carriageway passing over existing Ditton junction c) Complex traffic management would be required to maintain flows at Ditton junction d) Temporary road diversions required for existing and new carriageway areas
Area C: **Freight Line to St Helens Canal**	a) Demolition of existing buildings within the Catalyst Trade Park and along Victoria Road would be undertaken early to allow for service diversions b) Construction of Victoria Road Viaduct would be phased and require temporary traffic diversion for the Widnes Eastern Bypass along Ashley Way c) No traffic management required for bridges within Widnes Loop Junction
Area D: **Mersey Gateway Bridge**	a) No proposed traffic management measures
Area E: **Astmoor Viaduct**	a) Astmoor Road and Astmoor Busway diverted locally
Area F: **Bridgewater Junction**	a) Are likely to be undertaken late in the overall construction programme to minimise disruption on existing expressway network b) For the main bridge works, a complex multi-phase traffic management programme would be established c) Sequenced diversion of existing east-east and south traffic movements, with two-lane flows maintained in each direction d) Diversion of traffic onto new slip road bridges
Area G: **Central Expressway, Lodge Lane Junction and Weston Link Junction**	a) Phased traffic management along the expressways during construction of the modified road and junction layouts
Area H: **M56 Junction 12**	a) Temporary traffic measures and minor diversions during construction of new junction layout
Area I: **SJB and Widnes De-Linking**	a) Works would be carried out following completion of the main Mersey Gateway bridge works b) Traffic would be diverted onto other corridors, including the Project

Mitigation of Operational Effects

19.8.7 The predictions of traffic effects in the current assessment have taken account of the improvements in technology and tighter emissions controls through emission rates in the future. Beyond this, there are a number of potential traffic management actions that may also reduce emissions from traffic. These actions are detailed in “The Role of the Highways Agency in Local Air Quality Management” (Ref. 42) and summarised inTable 19.34. However, such measures are indicative only and have not been considered as part of the air quality assessment.

Table 19.34 - Traffic Management Measures

Primary Control Area	Action
Speed	Enforcement of existing limits
	Permanent speed limit reduction
	Vehicle class specific speed limits
	Improved signing
	Controlled motorways (variable speed limit depending on traffic flow with lower speed limits during busy periods)
	Traffic calming (rumble strips, colour bands, road surface changes etc.)
Access Control	Ramp metering (restricting access from the slip road onto the motorway)
	Zone restriction e.g. clear zone, low-emission zone, home zone, no stopping / parking zones etc
	Width restrictions
	Park and ride encouragement
Information Provision	Variable Message Signs (VMS)
	Driver training improvements
	Route/diversion information
	Alternative route provision
	Radio/Internet/TV traffic announcements
	Advanced warning of road repairs and closures, bad weather, major events etc
	Improved public transport information
	Use of motorway service areas as an interchange for park and ride
Segregation of traffic	Dedicated lanes for specific vehicle groups, single occupancy etc
	Tidal lanes (varying number of lanes depending on time of day)
	Climbing lanes
	Signal priority
	HGV or LDV dedicated routes
	Lane closures
Junction design	Improved signing
	Access closure
	Choice of appropriate junction

Monitoring during Construction

Construction Dust

19.8.8 The monitoring proposed in this document recognises the close proximity of sensitive locations to the construction works and sets out to define existing levels of dust and PM_{10} within the area in order to establish compliance with current health-based objectives, the effectiveness of mitigation measures, and to provide a means of continued measurement of dust and PM_{10} during the demolition and construction works.

19.8.9 Such monitoring will include continuous and non-continuous methods in those areas identified as being within 200 m of the construction areas identified in this assessment. Such areas would be in the vicinity of those receptors identified in Table 19.9, which are closest to the identified construction areas. Monitoring of PM_{10} would also be undertaken in proximity to road sources, such that the emissions of PM_{10} from exhaust emissions are monitored in key effect areas to the north and south of the River. Monitoring during the operational phase of the Project is discussed later on in this Section.

19.8.10 Typical monitoring techniques for construction (nuisance) dust include the following (in line with those methods detailed in Table 19.35):

a. Depositional Dust Gauges – Omni-directional Frisbee gauges provide a measurement of the mass per unit area per unit time and would be ideal for the quantification of dust close to the emitting source. The samples can be analysed for dissolved and undissolved solids;
b. Adhesive Strips – In conjunction with the depositional monitoring described above, soiling rates can also be measured using adhesive strips. The adhesive strips (sticky pads) are attached horizontally around the depositional gauges, with the adhesive side facing out, and the northerly direction marked. This allows for a directional analysis of the pad to be undertaken, resulting in soiling rates (%age Effective Area Covered per day) for 8 wind directions by determining the reduction in light reflectance; and
c. Glass Slides – A clean microscope slide is exposed to particles falling vertically from the atmosphere. The "dustiness" of the slide is quantified following exposure using a dust meter which measures the reduction in reflectance relative to a clean unexposed slide from the same batch, with the results expressed as Soiling Units (SU).

19.8.11 Table 19.35 provides a summary of these monitoring methods and the criteria applied to establish the likelihood of nuisance occurrence. It is worth noting that exceedence of these criteria does not automatically infer that nuisance has occurred – this is entirely dependent upon the perception of nuisance, which in itself is subject to considerable variation due to differing attitudes to 'what is nuisance'. Generally, nuisance dust in the community is perceived as an accumulated deposit on surfaces such as window ledges, paintwork and other light coloured horizontal surfaces. When the rate of accumulation is sufficiently rapid to cause noticeable fouling, discolouration or staining then the dust is generally considered to be a nuisance. However, the point at which an individual makes a complaint regarding dust is highly subjective, thus recording complaints does not necessarily provide an indication of nuisance.

Table 19.35 - Typical Approaches to Dust Deposition Monitoring

Method	Monitoring Technique	Units	Typical Criteria
Deposition Gauges	Frisbee / Directional Dust Gauges	Deposition of mass per unit area per day	200 $mg/m^2/day$ (averaged over a month) (Ref. 43)
Reflectance Techniques	Adhesive Strips (Ref. 44)	% Effective Area Coverage (EAC)	0.2 EAC = Noticeable 0.5 EAC = Possible complaints 0.7 EAC = Objectionable 2.0 EAC = Probable complaints 5.0 EAC = Serious complaints (Ref. 44)
	Dust Slides (Ref. 45)	Soiling Units (SU)	>25 SU per week is likely to cause complaint (Ref. 46)

19.8.12 Monitoring of PM_{10} would be compared to the relevant AQS objectives detailed in Table 19.1. Typical continuous PM_{10} monitoring techniques include the following:

a. TEOM – The TEOM is used widely around the UK and continually weighs a filter during sampling. While not equivalent to the European reference method, the TEOM can be used to give concentration every 15 minutes, which is very useful for automatic monitoring at construction sites where short term spikes can be picked up by dedicated monitoring equipment. The filter needs to be changed approximately monthly;
b. TEOM-FDMS – The FDMS is a modified TEOM that corrects for the loss of volatiles from the filter. Concentrations are calculated hourly. The TEOM-FDMS has also been shown for $PM_{2.5}$ monitoring of which there is a target of 25 $\mu g/m^3$ as an annual mean;
c. Met-one BAM – The Met-one BAM uses Beta radiation to measure the deposition on a filter tape, and correlates this to a mass. The BAM over reads by approximately 20 % due to water vapour on the filter tape, though the concentration can be corrected to make the data equivalent. Concentrations are calculated hourly; and
d. Opsis SM200 – The Opsis SM200 uses a filter every 24 hours, though can store about 2 weeks worth of filters. The beta attenuation is measured as with a BAM, which gives 24 hour concentrations. Filters can also be weighed after sampling.

19.8.13 A monitoring regime would be agreed with the Council and established well in advance of the construction works commencing in order to establish a suitable baseline. Where local receptors are deemed particularly sensitive, agreed monitoring would be undertaken in order to establish whether relevant standards or criteria are being exceeded. Furthermore, monitoring locations would be modified to reflect the ongoing construction programme, such that they are remain relevant to the area of works.

19.8.14 It is also recommended that local meteorological data be recorded at strategic locations to the north and south of the River, and relative to those construction areas with the longest construction phases e.g. construction of the New Bridge in the inter-tidal zone. Specifically, wind speed, wind direction and rainfall should be recorded as these will have the greatest effect on the generation of dust.

19.8.15 Monitoring would continue until the construction works are complete and for an agreed period of time once the Project is operational in order to provide information on the longer term environmental effects of the Project due to changes in traffic flows.

19.8.16 Any programme of monitoring of air quality would be agreed with the Council.

Contaminated Land

19.8.17 Monitoring during the construction and operational phases will be required in order to determine the effectiveness of those mitigation measures aimed at minimising the potential effect on air quality from contaminated land. These mitigation measures are described more fully in Chapter 14. Such monitoring may include asbestos, arsenic, lead, petroleum hydrocarbons and VOCs. Monitoring results will be compared to relevant short- and long-term environmental assessment levels (EALs).

19.8.18 Emissions to air from contaminated land may also be malodorous e.g. calcium sulphate. As such, it is also recommended that odour testing be undertaken in the vicinity of construction works that require the handling of contaminated land e.g. excavation of the ground below the Catalyst Trading Park. Such monitoring would be integrated into an odour management plan which would form part of the CEMP.

Waste and Recycling

19.8.19 Monitoring requirements associated with the handling, storage and transportation of wastes have been identified in waste chapter (Chapter 15). As described within Chapter 15, on-site sorting and segregation operations and recycling processes using mobile plant will require monitoring to control effects associated with nuisance, such as dust, noise or vibration. Monitoring requirements specific to the handling, storage and transportation of wastes will be identified as part of the waste management licensing or permitting procedures and normally specified under the terms or conditions of the licence or permit.

Monitoring of Local Air Quality Effects

19.8.20 Monitoring of NOx and PM_{10} would be undertaken using continuous analysers at a minimum of three locations. Such locations would be as follows:

a. On the Central Expressway, Halton;
b. North of the River, adjacent to those properties most affected by the SJB; and
c. South of the SJB.

19.8.21 Monitoring of NO_2 would also be undertaken using diffusion tubes as these will give good spatial resolution at low cost. A small number of diffusion tubes would be co-located (in triplicate) with each of the continuous analysers in order that bias adjustment factors can be derived. The tubes would also be co-located with the continuous analyser currently operated by the Council.

19.8.22 Monitoring would commence before construction on the Project begins, with programmes and timescales agreed with the Council. All monitoring techniques would be similar to those already undertaken by the Council and other neighbouring authorities as summarised in previous Sections of this assessment.

19.8.23 Monitoring of air quality over the long term would aim to show the benefits of the Project and demonstrate that the significance of the effects have been predicted appropriately. However, such monitoring would also highlight where the operation of the Project has resulted in greater effects than expected. This may be due to a number of reasons, such as meteorological conditions (e.g. high background years) and traffic data (actual traffic flows may be higher than those modelled). As such, all continuous monitoring sites will have a meteorological station and it is recommended that each site has an associated automatic traffic counter (ATC) located nearby such that monitoring data can be linked to traffic data.

19.9 Residual Effects

Residual Effects due to Construction

Construction Dust

19.9.1 Assuming that current best practice mitigation and abatement measures on construction sites are implemented in an effective manner, the potential effect on local receptors would be minimised. However, given those distances provided in Table 19.3, potential soiling may still be an issue at a number of those properties identified in Table 19.9 due to their proximity to the proposed construction areas i.e. within 100 m of a large construction site. Furthermore, there may also be a significant effect from PM_{10} even with mitigation in place at a number of receptors within 25 m of construction activities. As such, it is imperative that the mitigation measures detailed in this assessment are adhered to but also reviewed on a regular basis where it is felt that they are not fulfilling the requirements of dust and PM_{10} mitigation. A proactive approach to dust and PM_{10} mitigation including regular review of the effectiveness of the measures will be undertaken as part of the CEMP.

Construction Traffic Emissions

19.9.2 Predicted concentrations of NO_2 and PM_{10} are below the relevant AQS objectives at those receptors identified within 200 m of the nine identified construction areas. As such, given that best practice and abatement measures will aim to reduce the number of vehicles moving on and off site where possible, the residual effects of emissions from construction traffic will be further reduced, and are predicted to be negligible compared to emissions from existing non-construction related traffic.

Disruption to Traffic during Construction

19.9.3 Assuming effective traffic management measures are employed as part of the construction programme, disruption to traffic flows should be minimised. However, under certain circumstances, disruption to traffic flows will be unavoidable and may result severely restricted traffic movement and a resultant deterioration in the air quality adjacent to those links where the disruption occurs. However, such disruptions will be temporary and effects would not be long term.

Residual Effects during Operation

Local Air Quality

19.9.4 Residual effects from local road traffic emissions during the operation of the Project are the same as those in the potential effects. This is because the mitigation of traffic emissions has not been considered beyond the modelled emission rates in the future (2015) which are reduced as a result of tighter emission standards and more efficient combustion engines.

19.9.5 The residual local air quality effects of the Project are considered to be compliant with the relevant policies discussed in Section 19.3.2 and the AQS objectives for NO_2 and PM_{10} detailed in Table 19.1.

Regional Air Quality

19.9.6 As with the residual effects from local road traffic emissions, the residual effects from regional road traffic emissions during the operation of the Project are the same as those in the potential effects. This is because the mitigation of traffic emissions has not been considered beyond the modelled emission rates in the future (2015) which are reduced as a result of tighter emission standards and more efficient combustion engines.

19.9.7 The residual regional air quality effects of the Project are considered to be compliant with the relevant policies discussed in Section 19.3.2. These include those Regional and Sub-Regional policies relating to improvements in air quality, as well as Government policy on climate change and reduction in CO_2 emissions, reflected by the Council's commitment to reducing emissions of carbon dioxide within the Borough.

Summary of Residual Effects

19.9.8 A summary of the residual air quality effects after mitigation is considered are presented in Table 19.36 which includes those residual effects related to construction dust, construction traffic emissions, disruption to traffic during construction, local air quality and regional air quality due to the Project.

Table 19.36 – Air Quality Residual Effects

Effect	**Receptor and importance**	**Nature of Effect**	**Significance** (High, Moderate, Low and Positive/Negative)	**Mitigation & Enhancement Measures**	**Significance of Residual Effects** (High, Moderate, Low and Positive / Negative)
Construction Phase					
Construction Dust	Human and ecological receptors identified within 200 m of construction areas A to I, as identified in Table 19.9. High local importance.	Nuisance and Health Short to medium term Temporary Direct High magnitude	High negative significance	Mitigation as detailed in Section 19.8 and CEMP	Low negative significance
Construction Traffic Emissions	Human and ecological receptors identified within 200 m of construction areas A to I, as identified in Table 19.9. High local importance.	Health Short to medium term Temporary Direct Very low magnitude	Low negative significance	Mitigation as detailed in Section 19.8 and CEMP	Low negative significance
Disruption to Traffic during Construction	Human and ecological receptors identified within 200 m of construction areas A to I, as identified in Table 19.9. High local importance.	Health Short term Temporary Indirect High magnitude	High negative significance	Mitigation as detailed in Section 19.8 and CEMP	Moderate negative significance

Effect	Receptor and importance	Nature of Effect	**Significance** (High, Moderate, Low and Positive/Negative)	Mitigation & Enhancement Measures	**Significance of Residual Effects** (High, Moderate, Low and Positive / Negative)
Operation Phase					
Widnes Centre	Key sensitive receptors identified in Table 19.10. High local importance.	Health Long term Direct Extremely low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})		
A562 Speke Road	Key sensitive receptors identified in Table 19.10. High local importance.	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})		
Silver Jubilee Bridge	Key sensitive receptors identified in Table 19.10. High local importance.	Health Long term Direct High magnitude (NO_2 and PM_{10})	High positive significance (NO_2) Moderate positive significance (PM_{10})	No further mitigation required	High positive significance (NO_2) Moderate positive significance (PM_{10})
A557 Watkinson Way – Widnes Eastern Bypass	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})		
A557 Weston Point Expressway	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Moderate magnitude (NO_2 and PM_{10})	Moderate positive significance (NO_2) Low positive significance (PM_{10})	No further mitigation required	Moderate positive significance (NO_2) Low positive significance (PM_{10})
Runcorn Centre	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})		
A533 Central	Key sensitive	Health	Low negative	No further	Low negative

Effect	Receptor and importance	Nature of Effect	**Significance** (High, Moderate, Low and Positive/Negative)	Mitigation & Enhancement Measures	**Significance of Residual Effects** (High, Moderate, Low and Positive / Negative)
Expressway (Castlefields / Halton Brook / Southgate), Whitehouse Expressway (Palacefields) and the Mersey Gateway Bridge Corridor	receptors identified in Table 19.10. High local importance	Long term Direct Very low magnitude (NO_2 and PM_{10})	significance (NO_2) Not significant (PM_{10})	mitigation beyond indicative measures detailed in Section 19.8	significance (NO_2) Not significant (PM_{10})
A558 Daresbury Expressway (Castlefields to Daresbury)	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})		
M56 Motorway	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Extremely low magnitude (NO_2 and PM_{10})	Low negative significance (NO_2) Not significant (PM_{10})	No further mitigation beyond indicative measures detailed in Section 19.8	Low negative significance (NO_2) Not significant (PM_{10})
Weston Link-M56 Junctions (Rocksavage / Clifton / Beechwood)	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Extremely low magnitude (NO_2) Very low magnitude (PM_{10})	Not significant (NO_2 and PM_{10})		
Peel House Lane, Widnes	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct Very low magnitude (NO_2 and PM_{10})	Not significant (NO_2 and PM_{10})		
Deacon Road, Widnes	Key sensitive receptors identified in Table 19.10. High local	Health Long term Direct Very low magnitude	Low negative significance (NO_2) Not significant (PM_{10})	No further mitigation beyond indicative measures detailed in	Low negative significance (NO_2) Not significant

Effect	Receptor and importance	Nature of Effect	**Significance** (High, Moderate, Low and Positive/Negative)	Mitigation & Enhancement Measures	**Significance of Residual Effects** (High, Moderate, Low and Positive / Negative)
	importance	(NO_2) Extremely low magnitude (PM_{10})		Section 19.8	(PM_{10})
Greenway Road, Runcorn	Key sensitive receptors identified in Table 19.10. High local importance	Health Long term Direct High magnitude (NO_2) Moderate magnitude (PM_{10})	High positive significance (NO_2) Low positive (PM_{10})	No further mitigation required	High positive significance (NO_2) Low positive (PM_{10})
Changes in regional NOx, PM_{10} and CO_2 emissions from the modelled road network	Based on the length of the modelled road network. High regional importance	Health and climate change Long term Direct Very low magnitude	Low positive significance	No further mitigation required	Low positive significance

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