Tornagrain

A Planned Town for the Highlands

Environmental Statement

Technical Annex 2

Air Quality

CONTENTS

1 INTRODUCTION

1.1 PROJECT CONTEXT

The A96 Growth Corridor Development Framework identifies an opportunity for development of a new community near Inverness Airport, as part of the wider strategy for balanced development between Inverness and Nairn. Moray Estates Development Company (MEDCO) are now seeking outline planning permission for this new community.

An environmental impact assessment (EIA) has been carried out in accordance with the Environmental Impact Assessment (Scotland) Regulations, 1999, the findings of which are presented in the form of an Environmental Statement (ES). The ES comprises the following documents:

- a Non-Technical Summary;
- a Main Report;
- 12 Technical Annexes; and
- a Construction Environmental Management Plan (CEMP).

The technical annexes are as follows:

- Agricultural Land
- Air Quality
- Cultural Heritage
- Ecology
- Geo-Environment
- Landscape and Visual Amenity
- Noise and Vibration
- Socio-Economics
- Surfacewater Drainage and Flood Risk
- Sustainability
- Transport
- Waste

This report comprises Annex 2: Air Quality.

1.2 OVERVIEW

There are a number of potential impacts to air quality associated with the proposed development that may arise, both during the construction phase and when the settlement is occupied. The main impacts are likely to arise at existing sensitive receptors, although impacts at new receptors within the settlement itself once developed have also been considered. Impacts are primarily associated with increases in traffic related emissions, dust generated

during construction activities and also from emissions generated by the nearby Norbord manufacturing facility.

The proposals are for a New Town comprising up to 4,960 Housing Units and supporting Community Facilities (18,222m^2), Retail (20,000m^2), Business (7,000m^2), General Industry (1,000m^2), Storage and Distribution (1,000m^2), Hotels (4,000m^2), Residential Institutions (5,000m^2), Leisure (3000m^2), Petrol Stations (1,500m^2) and associated Landscaping, Open Space, Infrastructure and Services. The settlement is proposed to be developed on a largely green field site approximately 2 km south of Inverness Airport.

2 ASSESSMENT SCOPE

2.1 INTRODUCTION

The proposed development may have a number of impacts to air quality. An initial review has been undertaken to identify issues which need to be considered in more detail and those which can be excluded from the scope of the assessment and do not require detailed assessment. The assessment scope has been developed on the basis of The Highland Council scoping opinion.

2.2 ISSUES INVESTIGATED IN DETAIL

The initial review has identified the following issues as being potentially significant and these have been considered in detail:

- dust arising from construction activities;
- emissions associated with traffic generated during construction of the new settlement both at the site and on the A96 trunk route; and
- emissions associated with additional traffic generated on the A96 trunk route when occupation commences.

In addition, consideration has been given to the existing air quality in the vicinity of the development including impacts arising from the current operations of the nearby Norbord plant. Specific consideration has not been made of traffic impacts within the Tornagrain new settlement itself, as these are expected not to result in unacceptable impacts due to the scale of the proposed development.

2.3 ISSUES SCOPED OUT OF THE ASSESSMENT

2.3.1 *Introduction*

In the initial review a number of potential issues have been considered and scoped out from further assessment. These issues and the justification for not undertaking further assessment are set out in more detail below.

2.3.2 *Generators and site plant*

Generators and other small stationary plant in use on site during construction activities are considered likely to have negligible impacts to local air quality, because of the phased nature of the development and the small scale of emissions.

2.3.3 Emissions associated with traffic in the settlement

Emissions associated with traffic within the settlement itself are considered unlikely to give rise to unacceptable air quality and in most residential areas of the settlement levels are likely to remain low. Levels around the main thoroughfares and trafficked roads will be somewhat higher due to the greater numbers of vehicles using the roads. However, the proposed rerouting and widening of the A96 will divert through traffic around the settlement so that there will be minimal 'through traffic' entering the settlement and therefore air quality around the busier roads within the settlement is likely to remain at acceptable levels.

In addition, the urban design process will avoid the creation of urban canyons, avoid extensive queuing traffic and avoid congestion whilst promoting ease of traffic movement. These measures will also minimise the impacts on air quality within the settlement.

This view is supported by assessments undertaken for other similar sized and designs of towns in the UK that demonstrate that air quality within these towns is, largely, good.

2.3.4 Domestic heating

Emissions associated with domestic heating are considered unlikely to give rise to unacceptable air quality. It is understood that natural gas will be the main fuel of choice and that coal, wood and oil will not be used on a large scale for domestic heating. Whilst it is understood that there may be open fires in place in properties for aesthetic purposes, it is anticipated that these will not provide the main source of space and water heating and that emissions will not result in unacceptable impacts to air quality.

The Energy Strategy makes reference to the use of Combined Heat and Power (CHP) and biomass plants, on a localised basis. Whilst the emissions from these plants will have an impact on local air quality, it is expected that these impacts will not result in any air quality limit values being exceeded.

At the present time whether these plants will be used, and the size and location of these plants has not been agreed. Detailed assessment will be undertaken at a later stage upon confirmation of more detailed plans. This assessment will assess proposed plant and will be used to inform the decision making process with regard to preferred size of plant, distribution within the town, plant design features (such as emission point height) and the potential requirements for abatement and emissions mitigation.

2.3.5 Inverness Airport

Impacts to air quality associated with aircraft movements at Inverness Airport at current and predicted future levels are considered unlikely to result in unacceptable impacts to air quality. This is based upon assessments

undertaken by the Highland Council and also assessments undertaken for other similar sized UK airports.

Inverness Airport is projected to handle 1.2 million passengers by 2015 and 1.8 million passengers by 2030. A review of air quality impacts at existing UK airports of a comparable size has been undertaken. The salient points are summarised below:

- Aberdeen airport handled 2.8 million passengers in 2005. Monitoring of nitrogen dioxide, the main pollutant associated with aircraft movements, in the vicinity of the airport demonstrated that concentrations were well below the Air Quality Limit Values (see *Table 4.1*).

- Newcastle Airport currently handles 1.2 million passengers per year and, in an assessment undertaken by Newcastle City Council, impacts to air quality were considered unlikely to give rise to unacceptable impacts on air quality (see *Table 4.1*).

Given that the projected aircraft movements at Inverness Airport are well below those currently at Aberdeen and that the background air quality in the vicinity of the airport is good, it can be concluded that the impacts of aircraft movements are unlikely to result in unacceptable impacts to air quality. This is supported by the national context where air quality issues have only been identified around UK airports with very high levels of aircraft movements and where background air quality is poor, for example, Heathrow airport in London.

Road traffic associated with the predicted growth in the Airport has been included in the assessment of traffic impacts associated with the A96.

2.3.6 Train movements

Impacts to air quality associated with increased train movements along the Inverness-Aberdeen line at current and likely future levels are considered to be negligible. This conclusion is based upon Government Guidance which suggests that significant impacts to air quality arising from trains are only likely to occur in the vicinity of major yards and large terminus stations servicing diesel powered trains where large numbers of trains may be idling for periods of time [(1)].

(1) [1] The Scottish Executive Local Air Quality Management Review and Assessment Technical Guidance Document TG(03)

3 METHODOLOGY

3.1 DUST

3.1.1 Introduction

Construction work has the potential to generate dust, in varying amounts. It is anticipated that during the operational phase of the project, dust emissions will be insignificant. The extent to which this dust causes nuisance or an air quality impact is almost entirely dependent on the efficacy of control measures and the proximity of people, residences or other receptors. The spatial extent of any impact is usually confined to within a few hundred metres at most of the dust sources, often much less.

The approach taken to assessing construction dust, as a potential nuisance issue, is twofold. Firstly, any on site practices and activities that might be especially liable to generate dust have been identified. Mitigation measures will be proposed for these and other potential dust generating activities that can be adopted by the contractor in the development of the Construction Environmental Management Plan (CEMP). Secondly, the surrounding area and land use has been evaluated with respect to the sensitivity of receptors. This includes commercial properties and residences.

3.1.2 Potential Impacts

The potential for dust to be emitted during construction is strongly dependent on the type of activities taking place, on wind speed and on whether winds carry emitted particles towards sensitive receptors, such as hospitals or schools and residential properties.

Dust emissions arising from construction activities can cause nuisance both within the site and outside the site boundary. Within the site, dust can cause mechanical or electrical faults to equipment, such as computers, and will increase abrasion of moving parts in plant and clogging of filters. Although not relevant to this assessment, on-site effects are a strong motive for controlling dust emissions at source. In the surrounding environment, it can cause annoyance to neighbours by the soiling of property; in particular, windows, cars and also of washed clothes that have been hung out to dry.

Dust becomes airborne with the action of winds on material stockpiles and other dusty surfaces, or when thrown up by mechanical action, for example the movement of tyres on a dusty road. General construction will cause occasional rather than continuous emissions of dust, as only some activities (such as grinding and cutting) will result in dust emissions.

The quantity of dust released during construction depends on a number of factors, including:

- the type of construction activities occurring (ie crushing and grinding);
- the volume of material being moved;
- the moisture and silt content of the materials;
- the distance travelled on unpaved roads by vehicles;
- the mitigation measures employed; and
- the area of exposed materials.

The significance of the effect of dust also depends on the wind direction and the relative location of the dust source and receptor.

In addition to the above issues that relate specifically to dust, the laying of tarmac and the associated use of hot bitumen can generate emissions of black smoke particles.

3.1.3 Assessment Methodology

There are no established criteria for the assessment of dust deposition arising from construction sites. A risk-based approach has therefore been developed to identify construction activities with the potential to generate significant quantities of dust near to sensitive receptors. Studies highlighted by the Building Research Establishment also suggest that nuisance is unlikely to occur at distances greater than 50 m from a construction site boundary (1). One of these studies has also shown that at least half the people living within 50 m of the site boundary of a road construction scheme were seriously bothered by construction dust nuisance, but that beyond 100 m less than 20% of the people were seriously bothered.

On this basis, a risk evaluation matrix has been devised and is presented in *Table 3.1* below. This has been used to determine the significance of effects arising from construction dust deposition.

Table 3.1 Evaluation of Potential Significant Effects of Dust Deposition

Duration of on-site dust raising activity	**Distance from Site Boundary to Sensitive (a) Receptors (m)**		
	< 50 m	50 – 100 m	> 100 m
> 12 months	Significant	Significant	Potentially Significant
6 – 12 months	Significant	Potentially Significant	Not Significant
< 6 months	Potentially Significant	Not Significant	Not Significant
(a) Sensitive receptors defined as: residential, commercial office, hospital, surgery etc.			

The construction phases of the proposed development are expected to last considerably longer than 12 months in some areas, with the following proposed phasing schedule:

(1) Buildings Research Establishment (BRE) (2003) Control of dust from construction and demolition activities. Kukadia, V., Upton, S. and Hall, D. BRE Bookshop, London. February 2003.

- Phase 1 2011 – 2016;
- Phase 2 2016 – 2021;
- Phase 3 2021 – 2026;
- Phase 4 2026 – 2031;
- Phase 5 2031 – 2036;
- Phase 6 2036 – 2041;
- Phase 7 2041;

Activities within each phase will not be concentrated in a single location and will move around, and therefore the potential for impacts will vary at sensitive receptors throughout each phase. In addition, sensitive receptors may be subject to influence during more than one phase of the development. Using *Table 3.1* it can be seen that, if unmitigated, construction activities generating dust could have a significant impact at distances greater than 100 m from the site boundary, for the longer-term construction activities taking place at a fixed location.

3.2 ROAD TRAFFIC

3.2.1 Introduction

The proposed development has the potential to cause changes in road traffic during the construction and operational phases, primarily on the A96 trunk road. It is understood that within the wider context of the A96 corridor development it is proposed that the existing A96 would be rerouted to the north of the proposed Tornagrain new settlement development and will also be made into a dual carriageway. If this rerouting were to occur the existing route of the A96 would be incorporated into the Tornagrain new settlement. For the purposes of this assessment the assumption has been made that the rerouting will take place and will occur prior to the full habitation of the new town.

Nitrogen dioxide (NO_2) and particulate matter (as PM_{10} and $PM_{2.5}$) have been assessed here, as they are the principal pollutants relating to emissions from road traffic. The impact of emissions from the exhausts of the construction traffic to air quality along roadsides within the study area has been addressed using the UK Department for Transport Design Manual for Roads and Bridges (DMRB) [(1)] screening methodology for the assessment of the impact on air quality of road traffic and included local traffic data and background air quality data. The DMRB method provides a robust estimate of ground level concentrations for direct comparison/evaluation with the standards included in the Air Quality Standards Regulations 2007.

(1) Transport Scotland (2003) Design Manual for Roads and Bridges, Screening Method, Version 1.02. November 2003.

3.2.2 Assessment Method

The DMRB screening model has been used to assess the impacts of the additional traffic created by the scheme. This model has been recommended in Government guidance (1) for assessments of this nature. It is recognised by ERM that the Defra guidance has been specifically designed for the local authority review and assessment of air quality process, but the methodology has been prepared by the Highways Agency for the convenient screening of road schemes. The intended use was for all road schemes, and not necessarily just in local authority review and assessment work.

In addition to the DMRB methodology, the guidance states that only the following locations (relevant to this project) require a detailed assessment.

- Areas where there may be narrow congested streets with residential properties within 5 m of the curb.

- Roads and busy junctions with a daily flow exceeding 10,000 vehicles per day and where people may spend one hour or more close to traffic.

- Where traffic flows are predicted to increase above 5%.

- All roads with unusually high proportion of heavy goods vehicles (greater than 20% of Annual Average Daily Traffic flow, AADT) if there is relevant exposure within 10 m of these roads and if the flow of heavy duty vehicles is greater than 2,500 vehicles per day.

The outputs of the DMRB screening are assessed against the relevant Air Quality Limit Values, set out in *Table 4.1*.

(1) Part IV of the Environment Act 1995. Local Air Quality Management. Technical Guidance LAQM. TG (03). February 2003. Scottish Executive.

4 INPUT INFORMATION FOR THE AIR QUALITY IMPACT ASSESSMENT

4.1 INTRODUCTION

This section sets out information utilised in various aspects of the assessment, including:

- planning policy context;
- Local Air Quality Management issues;
- relevant Air Quality Limit Values(AQLVs);
- existing baseline air quality and derivation of a suitable site specific baseline; and
- sensitive human receptor locations.

4.2 PLANNING POLICY

Scottish Planning Policy SPP1, *The planning system*, addresses air quality. This legislation, including the Air Quality Standards Regulations 2007 is detailed further in *Table 4.1*.

4.3 LOCAL AIR QUALITY MANAGEMENT

As a requirement of *Part IV* of the *1995 Environment Act* local authorities have completed a review and assessment of air quality to determine whether air quality limit values are likely to be met in future years and, where necessary, designate Air Quality Management Areas (AQMAs). Local authorities then have to implement Air Quality Action Plans to improve the air quality within AQMAs in order to meet the limit values.

No Air Quality Management Areas have been declared by the Highland Council, based upon an initial assessment undertaken in 2000 and confirmed in subsequent progress reports and updating and screening assessments. The most recent Air Quality Progress Report carried out in 2006 did not identify any areas in the Highland region where an air quality limit value will be exceeded and detailed assessment was not deemed necessary at this time.

On this basis, the proposed development is not within an existing AQMA, nor will the development impact upon an existing AQMA. Therefore there is no need to consider impacts in relation to any AQMAs in this assessment.

4.4 AIR QUALITY LIMIT VALUES

The Air Quality Limit Values (AQLVs) are based upon the statutory air quality limit values set out in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (AQS) (1) and subsequent Addendum (2) and the air quality guideline values set out in the Scottish Environmental protection Agency H1 document. *Table 4.1* sets out the AQLVs relevant to this assessment.

In addition guideline environmental assessment levels for formaldehyde and isocyanates have also been included in *Table 4.*1 as these are relevant to the assessment of baseline air quality associated with the Norbord plant. These are derived from the H1 guidance document[3].

Table 4.1 AQLVs relevant to this assessment

Pollutant	Concentration	Measured as	Date to be achieved by
Nitrogen dioxide (NO_2)	200 µg m^{-3}	1 hour mean not to be exceeded more than 18 times a year (99.79%ile)	1st January 2010
	40 µg m^{-3}	Annual mean	1st January 2010
Particulate Matter (PM_{10})	50 µg m^{-3}	24 hour mean not to be exceeded more than 35 times a year (90.41%ile)	1st January 2005
		24 hour mean not to be exceeded more than 7 times a year (98.08%ile)	31st December 2010
	40 µg m^{-3}	Annual mean	1st January 2005
	18 µg m^{-3}	Annual mean	31st December 2010
Particulate Matter ($PM_{2.5}$)	25 µg m^{-3}	Annual mean	31st December 2015
Sulphur dioxide	266	15 minute mean not to be exceeded more than 35 times a year (99.9 %ile)	
	350	1 hour mean not to be exceeded more than 24 times a year (99.7 %ile)	1st January 2005
	125	24 hour mean not to be exceeded more than 3 times a year (99.2 %ile)	1st January 2005
Carbon monoxide	10,000	8 hour rolling mean	1st January 2005
Formaldehyde	100	30 minute mean	
	5	Annual mean	
Isocyanates	7	1 hour mean	
	0.2	Annual mean	

Source: the air quality limit values regulations (2003) Scottish Statutory Instrument No. 428.

(1) DETR et al (now DEFRA et al), 2000. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Working Together for Clean Air. DEFRA, London.
(2) DEFRA et al, 2003. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland: Addendum. DEFRA, London.
(3) Scottish Environmental Protection Agency (2008) Environmental Risk Assessment Part 2: Assessment of point source releases and cost benefit analysis

4.5 BASELINE AIR QUALITY

4.5.1 Introduction

A number of sources of data have been used in order to establish the existing air quality in the area. Sources of these data include the National Air Quality Information Archive (NAQIA) (1) and the Highlands Council (2). These data have been reviewed to identify the likely existing air quality in the vicinity of the proposed development. However, the majority of air quality monitoring undertaken in the vicinity of the proposed development is in urban areas or at roadside locations, the data from which will not be relevant to the proposed development site which is situated in a non-urban area. On this basis, monitoring data from rural sites further afield have also been considered.

In summary, the following data sources have been considered:

- monitoring data obtained from Inverness Automatic Urban and Rural Network (AURN) urban background site located in Inverness town centre;
- monitoring data obtained from Straith Vaich (AURN) remote rural site in the highlands northwest of Inverness;
- monitoring data from the Highland Council passive diffusion tube network;
- monitoring data from the Harwell rural monitoring site (data from this site has been used, as monitoring data for formaldehyde has not been recorded elsewhere in the UK); and
- interpolated background mapping data.

Some monitoring has been undertaken by Norbord. However, this monitoring is not representative of the 'background' as it is intentionally designed to quantify impacts associated with the Norbord plant. On this basis, these data have not been considered here but are set out separately in *Section 5*.

4.5.2 Nitrogen Dioxide

Nitrogen dioxide is emitted from combustion sources including road vehicles, industrial and domestic sources. Consequently, concentrations of NO_2 will be elevated around roads, in built up areas and around industrial sources.

Nitrogen dioxide concentrations are monitored at the Inverness AURN site, in the town centre.

(1) www.airquality.co.uk/archive/index.php
(2) The Highland Council (2007) Local Air Quality Progress Report

Table 4.2 sets out a summary of the NO_2 monitoring data for 2002-2006.

Table 4.2 Annual average NO_2 concentrations measured at Inverness AURN

Year	NO_2 (µg/m³)
2002	21.9
2003	23.1
2004	22.6
2005	20.9
2006	21.4
Average	*22.0*

The Highland Council does not undertake monitoring of NO_2 concentrations at any rural sites, or urban background sites in Inverness or in the vicinity of the proposed Tornagrain new settlement. However, the council does undertake monitoring of NO_2 concentrations at two urban background sites in Dingwall, which are likely to be representative of NO_2 concentrations in smaller towns and small built up areas away from main roads or other point sources. *Table 4.3* sets out a summary of the NO_2 monitoring results obtained in Dingwall.

Table 4.3 Dingwall NO_2 diffusion tube monitoring results

Year	Kintail Place (µg/m³)	Burns Crescent (µg/m³)
2004	7	8
2005	8	10
2006	6	8
Average	*7*	*9*

The monitoring undertaken in Dingwall indicates that NO_2 concentrations away from main roads and specific point sources are low.

Estimates of baseline air quality have also been generated for each square kilometre of the UK based upon local sources of emissions. The predicted levels of NO_2 for the nine kilometre squares around the proposed development location are set out in *Table 4.4*. This includes emissions arising from nearby industrial facilities and Inverness Airport.

Table 4.4 Interpolated concentrations of NO_2

Easting	Northing	NO_2 (µg/m³) 2004
276500	849500	2.8
276500	850500	3.0
276500	851500	1.9
277500	849500	1.9
277500	850500	2.2
277500	851500	2.1
278500	849500	1.7
278500	850500	2.1
278500	851500	2.0
Maximum		**3.0**

The NO_2 concentrations measured in Inverness are likely to overestimate those at the proposed Tornagrain site, as the former will be influenced by traffic and emissions associated with urban areas. The values obtained from the interpolated mapping data are likely to be more representative of concentrations at the Tornagrain site. On this basis, background concentrations of between 2 and 3 µg m^{-3} might be expected at locations around the site, not immediately adjacent to the A96 trunk road and other roads or downwind of the Norbord plant. A background NO_2 concentration of 10 µg m^{-3} is likely to be representative of background levels at locations close to the A96.

4.5.3 Particulate matter

Particulate matter is emitted from combustion sources including traffic, aircraft, industrial and domestic sources. In addition, there is a wide range of natural sources of particulate matter including sea salt, dust arising from fields and agricultural areas, from plants and from other sources. Consequently, concentrations of particulate matter will be elevated around roads, in built up areas and around industrial sources, but levels will also be proportionately higher in rural areas when compared to other pollutants.

Particulate matter exists in a range of particle sizes and in the UK, there are air quality limit values relating to PM_{10} (particulate matter of aerodynamic diameter ≤10µm) and $PM_{2.5}$ (particulate matter of aerodynamic diameter ≤2.5µm).

$PM_{2.5}$ has only recently become a pollutant of particular interest and therefore data for PM_{10} is much more established. This is reflected in the number of sites where PM_{10} is monitored compared to sites monitoring $PM_{2.5}$.

PM_{10}

PM_{10} concentrations are measured at the Inverness AURN site, in the town centre. *Table 4.5* sets out a summary of the PM_{10} monitoring data for 2002-2006.

Table 4.5 PM_{10} concentrations measured at Inverness AURN

Year	PM_{10} (µg/m³)
2002	17.9
2003	17.3
2004	15.0
2005	16.7
2006	19.5
Average	*17.3*

Estimated concentrations have also been generated for each square kilometre of the UK based upon local sources of emissions. The predicted concentrations of PM_{10} for the nine kilometre squares around the Tornagrain site are set out in *Table 4.6*.

Table 4.6 Interpolated concentrations of PM_{10}

Easting	Northing	PM_{10} (µg/m³) 2004
276500	849500	12
276500	850500	9.2
276500	851500	8.7
277500	849500	12
277500	850500	8.8
277500	851500	8.8
278500	849500	12
278500	850500	8.7
278500	851500	8.6
Maximum		**12**

The PM_{10} concentrations measured in Inverness are likely to overestimate those at the proposed Tornagrain site, as the former will be influenced by traffic and emissions associated with urban areas. The values obtained from the interpolated mapping data are likely to be more representative of concentrations at the Tornagrain site. On this basis, background concentrations of between 8 and 12 µg m^{-3} might be expected at locations around the site, but not immediately adjacent to the A96 trunk road and other main roads.

$PM_{2.5}$

The nearest site to Inverness at which $PM_{2.5}$ concentrations are measured is located at Auchencorth Moss a Rural site, near to the village of Leadburn, Midlothian. This is also the only site in Scotland currently monitoring $PM_{2.5}$. Whilst this is unlikely to be entirely representative of $PM_{2.5}$ levels around Tornagrain the data from the site will provide an indication of $PM_{2.5}$ levels in rural areas in Scotland. *Table 4.7* sets out a summary of the $PM_{2.5}$ monitoring data for 2006 and 2007.

Table 4.7 $PM_{2.5}$ concentrations measured at Auchencorth Moss

Year	$PM_{2.5}$ (µg/m³)
2007	5.1

4.5.4 Sulphur dioxide

Sulphur dioxide is emitted from combustion sources where sulphur containing fuels are burnt. However, the primary domestic fuel in use in Inverness and the surrounding areas is natural gas with only trace amounts of sulphur. In addition, Norbord utilises gas and wood as the primary fuel. On this basis, ambient concentrations of SO_2 are likely to be low.

Sulphur dioxide concentrations are not measured in Inverness or the surrounding areas and the nearest monitoring site is the remote rural site at Strath Vaich, approximately 60km northwest of the site, where SO_2 concentrations were monitored up to 1996. Whilst the background concentrations of SO_2 in the vicinity of the proposed Tornagrain development are likely to be influenced by other sources including domestic heating and

localised industrial emissions in Inverness, these measurements provide an indication of background concentrations in rural locations remote from specific sources. *Table 4.8* sets out a summary of the SO_2 monitoring data for 1994-1996.

Table 4.8 SO_2 concentrations measured at Strath Vaich AURN

Year	SO_2 (µg/m^3)
1994	1.1
1995	0.66
1996	0.88
Average	*0.88*

4.5.5 Carbon monoxide

Carbon monoxide is emitted from combustion sources including traffic, aircraft, industrial and domestic sources. Consequently, concentrations of CO will be elevated around roads, in built up areas and around industrial sources. CO concentrations are measured at the Inverness AURN site, in the town centre. *Table 4.9* sets out a summary of the CO monitoring data for 2002-2006.

Table 4.9 CO annual average concentrations measured at Inverness AURN

Year	CO (µg/m^3)
2002	427
2003	451
2004	431
2005	524
2006	405
Average	*448*

4.5.6 Formaldehyde

Formaldehyde is emitted from the Norbord plant, in small amounts from vehicle exhausts and also occurs naturally. The Norbord plant will be the primary source of formaldehyde in the vicinity of the proposed Tornagrain development and is likely to be the only significant point source.

Formaldehyde is not a primary pollutant in the UK and only very limited monitoring of ambient levels has been undertaken at a rural site in Harwell, Oxfordshire. Whilst it is appreciated that this is not representative of the situation around the proposed development site, it is likely to be an overestimation of baseline levels and therefore conservative.

Table 4.10 sets out a summary of the formaldehyde monitoring data for August to December 1993.

Table 4.10 Formaldehyde concentrations measured at Harwell

Month	Formaldehyde (µg/m³)
August	1.7
September	0.84
October	0.57
November	0.95
December	0.33
Average	*0.89*

4.5.7 Isocyanates

No background monitoring of airborne isocyanates concentrations has been undertaken in the UK. Potentially elevated concentrations of isocyanates will only occur around specific sources of emissions and on this basis the background concentrations of isocyanates is considered to be negligible.

4.5.8 Summary

Table 4.11 sets out a summary of the background air quality data used in this assessment. The short term background values are derived from the long term background values by multiplying by a factor of 2 with the exception of PM_{10} where a factor of 1.79 is used (1). There is no requirement for short term $PM_{2.5}$ to be derived.

Table 4.11 Summary of background air quality

Pollutant	Year	Short term background (µg/m³)	Long term background (µg/m³)
Nitrogen dioxide	2006	20	10
	2011*	17.6	8.8
	2021 and 2041*	16.6	8.3
Sulphur dioxide	2006	1.8	0.88
PM_{10}	2006	17.9	10
	2011*	16.3	9.1
	2021 and 2041*	16.1	9.0
$PM_{2.5}$	2006	Not applicable	5.1
Carbon monoxide	2006	896	448
Formaldehyde	2006	1.8	0.89
Isocyanates	2006	None available	None available

* Baseline air quality for the future assessment years 2011, 2021 and 2041 is derived from existing baseline data using conversion factors developed by Defra (2)

(1) [1] Local Air Quality Management Guidance Note TG(03)

(2) [2] UK Air Quality Archive www.airuqlaity.co.uk

4.6 NORBORD PLANT

4.6.1 Introduction

The Norbord company operates a chipboard manufacturing plant approximately 2.5 km southwest of the proposed Tornagrain settlement centre. The operation of the plant is potentially important in the context of the Tornagrain new settlement as the emissions from the existing facility is likely to have an impact upon air quality in the vicinity of the Tornagrain new settlement.

A review of the PPC permit for the plant, which includes the air quality impact assessment has been set out here to provide information on the impact on baseline air quality due to the Norbord plant. It should be noted that the baseline air quality set out in the previous section takes into account the impact of Norbord operations.

The existing Norbord plant is a significant source of emissions to air in the vicinity of the proposed Tornagrain development. The facility is regulated by the Scottish Environmental Protection Agency (SEPA) as a Part A process under the Pollution Prevention and Control regulations (PPC). As part of this regulatory permitting process, Norbord was required to undertake an Air Quality Impact Assessment (AQIA) (1) to assess the impacts on ambient air quality arising from emissions from the plant.

Potentially significant emissions from the plant include:

- particulate matter;
- formaldehyde;
- aldehydes;
- isocyanates (Polymerised Methylene Di-phenyl isocyanate);
- carbon monoxide;
- sulphur dioxide;
- oxides of nitrogen; and
- non-methane Volatile Organic Compounds.

These substances are emitted to air from production processes and from the boiler plant.

The AQIA for Norbord was undertaken using detailed dispersion modelling, following guidance set out by SEPA. The dispersion model used details of the stack, plant building, emission temperature, flow rate and emission concentration. This information is combined with weather data, which includes wind speed, wind direction and information on atmospheric

(1) [1] Environmental Dynamics (2000) CSC Oriented Strand Board Mill, Morayhill: Atmospheric dispersion and air quality assessment with three dryers in operation using PF and PMDI resin; produced on behalf on Norbord Ltd. In support of PPC application for the site.

stability, to predict how the emissions from the plant will disperse and what ground level concentration will be experienced.

4.6.2 Findings of the AQIA

Location of greatest impact

The wind direction and wind speed are the main environmental factors which will affect which direction the emissions from the plant will travel. The prevailing wind directions in the vicinity of the plant are from the southwest, west and northwest. The dispersion modelling indicated that the highest ground level concentrations over a long term period (ie annual mean) are predicted to occur close to the existing village of Tornagrain. This corresponds to a location at the south-western edge of the proposed new settlement. Over the short term, the maximum impacts are predicted to occur at a location approximately 0.5-1km to the southwest of the boundary of the proposed new settlement. Ground level concentrations will then fall away considerably to the northeast as the distance from the plant increases.

Predicted impacts to air quality

A summary of the results of the AQIA are set out in *Table 4.12*. The Process Contribution (PC) is the maximum predicted ground level concentration anywhere around the plant. The impact at other areas will be lower that those presented in *Table 4.12*.

Table 4.12 Summary of AQIA results

Pollutant	Period and statistic	EAL	PC	PC/ EAL
Nitrogen dioxide	Annual mean		40	5.7	14%
	99.7th percentile of 1 hour means		200	12	6.0%
Sulphur dioxide	Annual mean		50	0.53	1.1%
	99.8th percentile of 1 hour means		350	1.1	0.31%
PM_{10}	Annual mean 2005		40	6.7	17%
	Annual mean 2010		18	6.7	37%
	90.4th percentile of 24 hour means 2005		50	14	28%
	98.1st percentile of 24 hour means 2010	Not assessed			
$PM_{2.5}$	Annual mean 2015		25	6.7 (a)	27%
Carbon monoxide	8 hour rolling mean		10,000	104	1.0%
Formal-dehyde	Annual mean		5.0	2.3	46%
	30 minute maximum		100	4.9	4.9%
Isocyanates	Annual mean	0.20		0.020	10%
	1 hour maximum	7.0		0.040	0.57%

Process Contribution (PC): Impact to air quality due to plant emissions only
Environmental Assessment level (EAL): Air quality limit value or guideline value
(a) $PM_{2.5}$ not separately assessed; the assumption is made that all emissions of particulate matter occur as $PM_{2.5}$.

The results of the AQIA demonstrate that the emissions from the Norbord plant are not predicted to result in any of the current EALs being exceeded around the plant. The contributions to NO_2, PM_{10} and $PM_{2.5}$ concentrations are higher than are typical for this type of plant. This is primarily because of the relatively low stack height at the plant, which is necessary for compliance with planning constraints associated with Inverness Airport.

The assessment demonstrates that the emissions from the Norbord plant are not likely to result in any air quality limit values being exceeded in the vicinity of the Proposed Tornagrain new settlement and lead to only relatively small increases in airborne pollution levels above the baseline levels.

4.6.3 Results of monitoring in the vicinity of Norbord

In order to verify that the emissions from the plant do not have an unacceptable impact on air quality, Norbord undertakes routine monitoring of airborne pollutants in the vicinity of the plant. *Table 4.13* sets out a summary of the annual spot check monitoring survey undertaken in the vicinity of the Norbord plant between 1993-2003.

Table 4.13 Norbord air quality monitoring results

Pollutant	EAL	Morayston	W. Dalziel	Mid Dalziel	St. Cottages	Kerrowaird
PM_{10} (µg/m³)	40 (2005); 18 (2010)	22	25	21	23	32
Total VOCs (µg/m³)	N/A	4.0	4.0	3.0	3.0	5.0
Formaldehyde (µg/m³)[1]	5.0	0.03	0.06	0.02	0.06	0.05
Total Aldehydes (µg/m³)[1]	N/A	0.07	0.08	0.04	0.01	0.07
Isocyanates (µg/m³)	0.2	Below limit of detection	Below limit of detection	Below limit of detection	Below limit of detection	Below limit of detection

1: results for period 2001-2003 only

4.6.4 Summary

The results of the AQIA, undertaken in support of the PPC application for Norbord, indicate that emissions from the plant do not result in unacceptable impacts on air quality compared to the current air quality limit values and have only a small impact on the ambient air quality at the proposed Tornagrain site. However, there is the potential for elevated levels of PM_{10} when compared to the AQLV for 2010. This is a situation that is consistent across many areas of Scotland, including in towns and cities, but also in rural areas where localised natural sources may be important.

4.7 SENSITIVE RECEPTORS

There are a number of existing sensitive human receptors in the vicinity of the proposed Tornagrain development site. For the assessment of dust impacts, sensitive receptor locations have been identified, although the assessment has been made on a generic basis. For traffic impacts no sensitive receptor locations are required as the assessment has been made on a generic basis.

Emissions associated with traffic and domestic space heating have the potential to impact sensitive ecological habitats. However, due to the scale of the proposed development, the low background levels of pollutants and the likely increases in traffic, it is considered that it is unlikely that the proposed development will have an unacceptable impact on sensitive ecological receptors. On this basis no consideration of impacts on ecological receptors has been undertaken.

Table 4.14 sets out the sensitive human receptors in the vicinity of the proposed development.

Table 4.14 Sensitive Human Receptors

Reference	Receptor Name	Distance from development site boundary (m)	Direction from site
1	Mid Connage	1300	North
2	Easter Kerrowgair	1600	North
3	Wester Kerrowgair	1600	Northwest
4	Easterton	1675	Northwest
5	Wester Fisherton	2050	West
6	Drumnacreich	1750	West
7	Balnaglack	2125	West
8	Wester Dalziel	1225	West
9	Easter Dalziel	1050	West
10	Morayhill	1350	Southwest
11	Petty West Primary School	1575	Southwest
12	Morayston	1575	Southwest
13	Woodend	75	North
14	Tornagrain Village	Within site boundary	n/a
15	Tornagrain Church	Within site boundary	n/a
16	Kerrowaird	350	Southwest
17	Drumvoulin	Within site boundary	Southwest
18	Balnabual	700	South
19	Little Dalcross	1150	South
20	Blackford	900	South
21	Lochandinty	350	Southeast
22	Hillhead	Within site boundary	n/a
23	Culaird	Within site boundary	n/a
24	Mid Coul	Within site boundary	n/a
25	Culblair	25	North
26	Milton of Gollanfield	225	Northeast
27	Drumine	Within site boundary	n/a

Note: Distances have been calculated from site boundary to nearest building.

5 CONSTRUCTION IMPACTS, MITIGATION AND RESIDUAL IMPACTS

5.1 CONSTRUCTION TRAFFIC

The phased nature of the development means that the majority of construction traffic will arise whilst none or some areas of Tornagrain are occupied. The assessment of traffic impacts undertaken for the operational phase includes traffic that will arise because of construction activities. It is anticipated that the additional traffic due to the construction activities will not lead to an increase of more than 5% in traffic levels on the A96 over and above the existing and predicted levels of traffic on the A96.

On this basis, the impacts from construction traffic are likely to be insignificant and have not been separately assessed.

5.2 CONSTRUCTION DUST

There are a number of receptors within a few hundred metres or within the proposed Tornagrain development boundary which have the potential to be adversely affected by dust emissions from construction activities. On this basis, there is the potential for adverse impacts to arise during construction phase of the project.

5.2.1 *Potential Impacts*

Construction activity involving earthmoving operations and vehicle movements over unpaved roads and surfaces has the potential to cause emissions of dust. Whether or not dust is generated depends upon the nature of the soil conditions (ie moisture content), the quantities of material being moved, the weather conditions, season of the year and the type of plant and machinery used for work.

The activities involved in the construction of the new settlement and the associated roadways and car parks which have the potential to create dust are:

- topsoil stripping and stockpiling;
- activities using concrete and cement;
- backfilling;
- reinstatement;
- movement of vehicles over temporary access roads; and
- movement of vehicles over unpaved surfaces.

Activities associated with the proposed development will take place over an extended period at various locations around the development site, depending upon the proposed development phasing plan. There is the potential for dust generation to occur at some sites for a protracted period of time. The

tendency for dust generation will vary according to type of work and the nature of the weather.

Conditions most likely to cause dust formation will arise in dry ground conditions during the summer period. Prolonged dry weather coupled with windy conditions is most favourable to dust formation.

The main regulatory controls over dust are the 'statutory nuisance' provisions contained in the Environmental Protection Act 1990 and the Public Health (Scotland) Act 1897. Dust can give rise to a statutory nuisance if it is considered to be 'prejudicial to health or a nuisance'.

This assessment makes the assumption that the construction phase of the scheme adheres to best practice on the minimising of the impact of dust from construction activities. Examples of such practice are detailed in recently released guidance [(1)], funded by amongst others, the former UK Department for Trade and Industry. Some examples of good site practices that can be employed to reduce the risk of dust effects arising during construction are listed below.

5.2.2 Mitigation Measures

By implementing suitable mitigation and through careful management of construction activities these impacts may be minimised or removed. Where site conditions and surrounding land-use dictate, the following mitigation measures can be considered:

- limiting the speed of vehicles on unpaved surfaces;
- use of water sprays in dry weather to damp down soil surfaces prior to construction work to prevent mobilisation of dust particles;
- road sweeping vehicles to keep roads clean or wheel washing of vehicles leaving the construction site to minimise the re-suspension of dust due to construction traffic;
- water suppression or dust extraction technology fitted to drilling and grinding equipment;
- excavation surfaces to be wetted, where appropriate;
- surfaces damped down prior to clearing;
- debris piles to be kept watered or sheeted as required;

(1) Buildings Research Establishment (BRE) (2003). Control of dust from construction and demolition activities. Kukadia, V., Upton, S. and Hall, D. BRE Bookshop, London. February 2003.

- containers to be totally enclosed or covered by tarpaulins or nets to prevent escape of dust or waste materials during loading and transfer from site; and

- lorries to be sheeted during transportation of construction materials and spoil export.

The above mitigation requirements should be reflected in construction contracts and the environmental performance and management standards of potential contractors will be assessed as part of contract award procedures.

Construction works should not be commenced until the dust suppression measures have been put into place. Contractors should carry out the works in such a way that emissions to air of dust are minimised so far as is reasonably practicable and that best practicable means are employed to avoid the creation of a statutory nuisance. The effectiveness of the dust prevention measures will be monitored by Contractors on a regular basis.

Contractors are required under the Environmental Protection Act 1990 to use Best Practical Means (BPM) to minimise nuisance to people in the vicinity from dust.

5.3 RESIDUAL IMPACTS

5.3.1 Construction traffic

The construction of the proposed development is considered unlikely to have any adverse impacts on sensitive human or ecological receptors in terms of impacts arising due to emissions from construction traffic.

5.3.2 Dust

The scale of the proposed development and the nature of the works which will be undertaken are such that the potential exists for significant emissions of dust to occur and subsequent nuisance issues to arise at both existing and future sensitive receptor locations. Implementation of the mitigation measures outlined above and good site management practices should minimise the potential for dust nuisance. There may be times, however, when significant emissions of dust are inevitable and unavoidable. The risk of nuisance complaints being received from sensitive receptors can be minimised by communicating effectively with local residents to forewarn them of dust generating processes being undertaken on site and to provide a timescale for the duration of such emissions. Adopting such a proactive approach will positively contribute to minimising the impacts of dust emissions.

6 OPERATIONAL IMPACTS, MITIGATION MEASURES AND RESIDUAL IMPACTS

6.1 OPERATIONAL TRAFFIC

The potential impacts of operational traffic on air quality at sensitive receptors will primarily depend upon the final routing and capacity of the A96 trunk road. At the present time Transport Scotland has not yet finalised plans for the redevelopment of the A96 between Inverness and Nairn. However, it is expected that the road will be made into a dual carriageway between the two towns and there will also be a by-pass around the proposed Tornagrain New Settlement, by the completion of the proposed project in 2041.

The study specifically assessed the potential impacts associated with traffic on the A96 for:

- existing sensitive receptors in the vicinity of the current A96;
- existing sensitive receptors in the vicinity of the proposed new A96 alignment;
- new sensitive receptors in the vicinity of the current A96 (ie new properties within Tornagrain prior to the diversion of the A96); and
- new sensitive receptors in the vicinity of the proposed new A96 alignment (ie new properties within Tornagrain post diversion of the A96).

As discussed previously, it is considered unlikely that there will be air quality issues associated with road traffic within the town itself, and this has not been considered here, except where new properties are in place on the A96, prior to diversion.

6.1.1 *Scenarios and assessment assumptions*

For each assessment year, the impacts of traffic associated with the Tornagrain development have been assessed by comparison of the 'without development' scenario against the 'with development' scenario. The 'without development' scenario reflects the predicted increase in traffic that will occur on the A96 due to already committed and proposed developments and trends towards increased traffic. This includes traffic that would arise from the proposed Inverness Airport Business Park (IABP). The 'with development' scenario reflects the predicted increase in traffic that will arise if the Tornagrain settlement project goes ahead. This also includes traffic that would arise from the proposed Inverness Airport Business Park (IABP). The 'with development' scenario also reflects the fact that some of the workforce for the IABP development will live in Tornagrain and therefore do not need to drive to

work. The impacts are assessed on the predicted change in impacts due to additional traffic generated by the proposed Tornagrain development.

In line with the proposed development plans for Tornagrain, four assessment years have been investigated:

- Base case (2006), based upon current traffic levels and existing road layouts;

- Future case 1 (2011), based upon future traffic levels including traffic from IABP and the phased development of Tornagrain. This scenario assumes that the A96 is in current configuration;

- Future case 2 (2021), based upon future traffic levels including traffic from IABP and the phased development of Tornagrain. This scenario assumes that the A96 is in current configuration;

- Future case 3 (2041a), based upon future traffic levels including traffic from IABP and traffic associated with the completed Tornagrain development. This scenario assumes that the A96 is in dual carriageway configuration, by-passing Tornagrain; and

- Future case 4 (2041b), based upon future traffic levels including traffic from IABP and traffic associated with the completed Tornagrain development. This scenario assumes that the A96 is in current configuration.

The impacts on air quality of traffic have been assessed on the A96 only, as this is the only road, not within the settlement itself, associated with the proposed Tornagrain development for which traffic levels are likely to significantly increase (>5% growth) and carry more than 10,000 vehicles per day. Impacts have been investigated associated with five sections of the A96:

- Link 1: A96 Barn Church to Newton;
- Link 2: A96 Newton to Tornagrain;
- Link 3: Tornagrain to Inverness Airport junction;
- Link 4: Inverness Airport junction to Ardersier Junction; and
- Link 5: Ardersier Junction to Old Military Road.

For future case 3 (2041) link 3 and link 4 represent the Tornagrain by-pass.

The assessment has been undertaken using the worst case assumption that adjacent to single carriageway roads receptors are a minimum of 5m from the road centreline and that adjacent to dual carriageway roads receptors are a minimum of 10m from the road centreline. The distance is greater adjacent to a dual carriageway, because of the width of the road and the need for hard shoulder and additional road furniture. In reality, there are few receptors at this distance from the road and in the large majority of cases receptors are a greater distance from the road. No data are available on the predicted vehicle

speeds and therefore vehicle speed data are based upon the speed limits on the relevant road links.

6.1.2 Assessment input data

The traffic input data used in the assessment are set out in *Table 6.1*. They include:

- the traffic flows (as Annual Average Daily Traffic AADT);
- the percentage split between Heavy Duty Vehicles (HDVs >3.5 tonnes) and Light Duty Vehicles (LDVs <3.5 tonnes);
- average vehicle speed (in this case based upon the speed limit on the road); and
- the road type: Class A - A roads and motorways; B - urban roads neither A roads nor motorways; C - other roads including B - Roads and minor roads.

6.1.3 Results

The results of the DMRB assessment are set out in *Table 6.2*. note that these results include the existing baseline pollution levels.

Table 6.1 DMRB assessment input data

Road link	AADT (vehicles/day)				%LDV	%HGV	Speed (kph)		Distance to receptor (m)		Road type
	2006	2011	2021	2041			2006, 2011, 2021, 2041b	2041a	2006, 2011, 2021, 2041b	2041a	
Baseline (including IABP traffic)											
A96- Barn Church to Newton	21491	35181	84340	92450	93	7	96	112	5	10	A
A96- Newton to Tornagrain	20314	30002	78077	85549	93	7	96	112	5	10	A
A96- Tornagrain to Inverness airport junction	20341	30028	66957	50868	93	7	96	112	5	10	A
A96- Inverness Airport junction to Ardersier Road (W)	19361	22694	36469	35667	93	7	96	112	5	10	A
A96- Ardersier Road (W) to Old Military Road	19361	22694	36469	53464	93	7	96	112	5	10	A
Development (including IABP traffic and Tornagrain traffic)											
A96- Barn Church to Newton	21491	36672	84412	116708	93	7	96	112	5	10	A
A96- Newton to Tornagrain	20308	31783	78169	108992	93	7	96	112	5	10	A
A96- Tornagrain to Inverness airport junction	20334	31802	67128	63842	93	7	96	112	5	10	A
A96- Inverness Airport junction to Ardersier Road (W)	19348	24626	36449	44868	93	7	96	112	5	10	A
A96- Ardersier Road (W) to Old Military Road	19348	24626	36449	53944	93	7	96	112	5	10	A

Table 6.2 Results of DMRB assessment

Road link	Limit value	Without development impact (µg/m³)					With development impact (µg/m³)					% change				
		2006	2011	2021	2041 (a)	2041 (b)	2006	2011	2021	2041 (a)	2041 (b)	2006	2011	2021	2041 (a)	2041 (b)
Annual mean NO_2																
A96- Barn Church to Newton	40 (µg/m³)	20	17	16	17	17	20	17	17	17	18	0%	1%	3%	-1%	4%
A96- Newton to Tornagrain		20	16	16	17	17	20	17	17	17	18	0%	1%	3%	-1%	6%
A96- Tornagrain to Inverness airport junction		20	16	16	16	15	20	17	16	16	16	0%	1%	3%	0%	4%
A96- Inverness Airport junction to Ardersier Road (W)		19	16	15	16	15	19	16	15	16	15	0%	-2%	0%	-1%	3%
A96- Ardersier Road (W) to Old Military Road		19	16	15	15	16	19	16	15	15	16	0%	-2%	0%	-4%	0%
Annual mean PM_{10}																
A96- Barn Church to Newton	40 (µg/m³) (2006) 18 (µg/m³) (2011, 2021, 2041)	14	12	12	14	13	14	12	13	14	13	0%	1%	2%	0%	2%
A96- Newton to Tornagrain		14	12	12	14	13	14	12	12	14	13	0%	1%	2%	-1%	2%
A96- Tornagrain to Inverness airport junction		14	12	12	13	12	14	12	12	13	12	0%	1%	2%	0%	3%
A96- Inverness Airport junction to Ardersier Road (W)		14	12	12	13	12	14	12	12	13	12	0%	-1%	0%	-1%	2%
A96- Ardersier Road (W) to Old Military Road		14	12	12	13	12	14	12	12	12	12	0%	-1%	0%	-3%	1%
PM_{10} No. days >50µg/m³																
A96- Barn Church to Newton	≤35 days (2006) ≤7 days (2011, 2021, 2041)	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days
A96- Newton to Tornagrain		0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days
A96- Tornagrain to Inverness airport junction		0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days
A96- Inverness Airport junction to Ardersier Road (W)		0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days
A96- Ardersier Road (W) to Old Military Road		0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days	0 days
Annual mean $PM_{2.5}$ (a)																
A96- Barn Church to Newton	25 (µg/m³) (2021, 2041)	9.4	8.2	8.4	10	8.9	9.4	8.3	8.6	10	9.2	0%	1%	3%	-1%	3%
A96- Newton to Tornagrain		9.3	8.1	8.3	10	8.8	9.3	8.1	8.5	10	9.1	0%	1%	3%	-1%	3%
A96- Tornagrain to Inverness airport junction		9.3	8.1	8.1	9.2	8.1	9.3	8.1	8.3	9.2	8.4	0%	1%	3%	0%	4%
A96- Inverness Airport junction to Ardersier Road (W)		9.2	8.0	7.6	9.2	7.7	9.2	7.8	7.6	9.1	7.9	0%	-2%	0%	-1%	3%
A96- Ardersier Road (W) to Old Military Road		9.2	8.0	7.6	9.0	8.1	9.2	7.8	7.6	8.6	8.2	0%	-2%	0%	-4%	1%

Notes: Figures in bold indicate where the air quality limit values are predicted to be exceeded;

(a) $PM_{2.5}$ not separately assessed; the assumption is made that all emissions of particulate matter occur as $PM_{2.5}$.

6.1.4 Discussion

The assessment of impacts on air quality of traffic associated with the Tornagrain development indicates that there is unlikely to be a significant worsening in air quality at receptors adjacent to the A96 as a consequence of the proposed development.

The assessment has been undertaken using the worst case assumption that receptor locations are on the roadside, ie 5m from the road centre for single carriageway roads and 10m for dual carriageway roads. In reality, there are very few, if any, receptors that are this close to the road. Levels of pollution caused by road sources will diminish with increasing distance from the roadside and levels at receptors further away from the roadside will be lower than those presented here and will be well within the limit values.

The assessment shows that the development is not predicted to result in significantly increased concentrations compared to the anticipated baseline. In addition, the predicted pollutant concentrations are below the air quality limit values.

6.1.5 Mitigation

On the basis of the assessment set out here, no mitigation measures are required.

6.1.6 Residual Impacts

On the basis of the assessment the air quality limit values are not predicted to be exceeded due to operational traffic.

6.2 CUMULATIVE IMPACTS

The assessment of cumulative impacts has been undertaken through out the assessment with the use of appropriate background air quality levels and due consideration of the potential impacts of the proposed project. On the basis of the results set out here, it is predicted that any cumulative impacts will not result in any air quality limit values being exceeded or nuisance issues as a consequence of activities associated with the construction or operations of the proposed development.

7 CONCLUSIONS

The construction and the operation of proposed Tornagrain development are not predicted to have any unacceptable impacts on air quality.

There is the potential for adverse impacts to arise as a consequence of emissions of dust from construction activities. However, the incorporation of the recommended dust mitigation measures are predicted to reduce any dust emissions to an acceptable level.

Traffic associated with the construction and operational phases of the development are not predicted to result in unacceptable impacts to air quality at sensitive human receptors in the vicinity of the development.