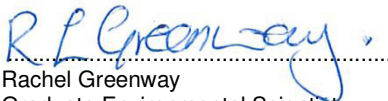


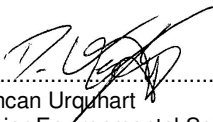
Simonstone, Air Quality Assessment



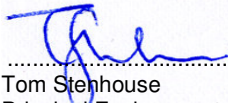
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1 Introduction

AECOM has been commissioned by Fort Vale Engineering Ltd to assess the potential local air quality impacts resulting from the proposed relocation of their foundry from South Vale Works, Southfield Street, Nelson, to Calder Vale Park, west of Padiham.

A qualitative assessment has been conducted to determine the potential impacts during the construction phase of the new works at nearby sensitive receptors and appropriate mitigation measures have been proposed.

Detailed dispersion modelling using AERMOD was undertaken to assess pollutant emissions from the stack sources at the proposed development site. Pollutant concentrations were predicted at selected sensitive receptors in the proposed opening year (2012). Emissions from development traffic have not been modelled, as the impact is anticipated to be negligible, but they have been discussed qualitatively.

Local air quality Review and Assessment work undertaken by Ribble Valley Borough Council has been reviewed to establish existing air quality in the vicinity of the proposed development site.

In addition, a qualitative odour assessment was undertaken to determine the likelihood of an impact due to the proposed foundry.

Qualitative comparisons have been made between the impacts of the foundry at the existing site compared to the proposed site. However, it should be noted that the assessment has not modelled the impacts on air quality of the existing foundry in Nelson; nevertheless, beneficial impacts are anticipated as the emission sources would no longer be present.

1.1 Study Area

The proposed site is at Calder Vale Park to the west of Simonstone Lane, near Padiham. Currently the site accommodates the company's international headquarter offices and production base whilst the existing foundry is located approximately 11 km to the north east.

The proposed site for the foundry is to the west of the existing buildings at Calder Vale Park and bounded to the west, south and north by open farmland. Part of the development site lies within green belt land.

1.2 Site Visit

A site visit of the existing foundry in Nelson was undertaken on 30 September 2010. Information regarding operating times and foundry processes was obtained during the visit. The site visit also involved meeting with Andy Bryce at the proposed site at Calder Vale Park.

Plans were provided for the proposed foundry, indicating the dimensions of building, location of the furnaces and abatement systems. It was confirmed that the equipment at the existing foundry would be moved to the new site, with operating times kept the same. Consequently PM₁₀ emission rates required for the operational phase assessment were based on the furnaces at the existing site. This information was obtained through emission testing reports, which are regularly undertaken to comply with the Authorisation issued by the local authority under the Environmental Protection Act.

2 Policy and Legislation

2.1 Introduction

The foundry is an industrial process will be regulated by the local authority as a Part A(2) activity and subject to the Local Air Quality Management (LAQM) guidance and legislation.

2.2 Overview of Recent Air Quality Legislation and Policy

The provisions of Part IV of the Environment Act 1995 establish a national framework for air quality management, which requires all local authorities in England, Scotland, Northern Ireland and Wales to conduct local air quality reviews. Section 82(1) of the Act requires these reviews to include an assessment of the current air quality in the area and the predicted air quality in future years. Should the reviews indicate that the standards prescribed in the Air Quality Strategy (HMSO, 2007) will not be met, the local authority is required to designate an Air Quality Management Area (AQMA). Action must then be taken at a local level to ensure that air quality in the area improves.

2.2.1 The Air Quality Strategy

The Air Quality Strategy identifies several ambient air pollutants that have the potential to cause harm to human health. These pollutants are associated with local air quality problems, with the exception of ozone, which is recognised as being a regional problem.

The Air Quality Strategy set standards and objectives for the pollutants that are associated with local air quality. These objectives aim to reduce the health impacts of the pollutants to negligible levels. The most important pollutants with regards to combustion processes are nitrogen dioxide (NO₂) and particulate matter of under 10 µm in diameter (PM₁₀).

2.3 Pollutants of Concern

When assessing a Foundry, the pollutants of concern are Particulate Matter and Nitrogen Dioxide. Heavy metals may be entrained within the emissions, particularly Chromium.

2.3.1 Nitrogen Dioxide

The Government and the Devolved Administrations adopted two Air Quality Objectives for NO₂ to be achieved by the end of 2005. In 2010, mandatory EU air quality limit values for NO₂ will apply in the UK. The EU limit values for NO₂ are the same as the national objectives for 2005 (HMSO, 2007):

- An annual mean concentration of 40 µg/m³; and
- An hourly mean concentration of 200 µg/m³, to be exceeded no more than 18 times per year.

In practice, meeting the annual mean objective has been and is expected to be considerably more demanding than achieving the 1-hour objective. The annual mean objective of 40 µg/m³ is currently widely exceeded at roadside sites throughout the UK, with exceedences also reported at urban background locations in major conurbations.

The number of exceedences of the hourly objective show considerable year-to-year variation, and is driven by meteorological conditions, which give rise to winter episodes of poor dispersion and summer oxidant episodes. Analysis of the relationship between 1-hour and annual mean NO₂ concentrations at roadside and kerbside monitoring sites indicate that exceedences of the 1-hour objective are unlikely where the annual mean is below 60 µg/m³ (AEA, 2008b). Exceptions were found to be related to a regional pollutant event in December 2007.

NO₂ and nitric oxide (NO) are both oxides of nitrogen, and are collectively referred to as NO_x. All combustion processes produce NO_x emissions, largely in the form of NO, which is then converted to NO₂, mainly as a result of its reaction with ozone in the atmosphere. Therefore the ratio of NO₂ to NO is primarily dependent on the concentration of ozone and the distance from the emission source.

2.3.2 Particulate Matter

This assessment considers the annual mean and daily mean air quality standards, as specified in the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (HMSO, 2007). Two objectives have been adopted for PM₁₀, to be achieved by the end of 2004:

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- An annual mean concentration of $40 \mu\text{g}/\text{m}^3$ (gravimetric); and
- A 24-hour mean concentration of $50 \mu\text{g}/\text{m}^3$ (gravimetric) to be exceeded no more than 35 times per year.

Particulate matter is composed of a wide range of materials arising from a variety of sources and is typically assessed as total suspended particulates or as a mass size fraction. National objectives and European limit values already apply for the PM_{10} fraction and objectives and limit values will apply for $\text{PM}_{2.5}$ from 2020 and 2015 respectively. These express particulate levels as the total mass size fraction at or below an aerodynamic diameter of 10 and $2.5 \mu\text{m}$ respectively.

Both short-term and long-term exposure to ambient levels of particulate matter are consistently associated with respiratory and cardiovascular illness and mortality as well as other ill-health effects. Particles of less than $10 \mu\text{m}$ in diameter have the greatest likelihood of reaching the thoracic region of the respiratory tract.

It is not currently possible to discern a threshold concentration below which there are no effects on the whole population's health. Recent reviews by WHO and the Committee on the Medical Effects of Air Pollutants (COMEAP, 1998) have suggested exposure to a finer fraction of particles ($\text{PM}_{2.5}$, which typically make up around two thirds of PM_{10} emissions and concentrations) give a stronger association with the observed ill health effects, but also warn that there is evidence that the coarse fraction (between PM_{10} – $\text{PM}_{2.5}$) also has some effects on health.

Industrial processes and road transport were the main sources of PM_{10} in 2005. In general diesel vehicles emit a greater mass of particulate per vehicle kilometre than petrol-engined vehicles (AEA, 2007). Emissions of PM_{10} have decreased considerably since 1970, mainly due to the decline in coal use and the result of legislative and technical control of emissions from both road traffic and industrial sources.

2.3.3 Chromium

The Nelson works was subject to annual testing for emission of Chromium (Cr), with an emission limit set by the local authority of $5 \text{ mg}/\text{m}^3$. Emission testing for this pollutant was not undertaken in 2010 as previous results indicated that these emissions were significantly below the emission limit and are not considered to represent a major pollutant from this process.

The toxicity of Cr is dependent on the oxidation state, with Cr (VI) being more toxic than the trivalent form Cr (III), due to its tendency to be more readily absorbed into the body.

2.4 Construction Dust

Dust is defined as all particulate matter up to $75 \mu\text{m}$ in diameter and comprising both suspended and deposited dust, whereas PM_{10} is a mass fraction of airborne particles of diameter of $10 \mu\text{m}$ or less. The health impacts associated with dust include eye, nose and throat irritation in addition to the nuisance caused by deposition on cars, windows and property. Dust and PM_{10} emissions arise from a number of sources, so construction activities and emissions from vehicles associated with the site should be considered.

2.5 Odour

In the UK, the main requirements with respect to industrial odour control are those relating to nuisance as provided in Section 79 of Part III of the Environmental Protection Act 1990 (HMSO, 1990). The Act defines nuisance as, "any dust, steam, smell or other effluvia arising on industrial trade or business premises and being prejudicial to health or a nuisance."

3 Construction Phase

3.1 Methodology

The construction phase of the development has the potential to cause a temporary localised impact. Although the proposed site is located in a largely rural location, there are several residential properties nearby and therefore measures should be adopted to prevent the production of dust, and where this is not possible, suitable control measures to minimise its dispersal as far as is practicable should be implemented. Construction activity is also likely to impact local traffic flows, with increased HGV movements on nearby roads to gain access to the site.

A qualitative assessment has been performed to determine:

- The dust and particulate generating potential of the works; and
- The sensitivity of receptors.

Based on these the following can be calculated:

- The significance of dust and particulate impacts; and
- The risk of dust and particulate impacts

Taking the above into consideration appropriate mitigation measures are proposed to reduce the dust and particulate generating potential of the works and so consequently reduce the significance and risk of the impacts.

3.2 Dust Generating Potential

According to the Best Practice Guidance provided by London Councils (GLC, 2006), determining the potential for a development to generate dust is dependent on its size and the duration of dust generating activities.

Dust generating activities that will be undertaken during this period include:

- Ground preparation;
- Breaking/crushing concrete;
- Creation of stockpiles;
- Vehicle movement and maintenance;
- Construction works; and
- Concrete batching.

The criterion in Table 1 are adapted from the London Councils' Best Practice Guidance and have been used to determine the dust generating potential of the construction activities, taking into consideration the scale and duration of the works. According to Table 1, the dust generating potential of the construction phase is considered to be 'Medium', due to the scale of the development site

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Table 1: Determining Risk of Dust and Particulate Impact

		Approximate Size of Development (with consideration of dust generating activities)		
		Small e.g. area of <1000 m ² e.g. <10 houses	Medium e.g. area of 1000-15,000 m ² e.g. 10-150 houses	Large e.g. area of >15,000 m ² e.g. >150 houses
Approximate Duration of dust generating activities	Weeks	Low Potential	Low Potential	Medium Potential
	Months	Low Potential	Medium Potential	High Potential
	Years	Medium Potential	High Potential	High Potential

3.3 Dust-Sensitive Receptors

Table 2 lists types of receptors typically affected by dust from construction sites and their relative sensitivity (ODPM, 2005).

Table 2: Defining Receptor Sensitivity to Dust

Low Sensitivity	Medium Sensitivity	High Sensitivity
Farms Light and heavy industry Outdoor storage	<i>Schools*</i> <i>Residential properties*</i> Food retailers Greenhouses and nurseries Horticultural land Offices	<i>Hospitals and clinics*</i> <i>Retirement homes*</i> Hi-tech industries Painting and furnishing Food processing

N.B. *Italicised* receptors are also sensitive to increased PM₁₀ concentrations in terms of health; although in this context the receptors should be considered to be of equal sensitivity (IAQM, 2009).

The proposed site is situated in a largely rural location; however there are still several sensitive receptors nearby. The receptors of most concern are the residential properties on Simonstone Lane, Tunstead Avenue and Burnley Road, although the closest are on Railway Terrace approximately 150 m to the east. According to Table 3 these receptors are considered to be of 'medium' sensitivity.

Low sensitivity receptors include the industrial units to the east of Simonstone Lane.

3.4 Significance

Based on the dust generating potential in Table 3 of the construction phase and the sensitivity of nearby receptors, the impacts can be considered to be of 'Moderate Significance'.

Table 3: Construction Phase Significance Criteria

		Receptor Sensitivity		
		Low	Medium	High
Dust and particulate generating potential	Low	Negligible	Minor Significance	Minor Significance
	Medium	Minor Significance	Minor Significance	Moderate Significance
	High	Minor Significance	Moderate Significance	Major Significance

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Table 4 is used to indicate the area within which significant impacts may be experienced, based on the potential of the scheme to generate dust. The table is derived from professional experience of many different types of projects, discussions with practitioners in the field and published reports (such as Association of British Ports, 2000). If no dust mitigation measures are applied then nuisance dust impacts may affect sensitive receptors up to approximately 500 m from construction activities

Table 4: Potential Distance for Significant Impacts from Construction Activities

		Maximum Potential Distance for Significant Impacts from Construction Activities		
		Nuisance Dust (e.g. soiling of property)	PM ₁₀ Concentrations (Health impacts)	Effects to Vegetation (e.g. horticultural land and farmland)
Dust and particulate generating potential	Low	Up to 100 m	Up to 25 m	Up to 25 m
	Medium	Up to 200 m	Up to 50 m	Up to 50 m
	High	Up to 500 m	Up to 100 m	Up to 100 m

3.5 Risk of Dust Impacts

During the construction phase the potential for the scheme to generate dust is high and the sensitivity of receptors is 'medium'; therefore it can be considered that there is a 'high' risk of dust impacts (Table 5).

Table 5: Determining Risk of Dust and Particulate Impact

		Receptor Sensitivity		
		Low	Medium	High
Dust and particulate generating potential	Low	Low Risk	Low Risk	Medium Risk
	Medium	Low Risk	Medium Risk	High Risk
	High	Medium Risk	High Risk	High Risk

3.6 Mitigation Measures

A number of mitigation measures can be adopted to reduce the production and/or dispersal of dust to lessen the nuisance and limit the human health impacts. Ideally dust should be controlled at the source as once airborne it is difficult to suppress.

Appropriate mitigation is discussed in the following guidance documents:

- BRE (2003a): Guidance on the Control of Dust from Construction and Demolition Activities;
- BRE (2003b): Controlling Particulates, Vapours and Noise Pollution from Construction Sites; and,
- London Councils (2006): The control of dust and emissions from construction and demolition: Best Practice Guidance.

Construction dust usually responds well to appropriate measures as long as a co-ordinated construction environmental management plan (or equivalent) is implemented. The Buildings Research Establishment's 'Guidance on the Control of Dust from Construction and Demolition Activities' covers dust issues, and should be followed.

Identifying potential dust generating activities and good site planning is essential to prevent unnecessary dust production and should be conducted prior to commencing work. Where appropriate, dust generating activities should be undertaken off-site, however, where this is not possible these activities should be located away from sensitive receptors.

According to the assessment criteria, the unmitigated works are considered to be high risk in terms of their potential dust impact. Appropriate mitigation measures, based on the London Councils Best Practice Guidance (GLC, 2006), are provided in Table 6.

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Mitigation should be implemented through a site-specific Construction Environmental Management Plan (CEMP), and the measures should be enforced and adhered to. It is anticipated that such procedures would be sufficient to reduce the dust-generating potential to 'Low'.

Table 6: Potential Site Operations and Possible Methods of Controlling Dust

Activity	Possible Dust Control Methods
Soil handling & excavation	- Seal and seed storage mound surfaces as soon as is practicable. - Protect surfaces from winds until disturbed areas are sealed and stable.
Overburden handling	- Protect exposed material from wind (by keeping material within voids or protecting them by topographical features). - Spray exposed surfaces of mounds regularly to maintain surface moisture unless mound surface has formed a crust after rainfall or is grassed. - Minimise handling.
Demolition Works	- Use hoarding especially in vulnerable areas.
Laying granular materials	- Use water sprays.
Loading/Unloading activities	- Reduce drop heights wherever practicable. - Protect activities from wind.
Minerals processing	- Varies depending on type of equipment used but generally complete enclosure is best with use of air extraction and filter equipment as appropriate. - Use water sprays.
Material storage	- Dampen material. - Protect from wind and store under cover. - Screen material to remove dusty fractions prior to external storage.
Transport by vehicle within and off-site	- Restrict vehicle speed. - Water unsurfaced roads and paved roads. - Wheel or body wash at an appropriate distance from site entrance. - Load and unload in areas protected from wind. - Minimise drop heights. - Sheet or cover loaded vehicles. - Use water sprays/spray curtains to moisten material. - Sweep/wash paved roads. - Use paved roads where practicable. - Demolition and construction vehicles conform to at least Euro III standards.

3.7 Residual Impacts

The unmitigated impacts of the construction phase are described as being of moderate adverse significance (Table 3). However, if mitigation is applied effectively, the dust generating potential should be reduced to low and the maximum potential distance for significant impacts to occur from construction activities will be reduced to approximately 100 m for nuisance dust and to 25 m for PM₁₀ health impacts and vegetation effects. Consequently, if these mitigation measures are effectively applied then no sensitive receptors will be impacted.

4 Assessment Methodology

4.1 Introduction

The operational phase assessment was undertaken using Breeze AERMOD Pro dispersion modelling system to predict pollutant concentrations due to three stack emission sources from the proposed foundry at Simonstone. PM₁₀ and NO₂ concentrations were predicted at selected sensitive receptors, both residential and designated ecological sites. In addition a qualitative odour assessment has also been undertaken.

4.2 Breeze AERMOD Pro

Breeze AERMOD Pro has been used to predict pollutant concentrations due to stack emissions. Breeze AERMOD is a dispersion modelling system that simulates essential atmospheric physical processes and provides refined concentration estimates over a wide range of meteorological conditions and modelling scenarios. AERMOD includes two data pre-processors for streamlining data input. AERMET, a meteorological pre-processor, computes boundary layer and other necessary parameters for use with AERMOD and accepts data from both on-site and off-site sources. AERMAP is a terrain pre-processor that simplifies the computation of receptor elevations and effective height scales for numerous types of digital data formats, including 7.5 minute digital elevation model (DEM) files and UK Ordnance Survey® digital elevation data (Trinity Consultants, 2008).

4.3 Emission Sources

There will be three stack emission sources from the proposed foundry:

- The rotary furnace, using afterburner abatement;
- The flash fire furnace using afterburner abatement; and
- Local Exhaust Ventilation (LEV) exhaust for the large melting pot (crucible), using bag-filter abatement.

PM₁₀ emissions are considered to represent the most significant emissions to air from this process and the existing works are subject to an emission limit defined by the local authority for PM₁₀, 50 mg/m³. The model was used to predict the annual mean concentration near the works, and also the 90.4th percentile in accordance with Box 6.3b of LAQM.TG(09) (Defra, 2009).

In addition to PM₁₀, it is considered that NO_x will represent a significant proportion of the emissions as it is a combustion product. In accordance with the Environment Agency H1 document for calculation of annual mean concentrations (EA, 2008) it has been assumed that 100% of the NO_x emitted will be converted to NO₂. The model was used to predict the annual mean and 99.8th percentile concentrations in accordance with Box 6.3a of LAQM.TG(09) (Defra, 2009).

Previous emission testing reports have also tested chromium concentrations from the melt pots. However, recorded concentrations were well below (~0.1 mg/m³) the local authority emissions limit (5 mg/m³). The ceramic filter was replaced by a new afterburner, which is considered to effectively improve abatement of Cr, and it was not tested in the latest emission testing undertaken in September 2010. For this reason chromium concentrations were not modelled in this assessment.

4.3.1 Emission Testing

Emission testing is undertaken to comply with the permit issued by the local authority under the Environmental Protection Act.

The most recent test was undertaken on 20 September 2010.

Table 7: Emission Test Results (September 2010)

Stack	Stack PM ₁₀ Concentration / mg/m ³
Rotary Furnace (Stack 21)	3.41
Flash Furnace (Stack 22)	17.16
Large Pot LEV Extraction (Stack 8)	9.30

The previous emission testing was undertaken in March 2008. Following this, concerns were raised regarding the efficiency of the ceramic particulate filter, as although the average concentrations measured were below the 50 mg/m³ emission limit, one of

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the two samples taken was slightly above the limit. There had also been a significant increase in measured concentrations since the previous testing undertaken in 2005. Since 2008 the ceramic filter has been replaced with an afterburner which, as the emission testing shows is much more effective, with concentrations now well below the current PM₁₀ emission limit.

4.3.2 Modelled Emission Factors

The emission rates and parameters applied to the model are provided in Table 8.

The PM₁₀ emission rates were derived from the emission testing results.

The NO_x emission rates were determined from typical gas consumption (gas is used to fuel the furnaces), using the Unit Conversion and Screening Tool (AEA, 2008) and emission factors published in the Emission Inventory Handbook (EMEP/CORINAR, 2006). The typical monthly fuel usage is approximately £3500, at an average cost of 0.034 £/kWh (Europe Energy Portal, October 2010). The gas usage also includes the fuel used for heating and hot water, although the furnaces (including the afterburners) are clearly the most significant uses on the site.

Table 8: Model Emission Parameters

Parameter	Source		
	Rotary Furnace	Flash Fire Furnace	LEV Exhaust
Operating times	07:30-17:30 and 22:00-07:30 Monday to Thursday		
Fuel	Gas	Gas	NA
NO _x Emission Rate / g/s	0.0172	0.0172	NA
PM ₁₀ Emission Rate / g/s	0.0011	0.0214	0.0210

4.4 Building and Stack Parameters

The dispersion of the pollutants will be affected by various stack parameters and the dimensions of nearby buildings within a distance equivalent to five stack heights (D1 Chimney Height Calculations, 1993). These include the current Fort Vale industrial units adjacent to the proposed foundry. A new building that is currently at early planning stages, directly to the east of the proposed foundry building, and north of the existing buildings has not been included within the model.

The modelled parameters of the proposed stacks are provided in Table 9, and building details in Table 10.

Table 9: Stack Parameters

Parameter	Rotary Furnace	Flash Fire Furnace	LEV Exhaust
Stack Location / OS Grid Coordinates	377224, 433479	377226, 433486	377249, 433475
Release Height (above ground level) (m)	11.35	11.35	11.35
Stack temperature (°C)	60	680	26
Flue Diameter (m)	0.46	0.46	0.55
Flue Gas Emission Rate (m ³ /s)	0.70	1.25	2.26

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Table 10: Building and Feature Parameters

Building Description	Height [m]	Width [m]	Length [m]
Existing Calder Vale Factory	9.85	60.5	146.9
Time Technology Park 1	9.85	165.0	134.6
Time Technology Park 2	9.85	30.8	66.5
Railway Terraces	9.00	7.4	51.7
Proposed Foundry	9.85	50.0	65.0
Existing Calder Vale Offices	9.85	57.9	14.8

4.5 Modelled Area

Ground-level pollutant concentrations have been predicted over an area of 250 m by 250 m, with a grid resolution of 10 metres, covering the development site and adjacent buildings, including all areas where a potentially significant impact may be attributed to the proposed facility.

According to H1 Guidance, ecological receptors within 2 km need to be considered. Therefore concentrations have been predicted at five sensitive receptor locations, which are considered to represent relevant exposure, according to the criteria defined in LAQM.TG(09) (Defra, 2009a).

Digital elevation data with a resolution of 50 m was used to create a Digital Terrain Model (DTM), which was used to determine the relative elevation of the sources, receptors and buildings.

4.6 Sensitive Receptors

Air quality receptors susceptible to changes in air quality typically include residential properties, schools, care homes, hospitals, designated ecological sites such as SSSI (Sites of Special Scientific Interest).

The receptors of most concern are the residential properties located on Railway Terrace, Simonstone Lane and Burnley Road. The closest property is situated on Railway Terrace, approximately 150 m to the east.

The residential receptors with potential to experience an impact from the scheme are shown in Table 11 and shown in the map in Appendix A.

Table 11: Modelled Residential Receptor Locations

ID	Location	OS Grid Reference	
1	Railway Terrace	377469	433515
2	Simonstone Lane	377429	433661
3	Burnley Road (east)	377446	433187
4	Burnley Road (west)	377339	432970
5	Calderbank	376828	433146

A number of sensitive ecological sites have been identified near the proposed development and within, or slightly beyond, the 2 km assessment distance defined by the H1 methodology (EA, 2010). These are provided in Table 12. The grid-coordinate location provided are considered to be representative of the closest point to the proposed works.

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Table 12: Ecological Sites

Type	Location	Approximate Distance from Site*	X	Y
BAP Priority Habitat	Wind Engine Clough (Wet Woodland)	1.2 km	376073	432880
	Shorten Wood (Wet Woodland)	1.0 km	377758	432594
	Shuttleworth Wood (Wet Woodland)	1.7 km	378847	432630
Areas of Outstanding Natural Beauty	Forest of Bowland	2.1 km	376062	435300

*Distances provided are the closest point

4.7 Meteorological Data

The meteorological data applied to the model were derived from Bingley Met station, which is approximately 32 km to the east of the proposed site. This site is considered to be representative of regional meteorological conditions and sufficient to satisfy the requirements of this assessment. Where there was missing wind and cloud data, data was obtained from Emley Moor, south of Bradford.

Five years of data, 2005 to 2009, were individually applied to the assessment to determine the average annual mean pollutant concentration for each of the five years. The year for which the highest concentrations were predicted are presented to represent a worse-case scenario.

The wind rose generated from these data, shown in Appendix B, indicate that wind speed and direction has remained relatively consistent over the past five years, with the prevailing wind for the region from the west and south west. Therefore it is considered that there is a greater likelihood of receptors to the east and north east of the development site experiencing an impact.

4.8 Determining Impact Significance

Air quality impacts of a proposed scheme may be considered to be significant if air quality objectives are predicted to be breached or if the development leads to significant impacts on air quality at sensitive receptors. According to Environmental Protection UK (EPUK, 2010) there are two main aspects which need to be taken into account when describing predicted impacts. These are:

- the magnitude of the change; and
- the absolute concentration in relation to air quality objectives.

The first aspect is addressed in Table 13, in which impacts are assigned a magnitude according to the absolute change in pollutant concentrations, derived based upon the predicted change in pollutant concentrations relative to the specific air quality objective or limit value in question.

Table 13: Assessment of the Magnitude of Change

Magnitude of Change	Change in Annual Mean Concentration
Large	Increase / decrease >4 µg/m ³
Medium	Increase / decrease 2-4 µg/m ³
Small	Increase / decrease 0.4-2 µg/m ³
Imperceptible	Increase / decrease <0.4 µg/m ³

The magnitude of change can then be compared to the absolute concentration in relation to the relevant air quality standard in order to describe predicted air quality impacts as detailed in Table 14.

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Table 14: Air Quality Impact Descriptors

Absolute Concentration in Relation to Standard	Magnitude of Impact		
	Small	Medium	Large
Above Objective/Limit Value With Scheme ($40 \mu\text{g}/\text{m}^3$ for NO_2 and PM_{10})	Minor Adverse / Beneficial	Moderate Adverse / Beneficial	Major Adverse / Beneficial
Just Below Objective/Limit Value With Scheme ($36\text{--}40 \mu\text{g}/\text{m}^3$ for NO_2 and PM_{10})	Minor Adverse / Beneficial	Moderate Adverse / Beneficial	Moderate Adverse / Beneficial
Below Objective/Limit Value With Scheme ($30\text{--}36 \mu\text{g}/\text{m}^3$ for NO_2 and PM_{10})	Negligible	Minor Adverse / Beneficial	Minor Adverse / Beneficial
Well Below Objective/Limit Value With Scheme ($<30 \mu\text{g}/\text{m}^3$ for NO_2 and PM_{10})	Negligible	Negligible	Minor Adverse / Beneficial

EPUK Guidance (EPUK, 2010) suggests that the following factors should be taken into account when determining the overall significance of predicted air quality impacts:

- the magnitudes of the changes and the descriptions of the impacts at the receptors;
- the number of people affected by increases and/or decreases in concentrations and a judgement on the overall balance;
- where new exposure is being introduced into an existing area of poor air quality, then the number of people exposed to levels above the objective or limit value will be relevant;
- whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased;
- whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced;
- uncertainty, including the extent to which worst-case assumptions have been made; and
- the extent to which an objective or limit value is exceeded, e.g. an annual mean NO_2 of $41 \mu\text{g}/\text{m}^3$ should attract less significance than an annual mean of $51 \mu\text{g}/\text{m}^3$.

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5 Baseline Conditions

5.1 Local Air Quality Management

Ribble Valley Borough Council (RVBC) undertake Local Air Quality Management (LAQM) duties in the area.

The 2006 Updating and Screening Assessment reported exceedences of the NO₂ air quality objective in Clitheroe, approximately 8.5 km to the north of the proposed site. Anticipated improvements were not observed and therefore following the 2009 USA an Air Quality Management Area (AQMA) was declared (RVBC, 2010).

There is no AQMA or other locations of elevated pollutant concentrations near the proposed works identified by RVBC.

5.2 Local Air Quality Monitoring

Ribble Valley Borough Council undertakes monitoring using NO₂ diffusion tubes in Clitheroe, where exceedences of the annual mean objective have been recorded (RVBC, 2010).

No air quality monitoring is undertaken in the vicinity of the proposed site and due to its rural location pollutant concentrations are likely to be low.

5.3 Modelled Background Concentrations

Modelled estimates of annual mean background pollutant concentrations have been obtained from the UK National Air Quality Information Archive (Defra, 2010) for the 1 km square at the proposed development site (centred at 377500, 433500).

The data provided in Table 15 account for all existing local sources. These data were downloaded in September 2010.

The background pollutant concentrations are clearly well below the annual mean objectives. The modelled concentrations are also predicted to decrease in future, due to improvements in emission regulations and other regional or national programmes.

Table 15: Annual Mean Modelled Background Pollutant Concentrations, µg/m³

Pollutant	2009	2011	2012
NO _x	18.6	16.5	15.7
NO ₂	13.9	12.4	11.9
PM ₁₀	14.1	13.5	13.4

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6 Assessment Results

6.1 Stack Emissions

Annual and short-term concentrations of PM₁₀ and NO₂ were predicted at the nearest residential properties and designated ecological sites, identified above as sensitive receptor locations. The model considers five consecutive years of meteorological data to determine the conditions that would result in the greatest impact.

The annual mean concentrations are also presented as plotted results in Appendix C.

According to Table 16, the largest annual mean impacts are predicted to occur at Receptor 1 (Railway Terrace) for the meteorological year 2007, where a maximum PM₁₀ impact of 0.4 µg/m³ was predicted to occur. This is categorised as a 'small' magnitude change.

The predicted annual mean concentration was well below the objective (<30 µg/m³) and so the maximum predicted impact can be described as 'negligible'.

The largest annual mean ground-level contribution of NO₂ (Table 17) was predicted to be 0.2 g/m³ at Receptor 1, and the total annual mean concentration was well below the objective. Therefore, this impact was predicted to be imperceptible in magnitude and can be described as negligible.

Table 16: Predicted PM₁₀ Annual Mean Concentrations

ID	Annual Mean / µg/m ³									
	Process Contribution					Total (Process Plus Background)				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
1	0.3	0.3	0.4	0.4	0.4	13.7	13.7	13.8	13.8	13.8
2	0.2	0.2	0.2	0.2	0.3	13.6	13.6	13.7	13.7	13.7
3	0.1	0.1	0.1	0.1	0.1	13.5	13.5	13.5	13.5	13.5
4	0.0	0.0	0.0	0.0	0.0	13.4	13.4	13.4	13.4	13.4
5	0.0	0.0	0.0	0.0	0.0	13.4	13.4	13.4	13.4	13.4
6	0.0	0.0	0.0	0.0	0.0	13.4	13.4	13.4	13.4	13.4
7	0.0	0.0	0.0	0.0	0.0	13.4	13.4	13.4	13.4	13.4
8	0.0	0.0	0.0	0.0	0.0	13.4	13.4	13.4	13.4	13.4
9	0.0	0.0	0.0	0.0	0.0	13.4	13.4	13.4	13.4	13.4

Note: Annual mean impacts of 1% of the annual mean standard or greater highlighted in bold

Table 17: Predicted NO₂ Annual Mean Concentrations

ID	Annual Mean / µg/m ³									
	Process Contribution					Total (Process Plus Background)				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
1	0.1	0.1	0.2	0.2	0.1	12.0	12.0	12.1	12.0	12.0
2	0.1	0.1	0.1	0.1	0.1	12.0	12.0	12.0	12.0	12.0
3	0.0	0.0	0.0	0.0	0.0	11.9	11.9	11.9	11.9	11.9
4	0.0	0.0	0.0	0.0	0.0	11.9	11.9	11.9	11.9	11.9
5	0.0	0.0	0.0	0.0	0.0	11.9	11.9	11.9	11.9	11.9
6	0.0	0.0	0.0	0.0	0.0	11.9	11.9	11.9	11.9	11.9
7	0.0	0.0	0.0	0.0	0.0	11.9	11.9	11.9	11.9	11.9
8	0.0	0.0	0.0	0.0	0.0	11.9	11.9	11.9	11.9	11.9
9	0.0	0.0	0.0	0.0	0.0	11.9	11.9	11.9	11.9	11.9

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The short-term hourly NO₂ and daily PM₁₀ concentrations are presented as percentile values in accordance with the guidance and methodology defined in Box 6.3a and 6.3b of LAQM.TG(09) (Defra, 2009). The predicted concentrations were well within the permitted limit values and it is therefore considered very unlikely that a short-term exceedence will occur due to either pollutant.

Table 18: Predicted PM₁₀ 90.4% percentile Concentrations

ID	90.4 percentile Concentration / $\mu\text{g}/\text{m}^3$				
	2005	2006	2007	2008	2009
1	14.1	14.3	14.4	14.3	14.2
2	13.9	14.0	14.1	14.1	14.1
3	13.7	13.6	13.7	13.6	13.6
4	13.5	13.5	13.5	13.5	13.5
5	13.5	13.5	13.5	13.5	13.5
6	13.4	13.4	13.4	13.4	13.4
7	13.4	13.4	13.4	13.4	13.4
8	13.4	13.4	13.4	13.4	13.4
9	13.4	13.4	13.4	13.4	13.5

Table 19: Predicted NO₂ 90.4% percentile Concentrations

ID	1-hour 99.8% percentile concentration / $\mu\text{g}/\text{m}^3$				
	2005	2006	2007	2008	2009
1	29.6	28.9	28.8	30.3	30.6
2	27.4	28.0	28.5	28.2	27.5
3	26.0	26.0	25.7	25.6	25.8
4	24.4	25.0	24.5	24.3	24.2
5	24.6	25.1	25.1	24.6	24.9
6	23.8	23.8	23.8	23.9	23.8
7	23.9	24.0	24.1	23.9	24.1
8	24.1	24.1	24.1	24.0	24.0
9	24.1	24.0	24.1	24.0	24.1

It is also considered that the proposed site for the foundry is better than the existing site, with the new impacts anticipated to be lower. This is due to the rural location of the new site, with fewer sensitive receptors, located further from the emission sources.

6.2 Odour

During the site visit at the existing foundry at the Nelson site, two odour sources were recognised outside of the building due to local extraction ventilation:

- 'Burning metal' smell, from the metal cutting and finishing; and
- 'Chemical/solvent' smell from the wax preparation and moulding room.

Both sources were highly localised, with no impact beyond the site boundary. Therefore, it is not considered necessary to assess this impact further.

No odours were identified due to emissions from the furnace chimneys.

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6.3 Mitigation Measures

The abatement techniques currently in use at the existing site are:

- Furnaces are fitted with afterburners;
- The local extraction ventilation from the metal cutting and finishing uses a wet-scrubber, as this is a hot-process; and
- The extraction hoods from the crucibles and other local extraction ventilation uses a bag-filter unit.

As the significance of the impacts is negligible no further mitigation measures are proposed.

7 Summary and Conclusion

A detailed modelling assessment was undertaken to determine the potential local air quality impacts due to a proposed metal foundry process at the Fort Vale site at Simonstone. The plant and equipment is currently in operation at their site in Nelson, and will be relocated to the Simonstone works in preference to the purchase or construction of new equipment.

7.1 Summary

The assessment can be summarised as follows:

- A construction phase assessment was undertaken;
- Concentrations of the main pollutants of concern, PM₁₀ and NO₂, were predicted at sensitive receptors near the works;
- The model considered the local topography, buildings, and five years of meteorological conditions;
- Annual mean and short-term impacts were predicted.

7.2 Conclusions

7.2.1 Construction Phase

A qualitative assessment was performed to determine the potential impacts due to the production of dust and PM₁₀ during construction activity and emissions from construction vehicles.

If the recommended mitigation measures are adopted, the distance over which the impacts of the construction phase will be felt, should be reduced significantly to within 100 m, and the degree of impact will be similarly reduced to acceptable levels.

7.2.2 Operational Phase Assessment

The main conclusions of the assessment are:

- Annual mean concentrations of NO₂ and PM₁₀ will remain well below the UK objective either with, or without, the proposed development going ahead;
- The change in concentration of PM₁₀ at the nearest residential property was considered to be 'small', and the overall impact described as 'negligible';
- The change in concentration of NO₂ at the nearest residential properties was considered to be 'imperceptible';
- The qualitative odour assessment indicated that two sources of odour are present. Both are highly localised, with no impact beyond the site boundary;
- The impacts at the proposed site are anticipated to be less than at the existing site due to its rural location with fewer sensitive receptors, located further from the emission sources;
- Beneficial impacts are anticipated near the existing site in Nelson if the foundry is relocated to Simonstone.

Capabilities on project:
Environment

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Capabilities on project:
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Appendices

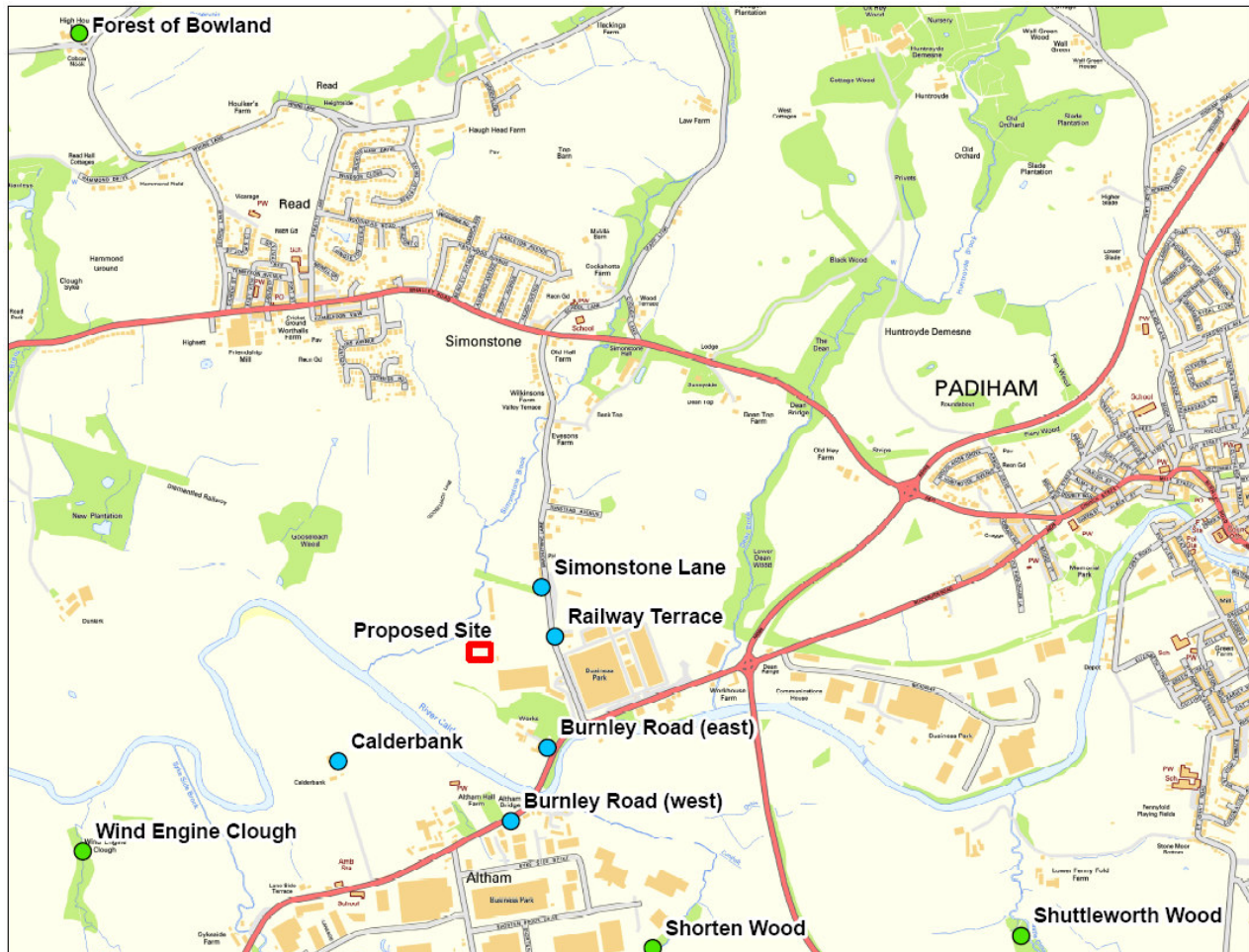
Appendix A: Sensitive Receptor Locations

Figure 1: Location of Sensitive Receptors

Blue = residential properties

Green= ecological

Proposed works shown as red box



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Appendix B: Meteorological Data Bingley 2005-2009

Figure 2: Windrose, Bingley, 2005

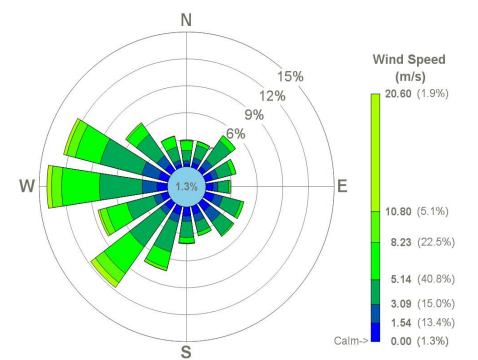


Figure 5: Windrose, Bingley, 2008

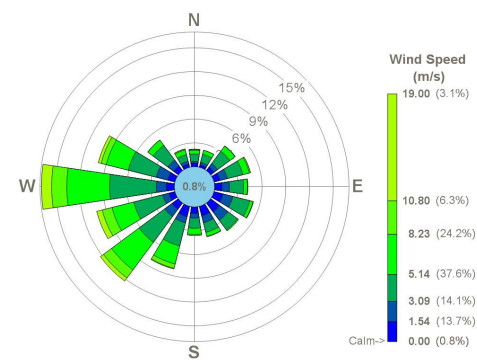


Figure 3: Windrose, Bingley, 2007

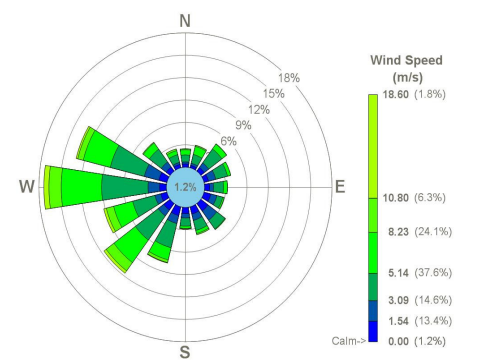


Figure 6: Windrose, Bingley, 2009

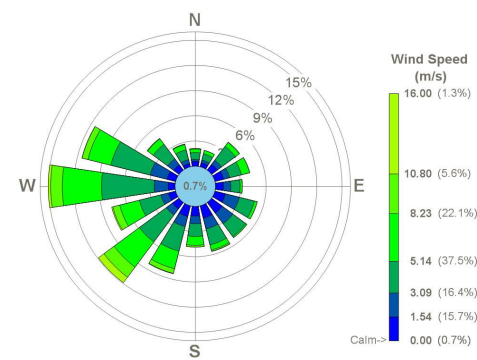
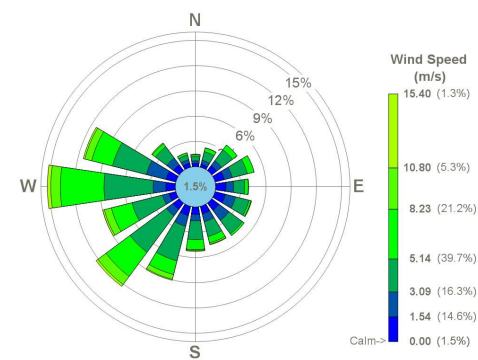


Figure 4: Windrose, Bingley, 2006

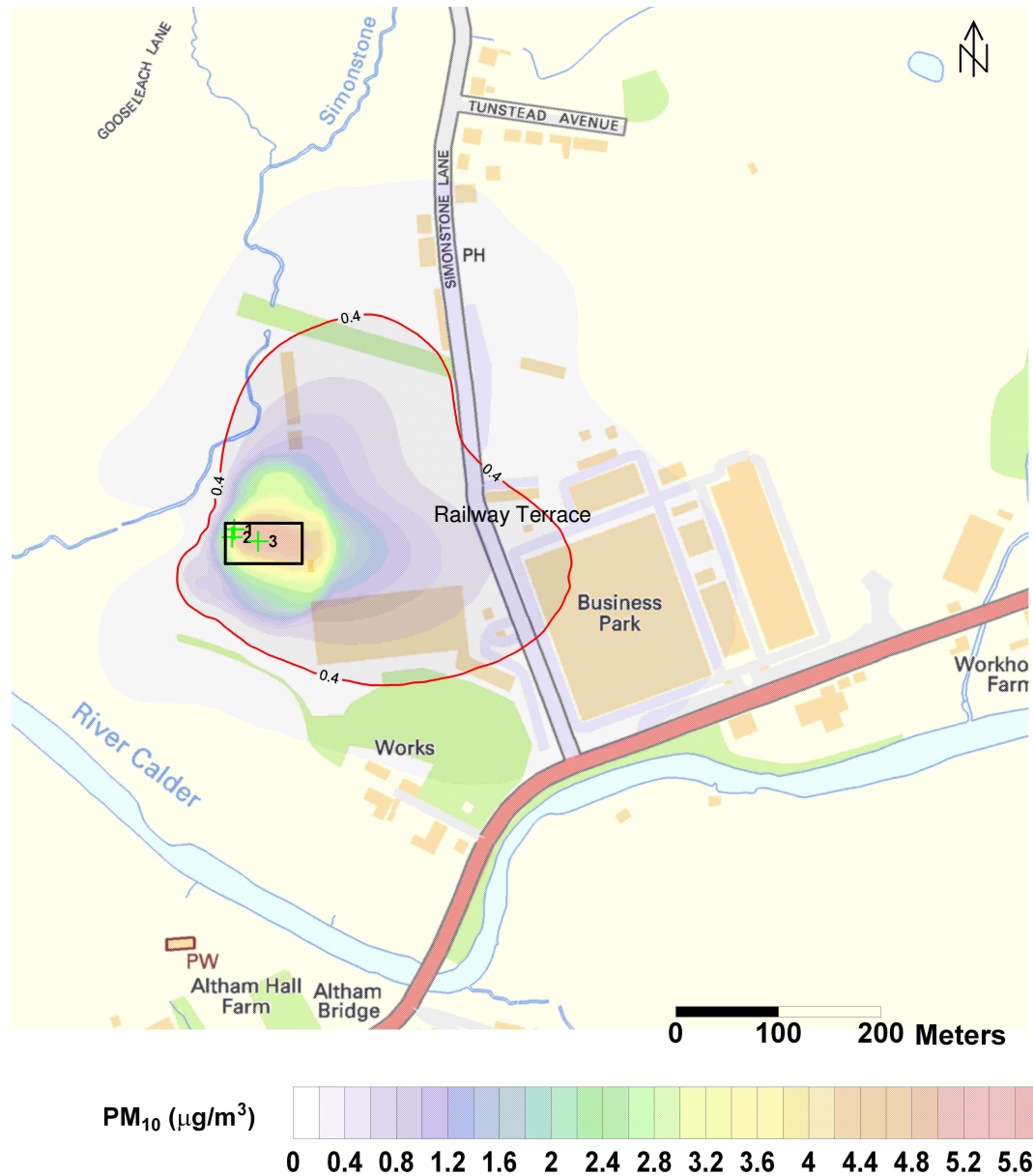


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Appendix C: Predicted Pollutant Concentrations

Figure 7: Annual Mean PM₁₀, Meteorological Year 2007

NB The red line defines the area where concentrations exceed 0.4 µg/m³. The proposed location of the foundry and stacks is also shown (1 – Flash fire Furnace 2 – Rotary Furnace 3 – Large Melt Pot)



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Figure 8: Annual Mean NO₂, Meteorological Year 2007

NB The red line defines the area where concentrations exceed 0.4 µg/m³. The proposed location of the foundry and stacks is also shown (1 – Flash fire Furnace 2 – Rotary Furnace 3 – Large Melt Pot)



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