Airbus Operations Ltd

934692-RPT-2

AQIA for PM_{10} emissions from stack sources A184, A185 and A186

January 2018

Executive summary

This report is subject to, and must be read in conjunction with, the limitations set out in section 1.3 and the assumptions and qualifications contained throughout the Report.

The purpose of this report is to deliver an air quality impact assessment (AQIA) for emissions of particulate matter, in the form of PM_{10}, from two existing and one proposed release point located on the Airbus Operations Ltd (Airbus) installation near Broughton. The installation is permitted to operate under the terms of an environmental permit issued under the Environmental Permitting (England & Wales) Regulations 2016 (EPR) (permit reference EPR/BM3965IA) and regulated by Natural Resources Wales (NRW).

The two existing release points (references A184 and A185) serve the preparation and combo booths installed in 2016 within the existing Final Single Aisle Wing Painting Facility (site building number 160, "Final Single Aisle Paintshop") which were the subject of the previous EPR permit variation application. The new release point (reference A186) is for a new new detail paint booth within the same building.

This report supports the current variation application for installation of the new detail paint booth and also supports delivery of the AQIA aspects of improvement condition 5 of the current EPR permit.

This AQIA has been performed in keeping with the Environment Agency/NRW and Local Authority guidance on performance of air emissions risk assessment and includes dispersion modelling and impact assessment for emissions of particulate matter, in the form of PM_{10}, from the three booth stack sources.

Air dispersion modelling was performed using the US EPA AERMOD software version 16216 modelling emissions for two scenarios:

- Scenario 1 – 'worst normal' operational case with all stack emissions at worst possible emission levels and mass emission rates for normal operations
- Scenario 2 – typical operating conditions with stack emissions at typical or anticipated emission levels and mass emission rates for normal operations.

The two scenarios modelled capture the needs of the variation application, which requires the 'worst normal' operating case, and the NRW improvement condition which requires modelling of actual operational release levels.

Air dispersion modelling was performed using 5 years of appropriate meteorological data (2012-2016). The predicted maximum process contributions (PCs) and predicted environmental concentrations (PECs) for PM_{10} were identified for sensitive human health in the vicinity of the installation and assessed with respect impact on air quality i.e. the risk of exceeding relevant long-term and short-term air quality objectives (AQOs).

The maximum PCs for all human health receptors over all five years modelled for the worst normal operating case (Scenario 1) was for the Bretton Lane houses (Chester Road) CH4 0DX (D9) human health receptor close to the site boundary. For this scenario:

- The maximum annual average PC of 2.60 $\mu g/m^3$ and the 90.4th percentile of the 24 hour means over a year PC of 8.10 $\mu g/m^3$ represent 6.50 % and 16.20 % of the relevant long and short-term AQO values respectively.
- Taking into account the background PM_{10} levels, these maximum PC values do not risk exceeding relevant long or short-term AQOs as:

- the long-term PEC is 38.50 % of the AQO
- the short-term PEC is 41.80 % of the AQO
- the short-term PC is 21.77 % of the short-term headroom for the AQO.

- The maximum short-term PC modelled for all receptors across all meteorological data years of 8.10 µg/m^3 is 21.77 % of the short-term headroom and exceeds the stage 2 screening threshold value of 20%. This maximum PC represents the worst normal operational case with all PM_{10} emissions from the three booths at worst possible emissions levels and rates and is an unlikely scenario to occur. This maximum PC modelled at a human health receptor does not threaten an exceedance of the short-term AQO of 50 µg/m^3 and, given that this is an unlikely to occur, it is considered that no further assessment is required.

The maximum PCs for all human health receptors over all five years modelled for the typical normal operating case (Scenario 2) was for the Bretton Lane houses (Chester Road) CH4 0DX (D9) human health receptor close to the site boundary. For this scenario:

- The maximum annual average PC of 0.02 µg/m^3 and the 90.4th percentile of the 24 hour means over a year PC of 0.07 µg/m^3 represent 0.05 % and 0.14 % of the relevant long and short-term AQO values respectively.
- Taking into account the background PM_{10} levels, these maximum PC values do not risk exceeding relevant long or short-term AQOs as:
  - the long-term PEC is 32.05 % of the AQO
  - the short-term PEC is 25.74 % of the AQO
  - the short-term PC is 0.19 % of the short-term headroom for the AQO.

The air dispersion modelling and AQIA demonstrates that emissions of PM_{10} from the two existing booths installed in 2016 and the proposed new detail paint booth do not risk exceeding of relevant long or short-term AQOs for human health in the vicinity of the installation.

The modelling also demonstrates that the release of emissions from the proposed new booth (emission reference A186) at the design stack exit velocity of 8.22 m/s does not risk exceeding AQOs for PM_{10}.

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Glossary of abbreviations and acronyms

AAD	Ambient Air Directive
AQIA	Air Quality Impact Assessment
AQMA	Air Quality Management Area
AQOs	Air Quality Objectives
DEFRA	Department for Environment, Food and Rural Affairs
ELV	Emission Limit Value
FCC	Flintshire County Council
LAQM	Local Air Quality Management
AQMA	Air Quality Management Area
OS	Ordinance Survey
PEC	Predicted Environmental Concentration
PC	Process Contribution
PM	Particulate matter
PM_{10}	Particulates with an aerodynamic diameter of less than 10 µm
NRW	Natural Resources Wales

1. Introduction

1.1 Overview

This report delivers an air quality impact assessment (AQIA) for emissions of particulate matter from two existing and one proposed release point located on the Airbus Operations Ltd (Airbus) installation near Broughton. The installation is permitted to operate under the terms of an environmental permit issued under the Environmental Permitting (England & Wales) Regulations 2016 (EPR) (permit reference EPR/BM3965IA) and regulated by Natural Resources Wales (NRW).

The two existing release points (references A184 and A185) serve the preparation and combo booths installed in 2016 within the existing Final Single Aisle Wing Painting Facility (site building number 160, “Final Single Aisle Paintshop”) which were the subject of the previous EPR permit variation application. The new release point (reference A186) is for a new new detail paint booth within the same building.

This report supports the current variation application for installation of the new detail paint booth and also supports delivery of the AQIA aspects of improvement condition 5 of the current EPR permit, i.e. :

> ‘The Operator shall sample and analyse emissions from release points A184 and A185 for Particulate Matter in the form of PM_{10}, when the preparation and combo booths serving these emission points are operational. The sampling and analysis exercise shall be designed to ensure that a representative sample is obtained and shall be conducted in accordance with the requirements of the Natural Resources Wales guidance document M1 “Sampling Requirements for Stack Emission monitoring” and BS EN 13284-1.
>
> The analysis results shall be converted into long and short term process contributions (PC) using detailed air dispersion modelling software. The detailed air dispersion modelling shall show the PCs as a percentage of both the 40 µg/m^3 annual mean UK air quality objective and the 50 µg/m^3 24-hour mean UK air quality objective for Particulate Matter. In addition, the calculated PCs shall be added to the existing long and short term backgrounds for particulate matter to derive the Predicted Environmental Concentration (PEC) at all nearby human sensitive receptors and as a maximum on the modelling grid. The air dispersion modelling shall also show the PECs as a percentage of the long and short term air quality objectives for particulate matter in order to demonstrate the likelihood of exceedance of either as result of the operation of the new booths.’
>
> The results of the sampling and analysis exercise and air dispersion modelling study and conclusions shall be submitted in the form of a written report to Natural Resources Wales.’

Airbus commissioned Gutteridge Haskins & Davey Ltd (GHD) to deliver the air dispersion modelling and air quality impact assessment (AQIA) for the previously installed booths and the proposed new detail paint booth.

This AQIA has been performed in keeping with the Environment Agency/NRW and Local Authority guidance on performance of air emissions risk assessment and includes dispersion modelling and impact assessment for emissions of particulate matter, in the form of PM_{10}, from the three booth stack sources.

1.2 Purpose of this report

The purpose of this report is to deliver an air quality impact assessment (AQIA) for emissions of particulate matter from two existing and one proposed release point located on the Airbus installation near Broughton. The proposed installation of the new detail paint booth is the subject of the associated 2017 environmental permit variation application report.

1.3 Scope and limitations

This report supports the environmental permit variation application to be submitted by Airbus to NRW in late 2017 and also delivers the air dispersion modelling and AQIA aspects of improvement condition 5 of the current EPR permit.

GHD were commissioned by Airbus to deliver the following scope of work:

- Perform air dispersion modelling emissions of particulate matter, in the form of PM_{10}, from the three booth stack sources.
- Perform an AQIA for the emissions of PM_{10} from the three booth stack sources.

The following approach was taken to delivery of this project:

- Information gathering, model scope and scenario detail confirmation
    - GHD liaised with Airbus to gather information and agree the model scope and scenarios to be modelled.
    - GHD agreed with Airbus to model two scenarios at the following PM_{10} emission concentrations:
        - Scenario 1 – 'worst normal' operational case with all stack emissions at worst possible emission levels and mass emission rates for normal operations: PM_{10} emission levels for all stacks at 50 mg/Nm^3
        - Scenario 2 – typical operating conditions with stack emissions at typical or anticipated emission levels and mass emission rates for normal operations:
            - A184 – zero emissions
            - A185 – PM_{10} emission concentration at the maximum value calculated from the previously monitored levels i.e. 0.61 mg/Nm^3
            - A186 – projected PM_{10} emission concentration equivalent to A185 on assumption it could be anticipated concentration would be no higher than for A185
    - The two scenarios modelled capture the needs of the variation application, which requires the 'worst normal' operating case, and the NRW improvement condition which requires modelling of actual operational release levels.
- Dispersion model development and scenario modelling
    - GHD identified sensitive human health receptors in the vicinity of the installation for inclusion in the assessment.
    - GHD collated, checked and prepared the air dispersion model input data in suitable format for PM_{10} modelling and managed the dispersion model build.

- Modelling was performed by ADM Ltd who have delivered numerous air dispersion models for GHD for UK based clients.
- Air dispersion modelling was performed using the US EPA AERMOD software version 16216 modelling emissions at worst normal and typical operating conditions for 5 years of appropriate meteorological data (2012-2016) and appropriate terrain data.
- The predicted maximum process contributions (PCs) for PM_{10} were identified for sensitive human health in the vicinity of the installation.
- The air dispersion modelling input and output files are available for review on request. A summary of the output, including contour plots for maximum predicted ground level concentrations of PM_{10} at sensitive receptors, has been included in the body of this report.

- AQIA
  - GHD collated and reviewed air quality data to determine the relevant background PM_{10} levels to apply in performance of an AQIA.
  - GHD reviewed the model output and performed an impact assessment of the maximum predicted PCs and, where appropriate, the Predicted Environmental Concentrations (PECs), with respect to relevant European Union (EU) Ambient Air Directive (AAD) air quality objectives (AQOs) for the protection of human health.

This report has been prepared by GHD for Airbus and may only be used and relied on by Airbus for the purpose agreed between GHD and Airbus as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Airbus arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (in particular in section 1.4 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Airbus and others (including the UK Government authorities web based air quality data), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.4 Assumptions

It has been assumed by GHD that all information provided by Airbus is accurate.

2. Background

2.1 Modelled scenarios

The two scenarios modelled are described in section 1.3 of this report and capture the needs of the variation application, which requires the 'worst normal' operating case, and the NRW improvement condition which requires modelling of actual operational release levels.

The PM_{10} emission concentrations, volumetric release rates and emission velocities modelled for each scenario were agreed with Airbus and represent projected worst case and typical normal release levels and mass release rates for the three stack sources.

The existing and new booths have been designed to meet the the emission limit for particulate matter of 50 mg/Nm^3 (as a 15 minute mean) as stipulated in the relevant statutory guidance (PG 6/40(11)). The worst normal operating case is therefore that all three booths emit PM_{10} at this level.

Under normal operations however the PM_{10} emissions are/are projected to be considerable lower i.e.:

- A184 – typical normal operations zero release of PM_{10} is anticipated. There are no painting operations in A184 and the abrading operations have 'tool tip' extraction by way of a dedicated Minden dust extract unit. The stack is for general booth ventilation and Airbus assume no PM_{10} presence.
- A185 – typical normal operations very low emissions of PM_{10} have been monitored i.e. 0.61 mg/Nm^3. Monitoring results for this stack source were provided by Airbus, and are taken from the report by Environmental Compliance Limited dated 15th July 2016 which reported stack monitoring results during painting operations in this booth in June of 2016.
- A186 – typical normal operations for this proposed detail paint booth are anticipated to have very low PM_{10} emissions in keeping with those observed for A185 i.e. 0.61 mg/Nm^3.

Operating hours included in the model for both scenarios assume the stack sources are emitting continuously 24 hour a day, 7 days a week throughout the year. This overestimates PM_{10} releases as it does not take into account non-operational periods and plant shut downs.

2.2 Site location

The Airbus site is located within the boundary of the Hawarden airfield to the north of the village of Broughton, Flintshire, Wales (SJ 35127 64568) (Figure 4.1). Sandycroft town centre is located 1.5 km to the northwest, and the outskirts of Saltney are approximately 0.5 km east. The nearest residential dwellings are located adjacent to the southwest side of the site within 50 m of the site boundary on the opposite side of Chester Road (A5104). Land uses in the wider area are industrial, retail, residential and agricultural. The permitted boundary of the installation is given in the current permit, i.e. reference number EPR/BM3965IA.

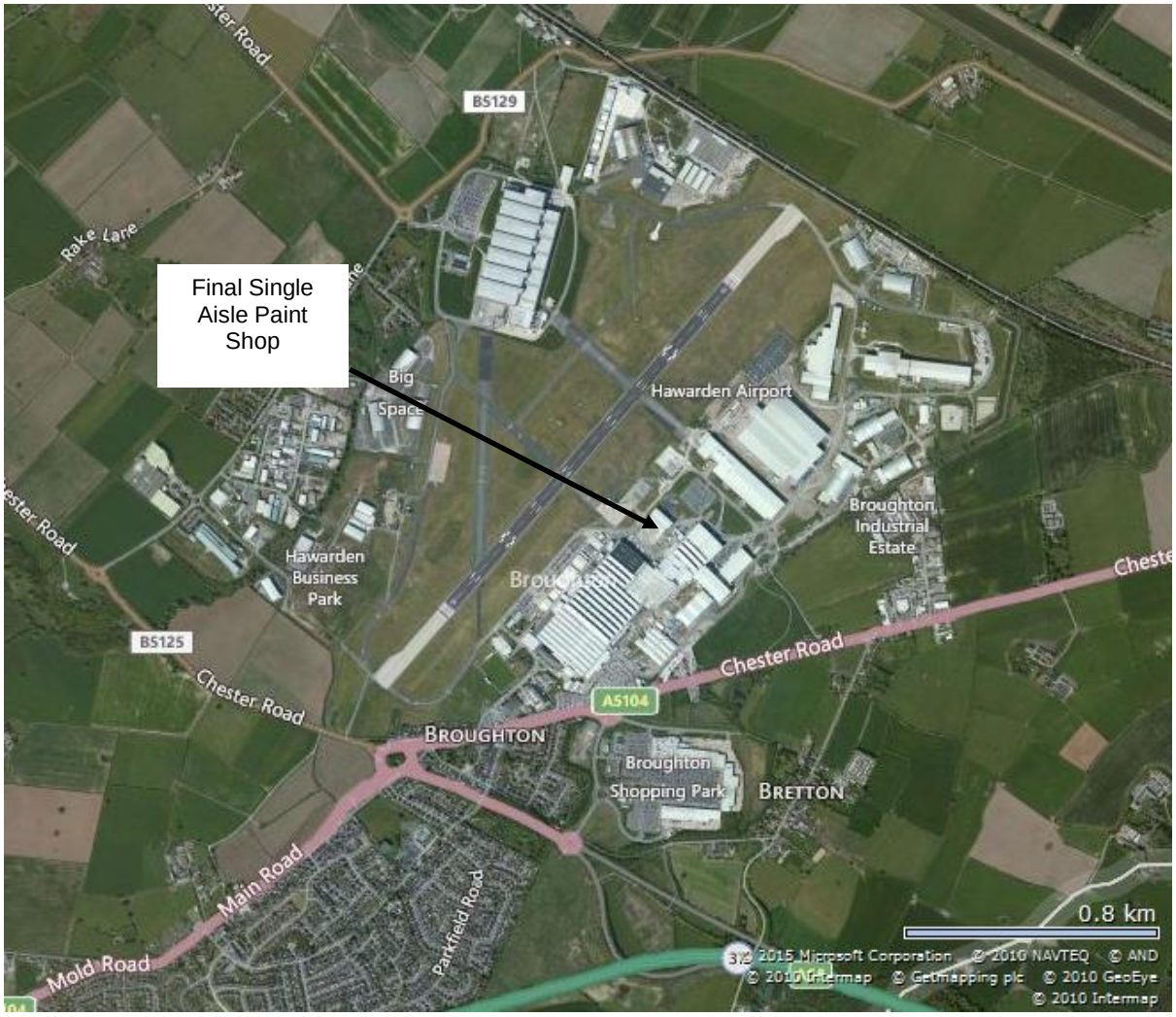


Figure 2.1 Location of site and Final Single Aisle Paint Shop building housing the existing and proposed new booths

2.3 Pollutants, air quality guidelines and other assessment criteria

2.3.1 Pollutants

The processes operated within the two existing booths and one proposed new detail paint booth involve use of solvents in the paint booths linked to stacks A185 and proposed stack A186 and preparation activities, involving abrasion of surfaces, in the preparation booth linked to stack A184. The paint and abrasion activities are managed to prevent or minimise release of particulate matter at source within the booths and the booths are designed with several filtration devices to minimise releases to air entering the stacks. Routine monitoring of particulate matter is not required under the current permit. Solvent emissions are minimised through application of a solvent management. There are no combustion plant releases from these stacks and the only potentially polluting substance included in this assessment is particulate matter with a diameter less than 10 µm (PM_{10}). PM_{10} is of concern as releases of particulate matter from industrial sources contribute to elevated ground level concentrations which impacts human health and amenity.

2.3.2 Air quality guidelines and Ambient Air Directive air quality objectives for PM_{10}

The Air Quality Standards (England) Regulations 2010 came into force in June 2010 bringing together in one statutory instrument the Governments obligations to fulfil the requirements of the Clean Air for Europe (CAFE) Directive (2008/50/EC). The relevant environmental standards referenced in this

assessment are the AAD and UK air quality objectives. The relevant AAD air quality objectives (AQOs) for human health relating to PM_{10} are listed below together with the number of exceedances in each reporting period year that are permitted (where applicable):

- AQOs for human health for PM_{10}:
    - 24 hour average of 50 µg/m^3 not to be exceeded more than 35 times per year i.e. the 90.4th percentile of the 24 hour means over a year must not exceed this level.
    - Annual average of 40 µg/m^3.

2.3.3 Averaging periods for environmental standards and relevance to impact assessments

The pollutant considered in this assessment has both long-term and short-term environmental standards i.e. AQOs, which reflects the potential for differing impacts on human health.

Environmental standards for human health apply where there is a risk of exposure (in outside air) over the associated average time period and should be applied to locations where members of the public are likely to be exposed over the averaging period of the objective. Local Air Quality Management (LAQM) Guidance TG(16) details examples of where the relevant target or standard should and should not apply:

- Annual mean. All locations where members of the public might be regularly exposed. At building facades of residential properties, public buildings etc.
- 24-hour and 8-hour mean. All locations where the annual mean objective would apply, together with hotels. Gardens of residential properties.
- 1-hour mean. All locations where the annual mean and the 24 and 8-hour mean objectives apply. Kerbside sites (for example, pavements of busy shopping streets). Those parts of car parks, bus stations and railway stations etc. which are not fully enclosed, where members of the public might reasonably be expected to spend one hour or more. Any outdoor locations where members of the public might reasonably expected to spend one hour or longer.
- 15 minute mean. All locations where members of the public might reasonably be exposed for a period of 15 minutes

The human health receptors included in the modelling study are residential including gardens and public buildings e.g. schools.

2.3.4 Other assessment criteria

The Environment Agency's/NRW Air Emissions Risk Assessment Guidance outlines the approach to establishing the impact of emissions from the proposed changes to emissions.

Stage 1: Screening out insignificant PCs

No further assessment is required if the PC meets both of the following criteria:

- The short-term PC is less than 10% of the short-term environmental standard.
- The long-term PC is less than 1% of the long-term environmental standards.

Stage 2: Screening out PCs and PECs which require no further assessment

No further assessment is required if:

- The short-term PC is less than 20% of the short-term environmental standards minus twice the long-term background concentration.
- The long-term PEC is less than 70% of the long-term environmental standards.

In keeping with the LAQM.TG(16) guidance when calculating the headspace for the AAD 24-hour average for PM_{10} the long-term background concentration value at the receptors does not need to be doubled for assessments within England and Wales.

For ease of reference, the short-term environmental standard minus the long-term background concentration is described, in this assessment, as the 'headspace'.

The above criteria apply for the assessment of impacts at human health receptors and statutory designated ecological sites. PM_{10} emissions are of concern for human health impacts only.

2.4 Identification of sensitive receptors

The human health receptors in the vicinity of the site were identified using online aerial mapping resources.

The potentially sensitive human health receptors, their Ordinance Survey (OS) grid locations and approximate distance from the Final Single Aisle Paint Shop building, where the three stack emission sources are located, are listed in Table 2.1 below

Table 2.1: Receptors

Ref	Name	Grid co-ordinate		Distance from sources	Direction
		Easting	Northing	km	
1	Kingfisher house day nursery, CH5 3QZ	333625	364863	1357	West
2	Manor Lane houses CH5 3PW	333639	365045	1357	West
3	Manor Close houses CH5 3PT	334157	365424	1025	North west
4	Beeches farm, CH4 0BB	334659	366307	1550	North
5	Ewart Street houses, CH4 0BR	336574	365363	1700	East north east
6	St David's High School, CH4 0AE	337347	364882	2387	East
7	Celyn Crescent houses, CH4 8UL	337637	364446	2687	East
8	Fir Trees Caravan and Lodge Park, CH1 6QF	337315	366628	2992	North east
9	Bretton Lane houses (Chester Road) CH4 0DX	335663	364364	808	East south east
10	5 Chester Road house CH4 0DF	336202	364551	1261	East south east
11	45 Simonstone Road house (Chester Road) CH4 0BU	334656	364125	717	South

Ref	Name	Grid co-ordinate		Distance from sources	Direction
		Easting	Northing	km	
12	1 St Mary's Way house (Chester Road) CH4 0DL	334104	364094	1102	South west
13	Cherry Orchard farm Cottage, CH4 0EQ	331990	363757	3,137	West south west
14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	334223	363719	1,289	South west
15	14-16 Chester Road	337085	364570	2,090	East

[1]Distance from sources is approximate minimum distance between the receptor and the Final Single Aisle Paint Shop building.

2.5 Ambient/background levels

2.5.1 Local Authority air quality information

Under the UK Government's LAQM regime, Local Authorities are obliged to assess the air quality in their region and in the event of an exceedance of an Air Quality Objective to establish management plans to address the issue. Flintshire County Council (FCC) is the Local Authority responsible for management of local air quality in the vicinity of the installation and information on air quality in Wales in available from the online government resources: www.welshairquality.co.uk including the Air Pollution in Wales Report 2016.

There are no active Air Quality Management Areas (AQMAs) within the FCC area, the nearest AQMA is Chester city which is approximately 7.4 km from the site and has been declared as an AQMA due to exceedance of environmental standards for nitrogen dioxide levels. The Air Pollution Wales Report 2016) highlights that PM_{10} related air quality is generally improving in Wales.

There are no local air quality monitoring sites close to the installation.

2.5.2 Department for Environment, Food and Rural Affairs (DEFRA) background air pollution data

The Department for Environment, Food and Rural Affairs (DEFRA) maintains Estimated Background Air Pollution Maps that provide annual mean concentration data based on 1 km grid squares. This information is available to download from the DEFRA air quality related web resource available on this link: https://laqm.defra.gov.uk/review-and-assessment/tools/background-maps.html

DEFRA currently advise that the most recent 2015 data is used to identify background levels for pollutants including PM_{10} which replaces the previous requirement to use the 2013 data.

Background air quality values provided in the 2015 datasets were used in assessing the significance of the potential impacts of the emissions from the three booth stack sources on human health and are presented in Section 4.0 of this report.

2.6 Model description

Air Dispersion Modelling was performed by ADM Ltd on behalf of GHD. ADM Ltd has delivered numerous air dispersion models for GHD in the UK. The AERMOD US EPA version 16216 Gaussian model was selected in preference to the standard ADMS model as the AERMOD US EPA version 16216 model deals well with emissions from sites with a range of different building heights.

2.7 Emission parameters and sources included in modelled scenarios

The scenarios modelled in this assessment and included in this report are described in Sections 1.3 and 2.1 of this report and represent emissions from three booth stack sources. The emissions parameters input to the air dispersion model data are included in the air dispersion model data files available on request and are summarised in Appendix A of this report.

Other stacks on the Airbus site also release particulate matter however the emissions from these stacks has been taken into account in this assessment through their contribution to the 2015 background data for PM_{10}.

2.8 Modelled domain and receptors

The modelled domain is a 5 km by 4.7 km rectangle centred on the installation with a 100 m grid spacing.

2.9 Meteorology and surface characteristics

The modelling was performed using 5 years of meteorological data from the Met Office observing station at Hawarden 2012 to 2016 for the years 2012-2016. This station is the local station for the Hawarden airport and is located approximately 1.1 km to the north east of the Final Single Aisle paint Shop building – to the north of the Airbus site and is considered to provide the most appropriate data set to use for the site.

The prevalent wind direction for this site is variable from the north west and south southeast, but mainly from the south southeast as illustrated in Figure 2.3 below for the 2016 data year.

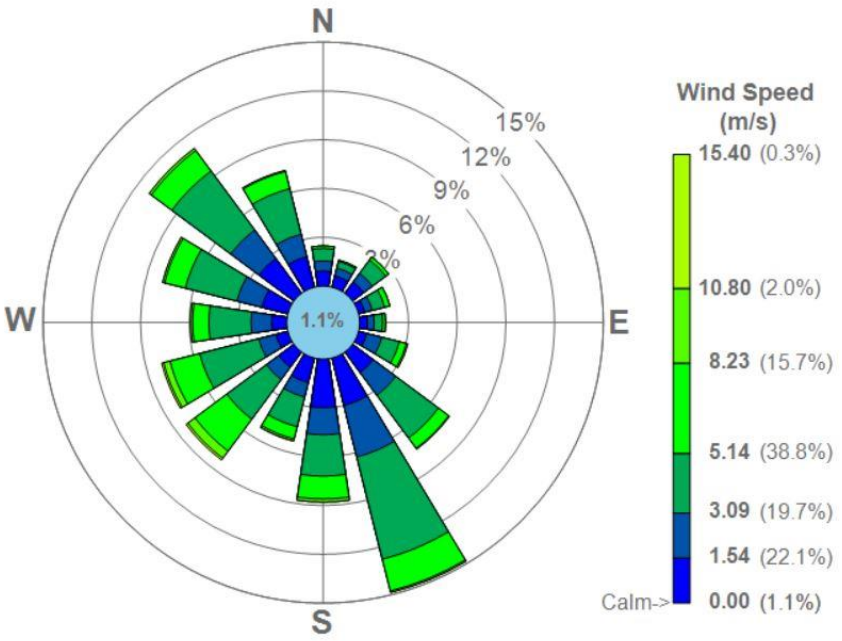


Figure 2.3 Windrose for 2016

Surface characteristics for the site and surrounding area were: Albedo 0.244, Bowen 0.983 and a surface roughness of 0.4 m was applied for all wind directions.

2.10 Treatment of buildings and site plan

The buildings on the site impact on the dispersion of the plumes from the various stack sources to differing extents depending on the relative building and stack heights, locations, wind direction, wind speed etc. Under certain conditions the buildings may pull the emissions plume downwards and cause grounding of the plume. This effect is known as ‘building downwash’. The AERMOD software used in this assessment attempts to take into account the impact of buildings and automatically reviews and selects the key buildings from the model input data.

3. Impact assessment

3.1 Introduction

The significance of the impacts of the emissions from the two existing release points (references A184 and A185) serving the preparation and combo booths installed in 2016 and the new release point (reference A186) serving the proposed new detail paint booth within the same building has been assessed.

The air dispersion model files input and output files for the two scenarios modelled are available on request and key details are summarised in Appendix A to this report. The maximum predicted PCs across all five years of meteorological data modelled for each receptor and the impact assessment are presented in the following sub-sections.

3.2 Model output and impact assessment

3.2.1 Scenario 1

Scenario 1 represents the 'worst normal' operational case with all stack emissions at worst possible emission levels and mass emission rates for normal operations: PM_{10} emission levels for all stacks at 50 mg/Nm^3.

The maximum modelled long and short-term PCs for PM_{10} in µg/m^3 at any point on the modelled grid occurred within the installation close to the stack sources on the east side of the FSAP building (grid reference 335000, 364800). The maximum modelled long-term (annual average) PC was 48.64 µg/m^3 and the maximum short-term (90.4th percentile of the 24 hour means over a year) PC was 97.35 µg/m^3. As these grid maxima occurred within the installation boundary close to the source the values have not been further considered in the AQIA.

The maximum modelled long and short-term PCs for PM_{10} in µg/m^3 across all receptors occurred at the D9 receptor, Bretton Lane Houses (Chester Rd) CH4 0DX. The maximum long-term (annual) PC of 2.60 µg/m^3 occurred for the meteorological data year 2015 and the maximum short-term (90.4th percentile of the 24 hour means over a year) PC of 8.10 µg/m^3 occurred for the meteorological data year 2013.

Contour plots of the maximum PCs, for the relevant averaging periods used in the impact assessment, are presented in Figures 3.1 and 3.2 below. As illustrated in Figures 3.1 and 3.2 the maximum PCs for the model grid are located in the vicinity of the stack sources within the installation boundary.

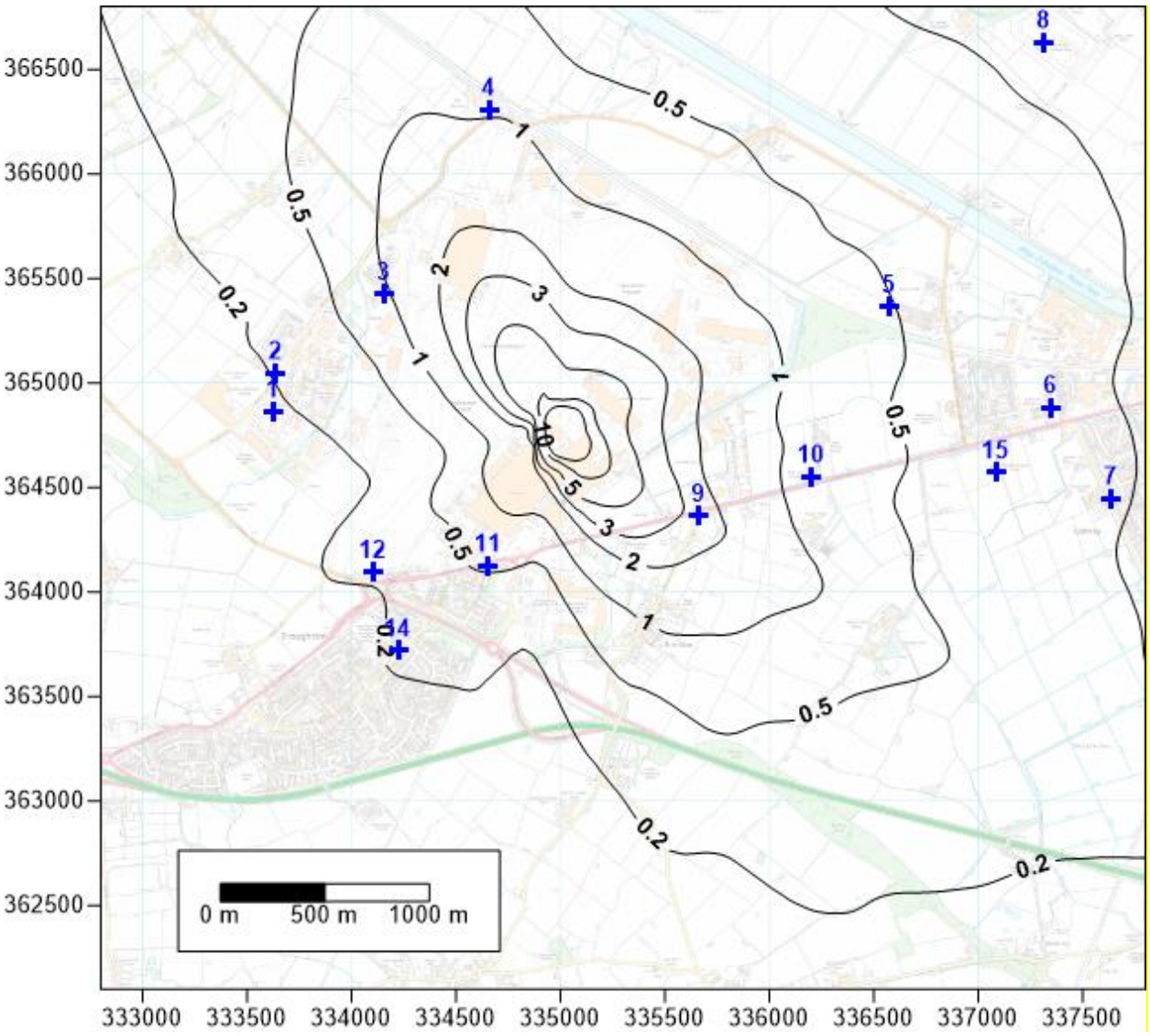


Figure 3.1 Scenario 1: maximum annual mean PCs for PM_{10} in µg/m³ for the 2015 meteorological data year

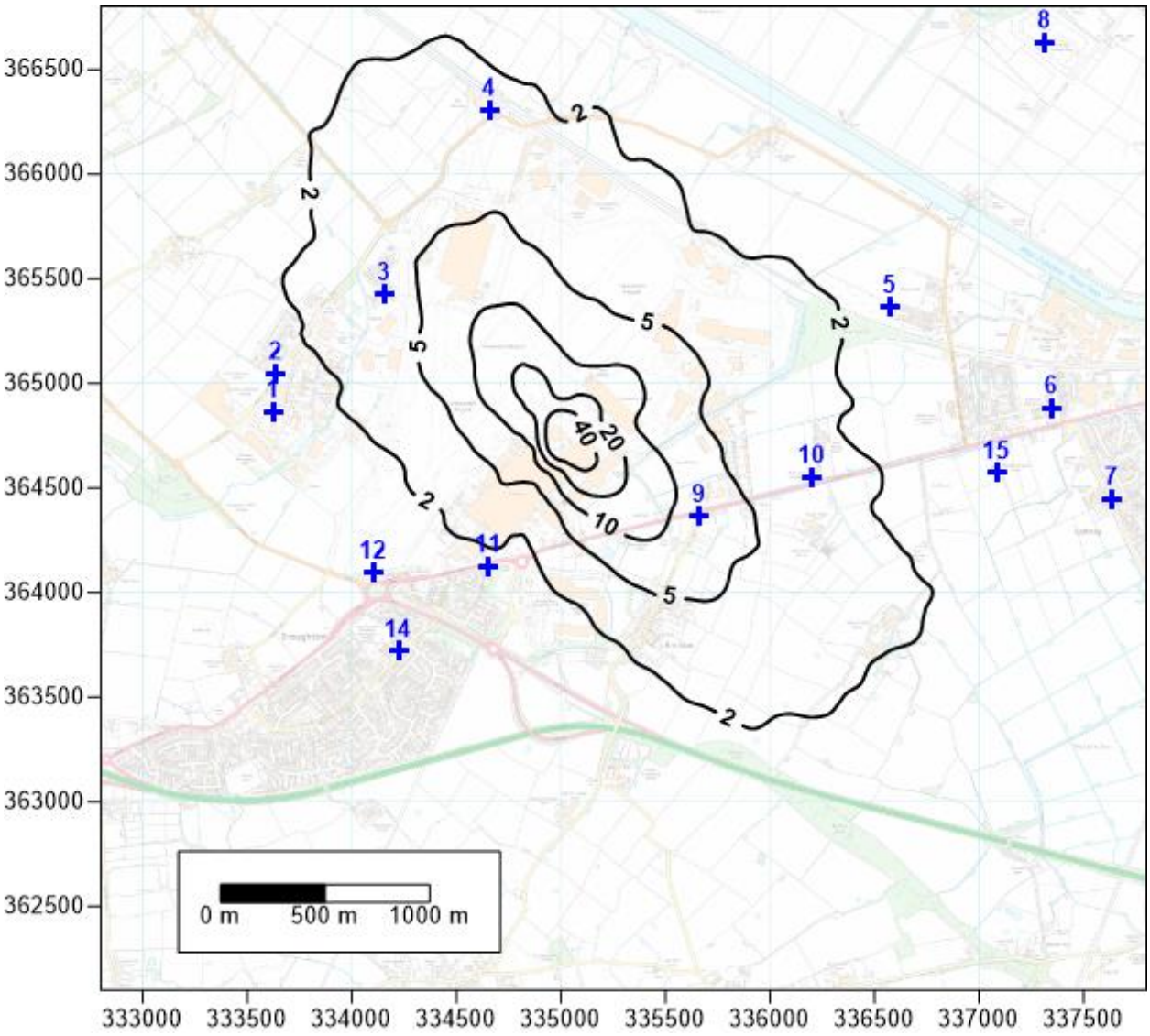


Figure 3.2 Scenario 1: maximum 90.4th percentile of the 24 hour means for PM_{10} in $\mu g/m^3$ for the 2013 meteorological data year

It should be noted that:

- The axis of the contour plots are the Ordinance Survey grid reference numbers.

The long-term and short-term impacts assessments for the maximum modelled PCs for PM_{10} at the human health receptors over the five meteorological data years modelled are presented in Tables 3.1 to 3.4 below.

Table 3.1 Scenario 1: Stage 1 screening assessment of long-term exposure impacts for PM_{10} emissions on human health

Ref.	Receptor	[1]PC	[2]PC as % AQO	[3]Does PC exceed significance threshold for AQO (1%)	Further assessment required
D1	Kingfisher house day nursery, CH5 3QZ	0.31	0.78	No	No
D2	Manor Lane houses CH5 3PW	0.37	0.93	No	No
D3	Manor Close houses CH5 3PT	1.18	2.95	Yes	Yes
D4	Beeches farm, CH4 0BB	1.22	3.05	Yes	Yes
D5	Ewart Street houses, CH4 0BR	0.51	1.28	Yes	Yes
D6	St David's High School, CH4 0AE	0.30	0.75	No	No
D7	Celyn Crescent houses, CH4 8UL	0.23	0.58	No	No
D8	Fir Trees Caravan and Lodge Park, CH1 6QF	0.18	0.45	No	No
D9	Bretton Lane houses (Chester Road) CH4 0DX	2.60	6.50	Yes	Yes
D10	5 Chester Road house CH4 0DF	0.92	2.30	Yes	Yes
D11	45 Simonstone Road house (Chester Road) CH4 0BU	0.77	1.93	Yes	Yes
D12	1 St Mary's Way house (Chester Road) CH4 0DL	0.40	1.00	Yes	Yes
D13	Cherry Orchard farm Cottage, CH4 0EQ	0.05	0.13	No	No
D14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	0.35	0.88	No	No
D15	14-16 Chester Road	0.36	0.90	No	No

N/A not applicable

[1]Maximum long-term PC as PM_{10} in $\mu g/m^3$ i.e. the maximum annual average PC from the air dispersion modelling for the particular receptor across all five years of meteorological data modelled.

[2]Maximum long-term PC as % of the long-term Environmental Quality Standard (AQO) of 40 $\mu g/m^3$as an annual mean for PM_{10} to be met at human health receptors.

[5]Significance threshold for Stage 1 screening of long term impacts: impacts can be screened as insignificant if PCs do not exceed 1% of the long-term AQO for human health.

Table 3.2 Scenario 1: Stage 2 screening assessment of long-term exposure impacts for PM_{10} emissions on human health

Ref.	Receptor	[1]Background annual average PM_{10} concentration	[2]PC	[3]PEC	PEC as % AQO	[4]Does PEC exceed significance threshold for AQO (70%)
D1	Kingfisher house day nursery, CH5 3QZ	12.31	0.31	12.62	31.55	No
D2	Manor Lane houses CH5 3PW	11.91	0.37	12.28	30.69	No
D3	Manor Close houses CH5 3PT	13.02	1.18	14.20	35.49	No
D4	Beeches farm, CH4 0BB	11.95	1.22	13.17	32.91	No
D5	Ewart Street houses, CH4 0BR	12.31	0.51	12.82	32.04	No
D6	St David's High School, CH4 0AE	12.51	0.30	12.81	32.01	No
D7	Celyn Crescent houses, CH4 8UL	12.51	0.23	12.74	31.84	No
D8	Fir Trees Caravan and Lodge Park, CH1 6QF	11.84	0.18	12.02	30.06	No
D9	Bretton Lane houses (Chester Road) CH4 0DX	12.80	2.60	15.40	38.50	No
D10	5 Chester Road house CH4 0DF	11.97	0.92	12.89	32.23	No
D11	45 Simonstone Road house (Chester Road) CH4 0BU	15.06	0.77	15.83	39.57	No
D12	1 St Mary's Way house (Chester Road) CH4 0DL	15.06	0.40	15.46	38.64	No
D13	Cherry Orchard farm Cottage, CH4 0EQ	12.18	0.05	12.23	30.58	No
D14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	13.28	0.35	13.63	34.08	No
D15	14-16 Chester Road	12.51	0.36	12.87	32.16	No

[1]Background annual average PM_{10} in $\mu g/m^3$ concentration taken from DEFRA background maps database for FCC for year 2015.

[2]Maximum long-term PC as PM_{10} in $\mu g/m^3$ i.e. the maximum annual average PC from the air dispersion modelling for the particular receptor across all five years of meteorological data modelled.

[3]PEC in $\mu g/m^3$ is the sum of the PC and the background ambient air concentration.

[4]Significance threshold for Stage 2 screening of long term impacts: no further assessment is required if PECs do not exceed 70% of the long-term AQO for human health.

Table 3.3 Scenario 1: Stage 1 screening assessment of short-term exposure impacts for PM_{10} emissions on human health

Ref.	Receptor	[1]PC	[2]PC as % AQO	[3]Does PC exceed significance threshold for AQO (10%)	Is further assessment required
D1	Kingfisher house day nursery, CH5 3QZ	1.23	2.46	No	
D2	Manor Lane houses CH5 3PW	1.16	2.32	No	
D3	Manor Close houses CH5 3PT	3.55	7.1	No	
D4	Beeches farm, CH4 0BB	3.40	6.8	No	
D5	Ewart Street houses, CH4 0BR	1.61	3.22	No	
D6	St David's High School, CH4 0AE	1.09	2.18	No	
D7	Celyn Crescent houses, CH4 8UL	0.79	1.58	No	
D8	Fir Trees Caravan and Lodge Park, CH1 6QF	0.53	1.06	No	
D9	Bretton Lane houses (Chester Road) CH4 0DX	8.10	16.2	Yes	Yes
D10	5 Chester Road house CH4 0DF	3.13	6.26	No	
D11	45 Simonstone Road house (Chester Road) CH4 0BU	2.12	4.24	No	
D12	1 St Mary's Way house (Chester Road) CH4 0DL	1.41	2.82	No	
D13	Cherry Orchard farm Cottage, CH4 0EQ	0.15	0.3	No	
D14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	0.73	1.46	No	
D15	14-16 Chester Road	1.24	2.48	No	

[1]Maximum short-term PC as PM_{10} in $\mu g/m^3$ i.e. the maximum 90.4th percentile of the 24 hour means over a year PC from the air dispersion modelling for the particular receptor across all five years of meteorological data modelled.

[2]Maximum short-term PC as % of short-term Environmental Quality Standard (AQO) for PM_{10} i.e. the 24 hour average of 50 $\mu g/m^3$ not to be exceeded more than 35 times per year (the 90.4th percentile of the 24 hour means over a year) to be met at the human health receptors.

[3]Significance threshold for Stage 1 screening of short-term impacts: impacts can be screened as insignificant if PCs do not exceed 10% of short-term AQO for human health. In the case that long-term impacts cannot be screened as insignificant it is necessary to do Stage 2 screening for short-term impacts at these receptors irrespective of the short-term screening Stage 1 outcome.

Table 3.4 Scenario 1: Stage 2 screening assessment of short-term exposure impacts for PM_{10} emissions on human health

Ref.	Receptor	[1]Background annual average PM_{10} concentration	[2]PC	[3]PEC	[4]PEC as % AQO	[5]Headroom	PC as % headroom	[6]Does PC exceed significance threshold for AQO (20%)
D1	Kingfisher house day nursery, CH5 3QZ	12.31	1.23	13.54	27.08	37.69	3.26	No
D2	Manor Lane houses CH5 3PW	11.91	1.16	13.07	26.13	38.09	3.05	No
D3	Manor Close houses CH5 3PT	13.02	3.55	16.57	33.13	36.98	9.60	No
D4	Beeches farm, CH4 0BB	11.95	3.40	15.35	30.69	38.05	8.93	No
D5	Ewart Street houses, CH4 0BR	12.31	1.61	13.92	27.84	37.69	4.27	No
D6	St David's High School, CH4 0AE	12.51	1.09	13.60	27.19	37.49	2.91	No
D7	Celyn Crescent houses, CH4 8UL	12.51	0.79	13.30	26.59	37.49	2.11	No
D8	Fir Trees Caravan and Lodge Park, CH1 6QF	11.84	0.53	12.37	24.75	38.16	1.40	No
D9	Bretton Lane houses (Chester Road) CH4 0DX	12.80	8.10	20.90	41.80	37.20	21.77	Yes
D10	5 Chester Road house CH4 0DF	11.97	3.13	15.10	30.21	38.03	8.23	No
D11	45 Simonstone Road house (Chester Road) CH4 0BU	15.06	2.12	17.18	34.35	34.94	6.07	No

Ref.	Receptor	[1]Background annual average PM_{10} concentration	[2]PC	[3]PEC	[4]PEC as % AQO	[5]Headroom	PC as % headroom	[6]Does PC exceed significance threshold for AQO (20%)
D12	1 St Mary's Way house (Chester Road) CH4 0DL	15.06	1.41	16.47	32.93	34.94	4.04	No
D13	Cherry Orchard farm Cottage, CH4 0EQ	12.18	0.15	12.33	24.66	37.82	0.40	No
D14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	13.28	0.73	14.01	28.03	36.72	1.99	No
D15	14-16 Chester Road	12.51	1.24	13.75	27.49	37.49	3.31	No

[1]Background annual average PM_{10} concentration in $\mu g/m^3$ for the receptor taken from the DEFRA background maps database for FCC for year 2015 for human health receptors.

[2]Maximum short-term PC as PM_{10} in $\mu g/m^3$ i.e. the maximum 90.4th percentile of the 24 hour means over a year PC from the air dispersion modelling for the particular receptor across all five years of meteorological data modelled.

[3]Maximum short-term PEC in $\mu g/m^3$ i.e. the sum of the PC and the annual background ambient air concentration – data presented to meet requirements of EPR permit improvement condition 5. In accordance with the statutory guidance LAQM.TG(16) the short-term PEC for PM_{10} is calculated without doubling the background annual average PM_{10} level for sites in England and Wales.

[4]Maximum short-term PEC expressed as % of the short-term AQO for PM_{10} of 50 $\mu g/m^3$ - data presented to meet requirements of EPR permit improvement condition 5.

[5]Headroom is the short-term AQO for PM_{10} of 50 $\mu g/m^3$ minus the annual average background concentration for PM_{10}.

[5]Significance threshold for Stage 2 screening of short-term impacts: no further assessment is required if PC < 20% of the headroom.

The maximum PCs for all human health receptors over all five years modelled for the worst normal operating case (Scenario 1) was for the Bretton Lane houses (Chester Road) CH4 0DX (D9) human health receptor close to the site boundary. For this scenario:

- The maximum annual average PC of 2.60 µg/m^3 and the 90.4th percentile of the 24 hour means over a year PC of 8.10 µg/m^3 represent 6.50 % and 16.20 % of the relevant long and short-term AQO values respectively.
- Taking into account the background PM_{10} levels, these maximum PC values do not risk exceeding relevant long or short-term AQOs as:
    - the long-term PEC is 38.50 % of the AQO
    - the short-term PEC is 41.80 % of the AQO
    - the short-term PC is 21.77 % of the short-term headroom for the AQO.
- The maximum short-term PC modelled for all receptors across all meteorological data years of 8.10 µg/m^3 is 21.77 % of the short-term headroom and exceeds the stage 2 screening threshold value of 20%. This maximum PC represents the worst normal operational case with all PM_{10} emissions from the three booths at worst possible emissions levels and rates and is an unlikely scenario to occur. This maximum PC modelled at a human health receptor does not threaten an exceedance of the short-term AQO of 50 µg/m^3 and, given that this is an unlikely to occur, it is considered that no further assessment is required.

The PM_{10} dispersion modelling for the worst normal operating case (Scenario 1) therefore demonstrates that operation of the three booths included in the assessment presents no significant risk of exceeding long-term or short-term AQO for human health receptors.

The modelling also demonstrates that the release of emissions from the proposed new booth (emission reference A186) at the design stack exit velocity of 8.22 m/s does not risk exceeding AQOs for PM_{10}.

3.2.2 Scenario 2

Scenario 2 represents typical operating conditions with stack emissions at typical or anticipated emission levels and mass emission rates for normal operations:

- A184 – zero emissions
- A185 – PM_{10} emission concentration at the maximum value calculated from the previously monitored levels i.e. 0.61 mg/Nm^3
- A186 – projected PM_{10} emission concentration equivalent to A185 on assumption it could be anticipated concentration would be no higher than for A185

As for Scenario 1, the maximum modelled long and short-term PCs for PM_{10} in µg/m^3 at any point on the modelled grid occurred within the installation close to the stack sources on the east side of the FSAP building (grid reference 335000, 364800). The maximum modelled long-term (annual average) PC was 0.35 µg/m^3 and the maximum short-term (90.4th percentile of the 24 hour means over a year) PC was 0.77 µg/m^3. As these grid maxima occurred within the installation boundary close to the source the values have not been further considered in the AQIA.

As for Scenario 1, the maximum modelled long and short-term PCs for PM_{10} in µg/m^3 across all receptors occurred at the D9 receptor, Bretton Lane Houses (Chester Rd) CH4 0DX. The maximum long-term (annual) PC of 0.02 µg/m^3 occurred for the meteorological data year 2015 and the maximum short-term (90.4th percentile of the 24 hour means over a year) PC of 0.07 µg/m^3 occurred for the meteorological data year 2013.

Contour plots of the maximum PCs, for the relevant averaging periods used in the impact assessment, are presented in Figures 3.3 and 3.4 below. As illustrated in Figures 3.3 and 3.4 the maximum PCs for the model grid are located in the vicinity of the stack sources within the installation boundary.

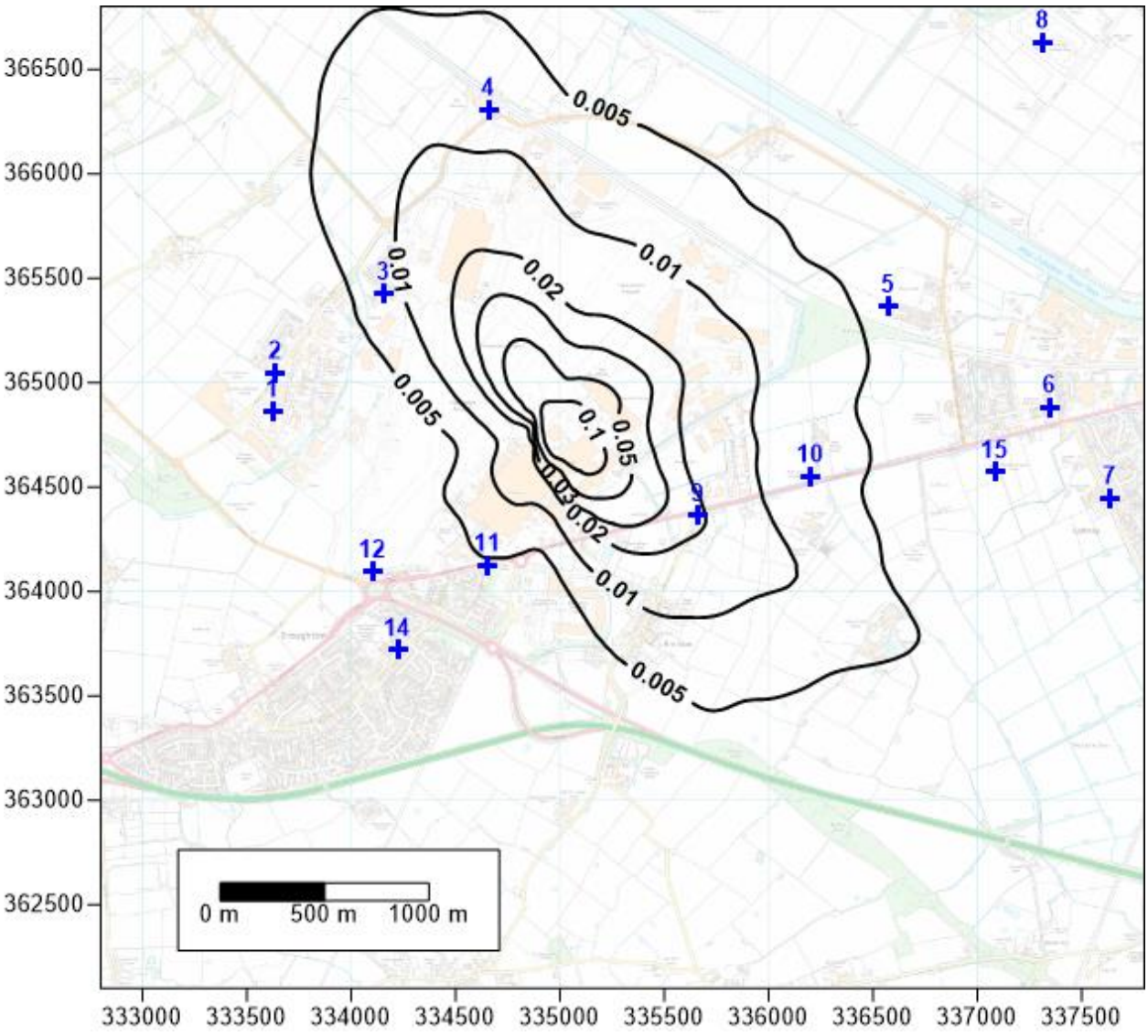


Figure 3.3 Scenario 2: maximum annual mean PCs for PM_{10} in µg/m^3 for the 2015 meteorological data year

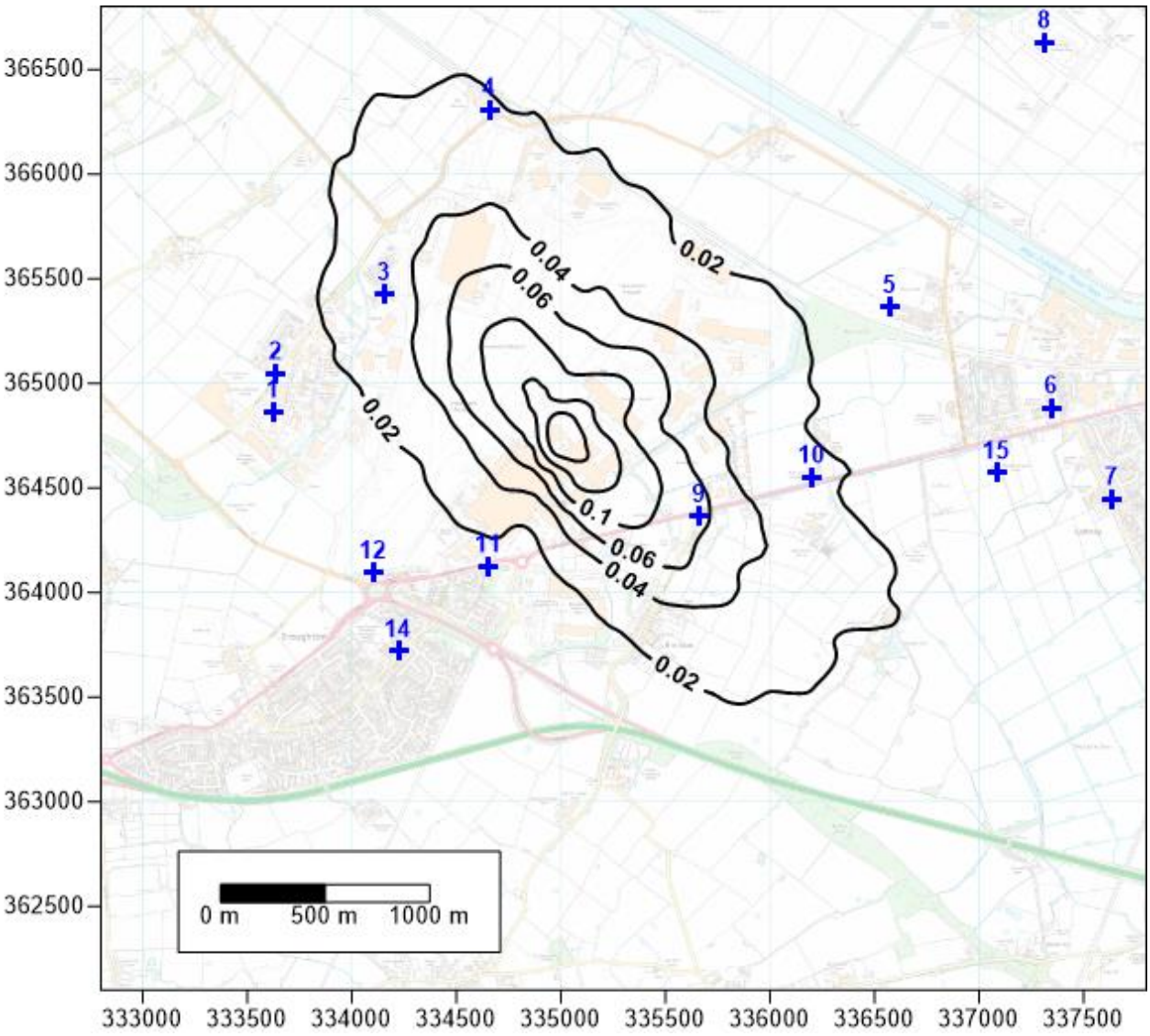


Figure 3.2 Scenario 2: maximum 90.4th percentile of the 24 hour means for PM_{10} in $\mu g/m^3$ for the 2013 meteorological data year

It should be noted that:

- The axis of the contour plots are the Ordinance Survey grid reference numbers.

The long-term and short-term impacts assessments for the maximum modelled PCs for PM_{10} at the human health receptors over the five meteorological data years modelled are presented in Tables 3.1 to 3.4 below.

Table 3.5 Scenario 2: Stage 1 screening assessment of long-term exposure impacts for PM_{10} emissions on human health

Ref.	Receptor	[1]PC	[2]PC as % AQO	[3]Does PC exceed significance threshold for AQO (1%)	Further assessment required
D1	Kingfisher house day nursery, CH5 3QZ	0.00	0.01	No	No
D2	Manor Lane houses CH5 3PW	0.00	0.01	No	No
D3	Manor Close houses CH5 3PT	0.01	0.02	No	No
D4	Beeches farm, CH4 0BB	0.01	0.03	No	No
D5	Ewart Street houses, CH4 0BR	0.00	0.01	No	No
D6	St David's High School, CH4 0AE	0.00	0.01	No	No
D7	Celyn Crescent houses, CH4 8UL	0.00	0.01	No	No
D8	Fir Trees Caravan and Lodge Park, CH1 6QF	0.00	0.00	No	No
D9	Bretton Lane houses (Chester Road) CH4 0DX	0.02	0.05	No	No
D10	5 Chester Road house CH4 0DF	0.01	0.02	No	No
D11	45 Simonstone Road house (Chester Road) CH4 0BU	0.01	0.02	No	No
D12	1 St Mary's Way house (Chester Road) CH4 0DL	0.00	0.01	No	No
D13	Cherry Orchard farm Cottage, CH4 0EQ	0.00	0.00	No	No
D14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	0.00	0.01	No	No
D15	14-16 Chester Road	0.00	0.01	No	No

N/A not applicable

[1]Maximum long-term PC as PM_{10} in $\mu g/m^3$ i.e. the maximum annual average PC from the air dispersion modelling for the particular receptor across all five years of meteorological data modelled.

[2]Maximum long-term PC as % of the long-term Environmental Quality Standard (AQO) of 40 $\mu g/m^3$as an annual mean for PM_{10} to be met at human health receptors.

[5]Significance threshold for Stage 1 screening of long term impacts: impacts can be screened as insignificant if PCs do not exceed 1% of the long-term AQO for human health.

Table 3.6 Scenario 2: Stage 2 screening assessment of long-term exposure impacts for PM_{10} emissions on human health

Ref.	Receptor	[1]Background annual average PM_{10} concentration	[2]PC	[3]PEC	PEC as % AQO	[4]Does PEC exceed significance threshold for AQO (70%)
D1	Kingfisher house day nursery, CH5 3QZ	12.31	0.003	12.31	30.79	No
D2	Manor Lane houses CH5 3PW	11.91	0.003	11.91	29.78	No
D3	Manor Close houses CH5 3PT	13.02	0.010	13.03	32.57	No
D4	Beeches farm, CH4 0BB	11.95	0.010	11.96	29.89	No
D5	Ewart Street houses, CH4 0BR	12.31	0.004	12.31	30.78	No
D6	St David's High School, CH4 0AE	12.51	0.003	12.51	31.27	No
D7	Celyn Crescent houses, CH4 8UL	12.51	0.002	12.51	31.27	No
D8	Fir Trees Caravan and Lodge Park, CH1 6QF	11.84	0.002	11.84	29.61	No
D9	Bretton Lane houses (Chester Road) CH4 0DX	12.80	0.022	12.82	32.05	No
D10	5 Chester Road house CH4 0DF	11.97	0.008	11.98	29.95	No
D11	45 Simonstone Road house (Chester Road) CH4 0BU	15.06	0.007	15.06	37.66	No
D12	1 St Mary's Way house (Chester Road) CH4 0DL	15.06	0.003	15.06	37.65	No
D13	Cherry Orchard farm Cottage, CH4 0EQ	12.18	0.000	12.18	30.45	No
D14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	13.28	0.003	13.29	33.21	No
D15	14-16 Chester Road	12.51	0.003	12.51	31.27	No

[1]Background annual average PM_{10} in $\mu g/m^3$ concentration taken from DEFRA background maps database for FCC for year 2015.

[2]Maximum long-term PC as PM_{10} in $\mu g/m^3$ i.e. the maximum annual average PC from the air dispersion modelling for the particular receptor across all five years of meteorological data modelled.

[3]PEC in $\mu g/m^3$ is the sum of the PC and the background ambient air concentration.

[4]Significance threshold for Stage 2 screening of long term impacts: no further assessment is required if PECs do not exceed 70% of the long-term AQO for human health.

Table 3.7 Scenario 3: Stage 1 screening assessment of short-term exposure impacts for PM_{10} emissions on human health

Ref.	Receptor	[1]PC	[2]PC as % AQO	[3]Does PC exceed significance threshold for AQO (10%)	Is further assessment required
D1	Kingfisher house day nursery, CH5 3QZ	0.01	0.02	No	No
D2	Manor Lane houses CH5 3PW	0.01	0.02	No	No
D3	Manor Close houses CH5 3PT	0.03	0.06	No	No
D4	Beeches farm, CH4 0BB	0.03	0.06	No	No
D5	Ewart Street houses, CH4 0BR	0.01	0.03	No	No
D6	St David's High School, CH4 0AE	0.01	0.02	No	No
D7	Celyn Crescent houses, CH4 8UL	0.01	0.01	No	No
D8	Fir Trees Caravan and Lodge Park, CH1 6QF	0.00	0.01	No	No
D9	Bretton Lane houses (Chester Road) CH4 0DX	0.07	0.14	No	No
D10	5 Chester Road house CH4 0DF	0.03	0.05	No	No
D11	45 Simonstone Road house (Chester Road) CH4 0BU	0.02	0.04	No	No
D12	1 St Mary's Way house (Chester Road) CH4 0DL	0.01	0.03	No	No
D13	Cherry Orchard farm Cottage, CH4 0EQ	0.00	0.00	No	No
D14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	0.01	0.01	No	No
D15	14-16 Chester Road	0.01	0.02	No	No

[1]Maximum short-term PC as PM_{10} in $\mu g/m^3$ i.e. the maximum 90.4th percentile of the 24 hour means over a year PC from the air dispersion modelling for the particular receptor across all five years of meteorological data modelled.

[2]Maximum short-term PC as % of short-term Environmental Quality Standard (AQO) for PM_{10} i.e. the 24 hour average of 50 $\mu g/m^3$ not to be exceeded more than 35 times per year (the 90.4th percentile of the 24 hour means over a year) to be met at the human health receptors.

[3]Significance threshold for Stage 1 screening of short-term impacts: impacts can be screened as insignificant if PCs do not exceed 10% of short-term AQO for human health. In the case that long-term impacts cannot be screened as insignificant it is necessary to do Stage 2 screening for short-term impacts at these receptors irrespective of the short-term screening Stage 1 outcome.

Table 3.8 Scenario 2: Stage 2 screening assessment of short-term exposure impacts for PM_{10} emissions on human health

Ref.	Receptor	[1]Background annual average PM_{10} concentration	[2]PC	[3]PEC	[4]PEC as % AQO	[5]Headroom	PC as % headroom	[6]Does PC exceed significance threshold for AQO (20%)
D1	Kingfisher house day nursery, CH5 3QZ	12.31	0.01	12.32	24.64	37.69	0.03	No
D2	Manor Lane houses CH5 3PW	11.91	0.01	11.92	23.83	38.09	0.02	No
D3	Manor Close houses CH5 3PT	13.02	0.03	13.05	26.09	36.98	0.08	No
D4	Beeches farm, CH4 0BB	11.95	0.03	11.98	23.95	38.05	0.08	No
D5	Ewart Street houses, CH4 0BR	12.31	0.01	12.32	24.64	37.69	0.04	No
D6	St David's High School, CH4 0AE	12.51	0.01	12.52	25.03	37.49	0.02	No
D7	Celyn Crescent houses, CH4 8UL	12.51	0.01	12.52	25.02	37.49	0.02	No
D8	Fir Trees Caravan and Lodge Park, CH1 6QF	11.84	0.00	11.84	23.70	38.16	0.01	No
D9	Bretton Lane houses (Chester Road) CH4 0DX	12.80	0.07	12.87	25.74	37.20	0.19	No
D10	5 Chester Road house CH4 0DF	11.97	0.03	12.00	24.00	38.03	0.07	No
D11	45 Simonstone Road house (Chester Road) CH4 0BU	15.06	0.02	15.08	30.15	34.94	0.05	No
D12	1 St Mary's Way house (Chester Road) CH4 0DL	15.06	0.01	15.07	30.14	34.94	0.04	No

Ref.	Receptor	[1]Background annual average PM_{10} concentration	[2]PC	[3]PEC	[4]PEC as % AQO	[5]Headroom	PC as % headroom	[6]Does PC exceed significance threshold for AQO (20%)
D13	Cherry Orchard farm Cottage, CH4 0EQ	12.18	0.00	12.18	24.36	37.82	0.01	No
D14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	13.28	0.01	13.29	26.58	36.72	0.02	No
D15	14-16 Chester Road	12.51	0.01	12.52	25.03	37.49	0.03	No

[1]Background annual average PM_{10} concentration in µg/m^3 for the receptor taken from the DEFRA background maps database for FCC for year 2015 for human health receptors.

[2]Maximum short-term PC as PM_{10} in µg/m^3 i.e. the maximum 90.4th percentile of the 24 hour means over a year PC from the air dispersion modelling for the particular receptor across all five years of meteorological data modelled.

[3]Maximum short-term PEC in µg/m^3 i.e. the sum of the PC and the annual background ambient air concentration – data presented to meet requirements of EPR permit improvement condition 5. In accordance with the statutory guidance LAQM.TG(16) the short-term PEC for PM_{10} is calculated without doubling the background annual average PM_{10} level for sites in England and Wales.

[4]Maximum short-term PEC expressed as % of the short-term AQO for PM_{10} of 50 µg/m^3 - data presented to meet requirements of EPR permit improvement condition 5.

[5]Headroom is the short-term AQO for PM_{10} of 50 µg/m^3 minus the annual average background concentration for PM_{10}.

[5]Significance threshold for Stage 2 screening of short-term impacts: no further assessment is required if PC < 20% of the headroom.

The maximum PCs for all human health receptors over all five years modelled for the typical normal operating case (Scenario 2) was for the Bretton Lane houses (Chester Road) CH4 0DX (D9) human health receptor close to the site boundary. For this scenario:

- The maximum annual average PC of 0.02 µg/m^3 and the 90.4th percentile of the 24 hour means over a year PC of 0.07 µg/m^3 represent 0.05 % and 0.14 % of the relevant long and short-term AQO values respectively.
- Taking into account the background PM_{10} levels, these maximum PC values do not risk exceeding relevant long or short-term AQOs as:
    - the long-term PEC is 32.05 % of the AQO
    - the short-term PEC is 25.74 % of the AQO
    - the short-term PC is 0.19 % of the short-term headroom for the AQO.

The PM_{10} dispersion modelling for the typical normal operating case (Scenario 2) therefore demonstrates that operation of the three booths included in the assessment presents no significant risk of exceeding long-term or short-term AQOs for human health receptors.

The modelling also demonstrates that the release of emissions from the proposed new booth (emission reference A186) at the design stack exit velocity of 8.22 m/s does not risk exceeding AQOs for PM_{10}.

4. Conclusions

The air dispersion modelling and AQIA demonstrates that emissions of PM_{10} from the two existing booths installed in 2016 and the proposed new detail paint booth do not risk exceeding of relevant long or short-term AQOs for human health in the vicinity of the installation.

The modelling also demonstrates that the release of emissions from the proposed new booth (emission reference A186) at the design stack exit velocity of 8.22 m/s does not risk exceeding AQOs for PM_{10}.

Appendix A Air dispersion model input and output data

Table 1: Air dispersion modelling input: stack and buildings details

Stack reference	Description	[1]Building height above ground	[1]Building height (AOD)	Ground elevation	Stack emission height above ground	Stack height (AOD)	Stack location	easting x	northing y	Stack dimensions at exit	Stack area at exit	Stack exit temperature
		m	m	m	m	m (AOD)	SJ			m	m^2	°C
A184	Preparation booth emission stack	15.85	21	5.15	20.85	26.00	SJ 34949 64766	334949	364766	0.66 x 0.66	0.44	20
A185	Paint booth emission stack	15.85	21	5.15	20.85	26.00	SJ 34963 64783	334963	364783	1.50 x 1.50	2.25	20
A186	Detail paint booth emission stack	15.85	21	5.15	19.60	24.75	SJ 35000 64721	335000	364721	1.00 x 1.00	1.00	20

[1]All three stacks are located on the Final Single Aisle Paintshop (FSAP) building reference number B160. AOD, above ordnance datum.

Table 2: Air dispersion modelling input: scenario and PM_{10} emission rate details

Stack reference	[1]Scenario 1					[2]Scenario 2				
	[3]Gas exit velocity at stack conditions	[4]Volumetric flowrate, at stack exit conditions	[5]Volumetric flowrate, normalised to 273 K, 101.3 kPa, wet gas	[6]Maximum PM10 concentration	Maximum PM10 emission rate	[3]Gas exit velocity at stack conditions	[4]Volumetric flowrate, at stack exit conditions	[5]Volumetric flowrate, normalised to 273 K, 101.3 kPa, wet gas	[7]Typical PM10 concentration	Typical PM10 emission rate
	m/s	m^3/s	Nm^3/s	mg/Nm^3	g/s	m/s	m^3/s	Nm^3/s	mg/Nm^3	g/s
A184	15.00	6.53	6.09	50	0.30	15.00	6.53	6.09	0.00	0.0000
A185	15.00	33.75	31.45	50	1.57	10.61	23.88	21.14	0.61	0.0129
A186	8.33	8.33	7.76	50	0.39	8.33	8.33	7.76	0.61	0.0047
				Total g/s	2.2649				Total g/s	0.0176

[1]Scenario 1: Worst normal operating case: PM_{10} emissions at the maximum possible for booth design of 50 mg/Nm^3.

[2]Scenario 2: Typical normal operating case: PM_{10} emissions based on MCERTS monitoring data from 2016 for stack A185 and Airbus estimated typical emissions for stacks A184 and A186 i.e. zero for A184 and equivalent to A185 for A186.

[3]Gas exit velocity for stack:

- A184 is maximum velocity for design specification of 15 m/s taking into account constriction on stack duct area at exit point i.e. stack exit area 0.44 m^2
- A185 for Scenario 1 is the maximum design velocity of 15 m/s
- A185 for Scenario 2 is calculated from 2016 monitoring data actual flowrate of 23.882 m^3/s and stack exit area of 2.25 m^2 and takes into account the constriction on stack duct area at exit point
- A186 is based on the maximum design volumetric flowrate of 30,000 m^3/hr and the duct design area of 1 m^2

[4]Volumetric flowrate for stack:

- A184 for Scenarios 1 and 2 is the calculated maximum design flowrate from the design exit velocity of 15 m/s and exit area of 0.660 x 0.660 mm
- A185 for Scenario 1 is the maximum volumetric flowrate for a 15m/s design stack exit velocity and a 1.5m x 1.5m exit i.e. 33.75 m^3/s
- A185 for Scenario 2 is the actual and normalised volumetric flowrates are taken from the 2016 *MCERTS monitoring report
- A186 for Scenarios 1 and 2 is the maximum design flowrate of 30,000 m^3/hr

[5]Normalised volumetric flowrate is flowrate corrected to standard temperature and pressure of 273 K and 101.2 kPa for wet gas.

[6]Maximum PM10 emission concentration is the maximum possible emission level based on the booth design of 50 mg/m^3.

[7]Typical PM10 emission concentration for stack:

- A184 under typical normal operations zero release of PM10 is anticipated. There are no painting operations in A184 and the abrading operations have ‘tool tip’ extraction by way of a dedicated Minden dust extract unit. The stack is for general booth ventilation and Airbus assume no PM10 presence
- A185 under typical normal operations very low emissions of PM10 have been monitored i.e. 0.61 mg/Nm3, as reported in the 2016 *MCERTS monitoring report.
- A186 under typical normal operations for this proposed detail paint booth PM10 emissions are anticipated to be in keeping with those observed for A185 i.e. 0.61 mg/Nm3

*MCERTS monitoring results from the report by Environmental Compliance Limited dated 15th July 2016 which reported stack monitoring results during painting operations in June of 2016.

Table 3: Airbus site buildings details for inclusion in air dispersion model

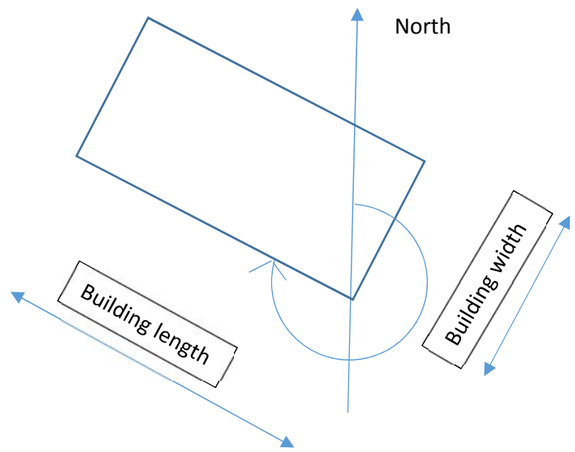
[1]Building	SJ grid ref	Co-ordinates		[2]Height above ground level	[2]Height AOD	[3]Length	[3]Width	[4]Building angle	[2]Elevation
		x	y	m	m	m	m	degrees	m
A380 West Factory B200	SJ 34595 65444	334595	365444	33	38	186	365.2	285	5
A380 Paint (A58/A59) B202	SJ 34577 65386	334577	365386	12	17	69.3	58.9	285	5
East Factory B001	SJ 34729 64264	334729	364264	23.1	29	213.5	306.5	311	5.9
Logistics B064	SJ 34983 64295	334983	364295	10	15	113.9	83.7	311	5
LCM 'Machine Shop' B132 plus B037 and extra units to west approximating to rectangle with largest building area within	SJ 35048 64547	335048	364547	18	23	104.81	195.73	315	5
LCM Surface 'Treatments' B134	SJ 35185 64493	335185	364493	20	25	121.7	52.1	315	5
LCM Effluent treatment (A90)	SJ 35209 64544	335209	364544	9.45	14.5	97.17	13.32	315	5.05
A380 Creep Form B151	SJ 35074 64418	335074	364418	16.3	21.4	49.15	119.59	315	5.1
A380 Skin Mill B150	SJ 35215 64559	335215	364559	16.3	21.4	52.73	106.09	315	5.1
Beluga Line Station B100	SJ 35167 64803	335167	364803	22.1	27.2	93.56	53.85	312	5.1
Site 5 B141 to largest rectangular area to fit in buildings	SJ 35339 64749	335339	364749	24	29.1	338.88	84.5	312	5.1
LR Wing Equip B166	SJ 35144 64955	335144	364955	20	25.1	37.96	186.58	315	5.1
A350 North Factory B165 to largest rectangular area to fit in buildings	SJ 35396 64862	335396	364862	24	29.1	255.26	208.16	312	5.1
Hangar 91	SJ 35538 64802	335538	364802	6.6	11.7	51.45	121.19	302	5.1
Hangar 91 front extension	SJ 35622 64894	335622	364894	10.5	15.6	91.02	31.02	302	5.1
Hangar 92	SJ 35630 65003	335630	365003	6.6	11.7	49.9	150.16	331	5.1
Hangar 89	SJ 35700 64869	335700	364869	6.6	11.7	50.64	111.58	330	5.1
Metal Improvement Company B133 to largest rectangular area to fit in buildings	SJ 35527 65143	335527	365143	19	24	92.96	297.4	278	5
Stringer Manufacturing Centre B149 to largest rectangular area to fit in buildings	SJ 35982 65182	335982	365182	20.1	25.2	341.28	81.8	277	5.1
FASP(Final Single Aisle) wing paintshop B160 (A184, A185, A186) to largest rectangular area to fit in buildings	SJ 34983 64710	334983	364710	15.85	21	72.15	65.2	317	5.15

[1]Abbreviations: A## refers to emission point reference and B## refers to building number

[2]Buildings height information provided by Airbus.

[3]Key buildings identified and details measured using online resource: Grid Reference Finder http://gridreferencefinder.com/

[4]Building angles are angles measured clockwise from north of grid reference point to alignment with the building length starting at grid reference point.



Angle measured clockwise from north to building length measured from most southerly corner of building

Figure 1: Buildings angle measurement

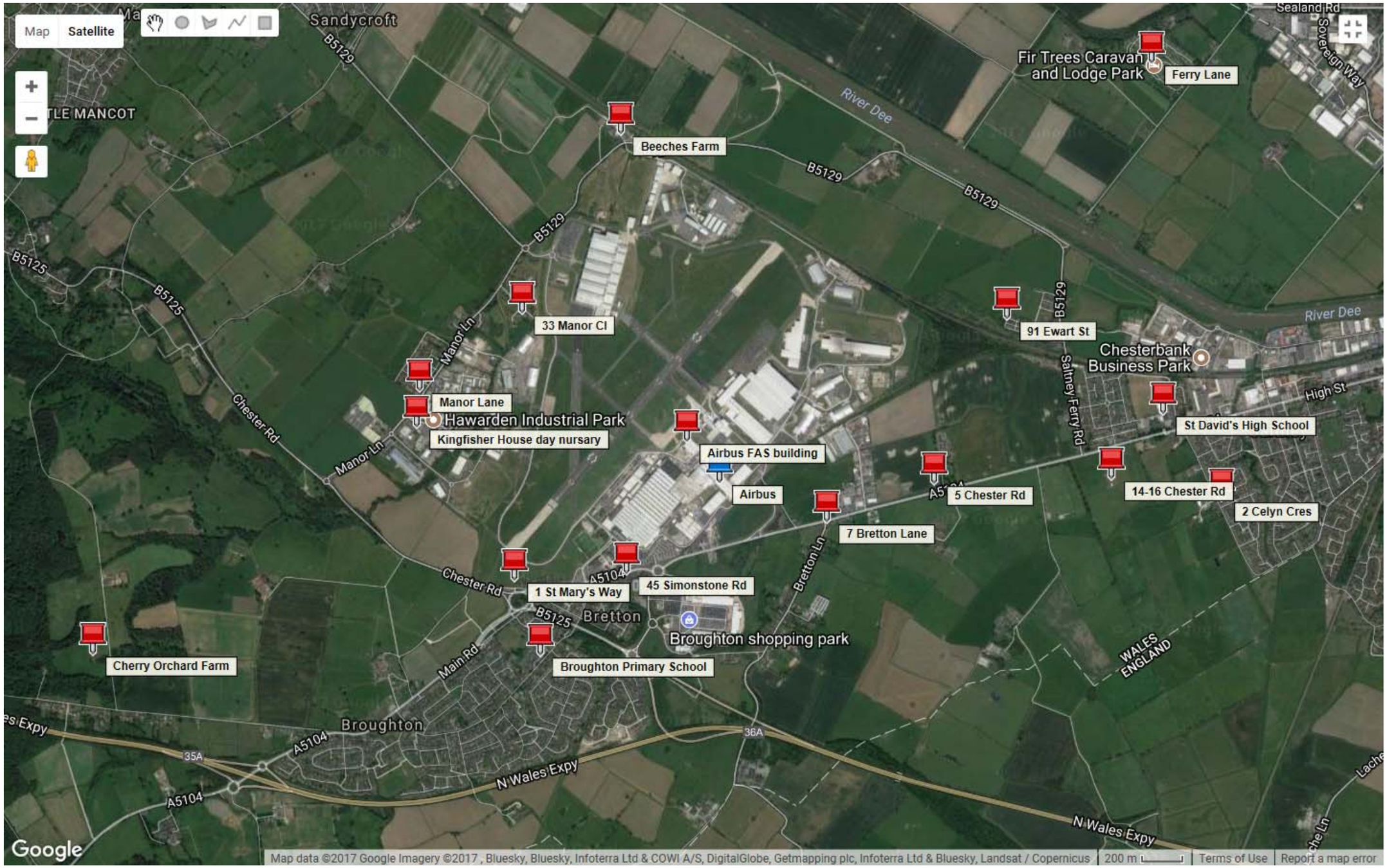


Figure 2: Human health receptors included in the air dispersion model

Receptors identified using UK grid reference finder to identify sensitive human health receptors in the vicinity of the Airbus site (http://gridreferencefinder.com/)

Table 4 Air dispersion model output: annual average predicted concentrations (PC) for PM_{10} in $\mu g/m^3$ at human health receptors

		Run 1	Run 2	Run 3	Run 4	Run 5		Run 6	Run 7	Run 8	Run 9	Run 10	Run 11
	Scenario	Scenario 1						Scenario 2					
	Met Data Year	2012	2013	2014	2015	2016	Maximum	2012	2013	2014	2015	2016	Maximum
D1	Kingfisher house day nursery, CH5 3QZ	0.20	0.31	0.22	0.17	0.20	**0.31**	0.0017	0.0026	0.0018	0.0014	0.0017	**0.0026**
D2	Manor Lane houses CH5 3PW	0.19	0.37	0.28	0.21	0.23	**0.37**	0.0016	0.0031	0.0023	0.0017	0.0019	**0.0031**
D3	Manor Close houses CH5 3PT	0.86	1.18	1.13	0.90	0.87	**1.18**	0.0073	0.0099	0.0094	0.0076	0.0073	**0.0099**
D4	Beeches farm, CH4 0BB	1.22	0.92	1.11	0.96	1.09	**1.22**	0.0103	0.0078	0.0094	0.0080	0.0092	**0.0103**
D5	Ewart Street houses, CH4 0BR	0.51	0.46	0.45	0.51	0.49	**0.51**	0.0043	0.0038	0.0037	0.0043	0.0041	**0.0043**
D6	St David's High School, CH4 0AE	0.28	0.23	0.30	0.25	0.25	**0.30**	0.0024	0.0019	0.0025	0.0021	0.0021	**0.0025**
D7	Celyn Crescent houses, CH4 8UL	0.21	0.21	0.233	0.21	0.225	**0.23**	0.0018	0.0018	0.0020	0.0018	0.0019	**0.0020**
D8	Fir Trees Caravan and Lodge Park, CH1 6QF	0.16	0.16	0.18	0.17	0.17	**0.18**	0.0013	0.0013	0.0015	0.0014	0.0014	**0.0015**
D9	Bretton Lane houses (Chester Road) CH4 0DX	2.07	2.53	2.36	2.60	2.46	**2.60**	0.0174	0.0212	0.0199	0.0219	0.0208	**0.0219**
D10	5 Chester Road house CH4 0DF	0.87	0.83	0.92	0.80	0.89	**0.92**	0.0074	0.0070	0.0078	0.0068	0.0075	**0.0078**
D11	45 Simonstone Road house (Chester Road) CH4 0BU	0.59	0.55	0.56	0.53	0.77	**0.77**	0.0050	0.0047	0.0048	0.0046	0.0066	**0.0066**
D12	1 St Mary's Way house (Chester Road) CH4 0DL	0.30	0.30	0.28	0.23	0.40	**0.40**	0.0026	0.0025	0.0024	0.0020	0.0034	**0.0034**
D13	Cherry Orchard farm Cottage, CH4 0EQ	0.04	0.05	0.04	0.03	0.05	**0.05**	0.0003	0.0004	0.0003	0.0002	0.0004	**0.0004**
D14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	0.24	0.21	0.23	0.23	0.35	**0.35**	0.0020	0.0018	0.0020	0.0020	0.0030	**0.0030**
D15	14-16 Chester Road	0.33	0.31	0.36	0.33	0.35	**0.36**	0.0029	0.0026	0.0030	0.0028	0.0029	**0.0030**
	Grid Maximum				48.64				0.349				

Note: Grid

Maximum values are the maximum PCs modelled over 5 meteorological data years and were located within the installation boundary close to east of FSAP building (grid reference at 335000, 364800).

Table 5 Air dispersion model output: 90.4th percentile of 24-hour means over a year predicted concentrations (PC) for PM_{10} in $\mu g/m^3$ at human health receptors

		Run 1	Run 2	Run 3	Run 4	Run 5		Run 6	Run 7	Run 8	Run 9	Run 10	Run 11
	Scenario	**Scenario 1**						**Scenario 2**					
	Met Data Year	**2012**	**2013**	**2014**	**2015**	**2016**	**Maximum**	**2012**	**2013**	**2014**	**2015**	**2016**	**Maximum**
D1	Kingfisher house day nursery, CH5 3QZ	0.53	1.23	0.64	0.35	0.55	**1.23**	0.0044	0.0102	0.0058	0.0028	0.0046	**0.0102**
D2	Manor Lane houses CH5 3PW	0.65	1.16	0.85	0.52	0.67	**1.16**	0.0058	0.0095	0.0071	0.0043	0.0057	**0.0095**
D3	Manor Close houses CH5 3PT	2.89	3.55	3.35	2.71	2.88	**3.55**	0.0246	0.0303	0.0280	0.0242	0.0244	**0.0303**
D4	Beeches farm, CH4 0BB	3.40	2.62	3.06	2.64	3.00	**3.40**	0.0300	0.0224	0.0264	0.0225	0.0245	**0.0300**
D5	Ewart Street houses, CH4 0BR	1.61	1.52	1.36	1.46	1.53	**1.61**	0.0135	0.0126	0.0117	0.0115	0.0125	**0.0135**
D6	St David's High School, CH4 0AE	0.93	0.79	1.09	0.81	0.86	**1.09**	0.0076	0.0065	0.0089	0.0066	0.0071	**0.0089**
D7	Celyn Crescent houses, CH4 8UL	0.72	0.68	0.79	0.66	0.75	**0.79**	0.0059	0.0058	0.0067	0.0053	0.0064	**0.0067**
D8	Fir Trees Caravan and Lodge Park, CH1 6QF	0.51	0.50	0.53	0.48	0.53	**0.53**	0.0041	0.0039	0.0044	0.0038	0.0042	**0.0044**
D9	Bretton lane houses (Chester Road) CH4 0DX	6.23	8.10	7.25	7.90	7.09	**8.10**	0.0528	0.0679	0.0606	0.0667	0.0591	**0.0679**
D10	5 Chester Road house CH4 0DF	3.02	2.88	3.13	2.41	2.70	**3.13**	0.0255	0.0240	0.0269	0.0207	0.0224	**0.0269**
D11	45 Simonstone Road house (Chester Road) CH4 0BU	1.98	1.37	1.64	1.40	2.12	**2.12**	0.0173	0.0131	0.0154	0.0115	0.0180	**0.0180**
D12	1 St Mary's Way house (Chester Road) CH4 0DL	0.67	0.80	0.61	0.50	1.41	**1.41**	0.0061	0.0069	0.0048	0.0041	0.0128	**0.0128**
D13	Cherry Orchard farm Cottage, CH4 0EQ	0.09	0.14	0.09	0.05	0.15	**0.15**	0.0006	0.0010	0.0007	0.0003	0.0011	**0.0011**
D14	Broughton Primary School 119-129 Broughton Hall Rd CH4 0QQ	0.60	0.40	0.49	0.37	0.73	**0.73**	0.0047	0.0032	0.0040	0.0028	0.0065	**0.0065**
D15	14-16 Chester Road	1.08	1.03	1.24	1.04	1.14	**1.24**	0.0099	0.0087	0.0104	0.0082	0.0097	**0.0104**
	Grid Maximum				97.35				0.769				

Note: Grid Maximum values are the maximum PCs modelled over 5 meteorological data years and were located within the installation boundary close to east of FSAP building (grid reference at 335000, 364800).

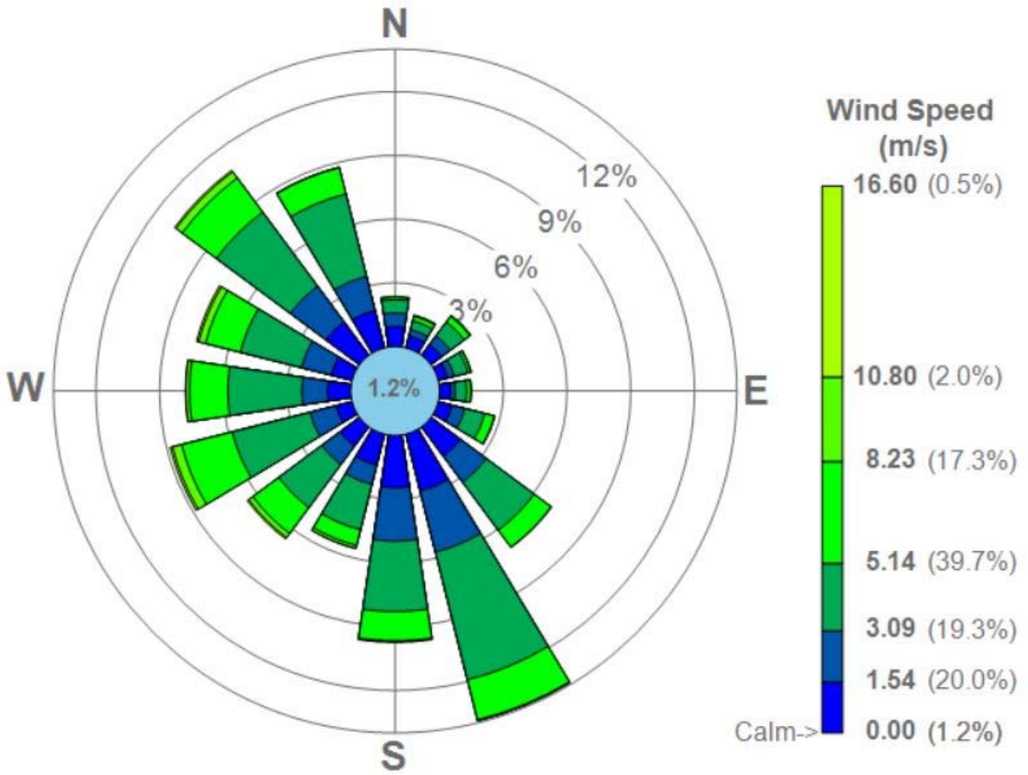


Figure 3.1 Windrose for 2012

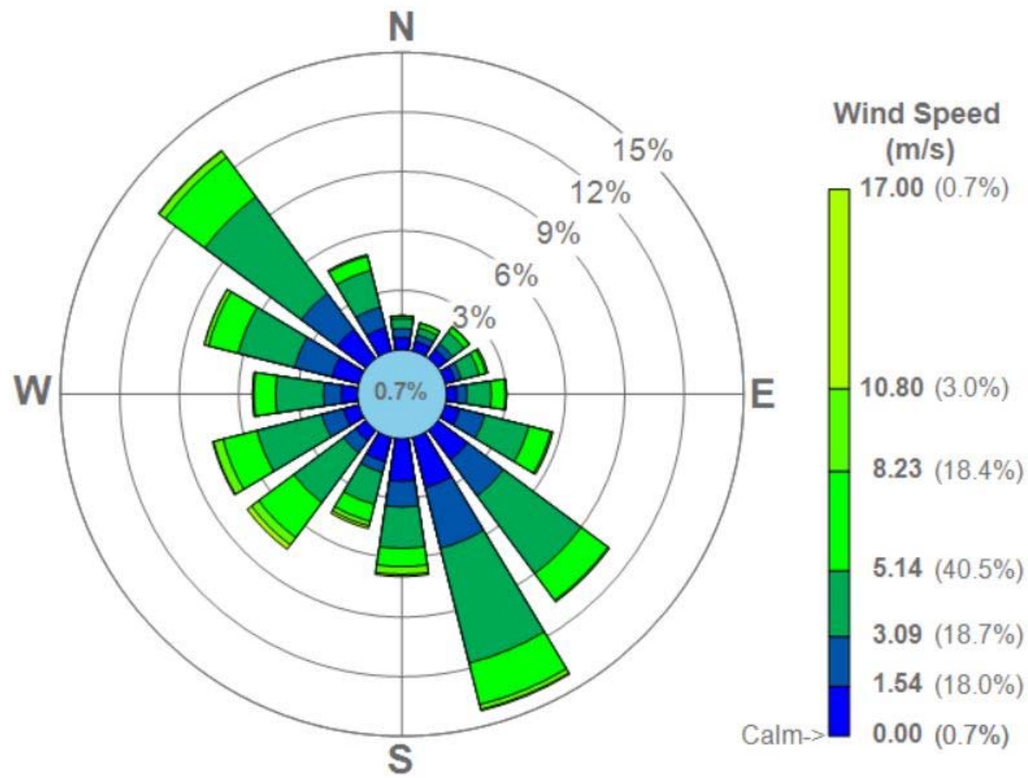


Figure 3.2 Windrose for 2013

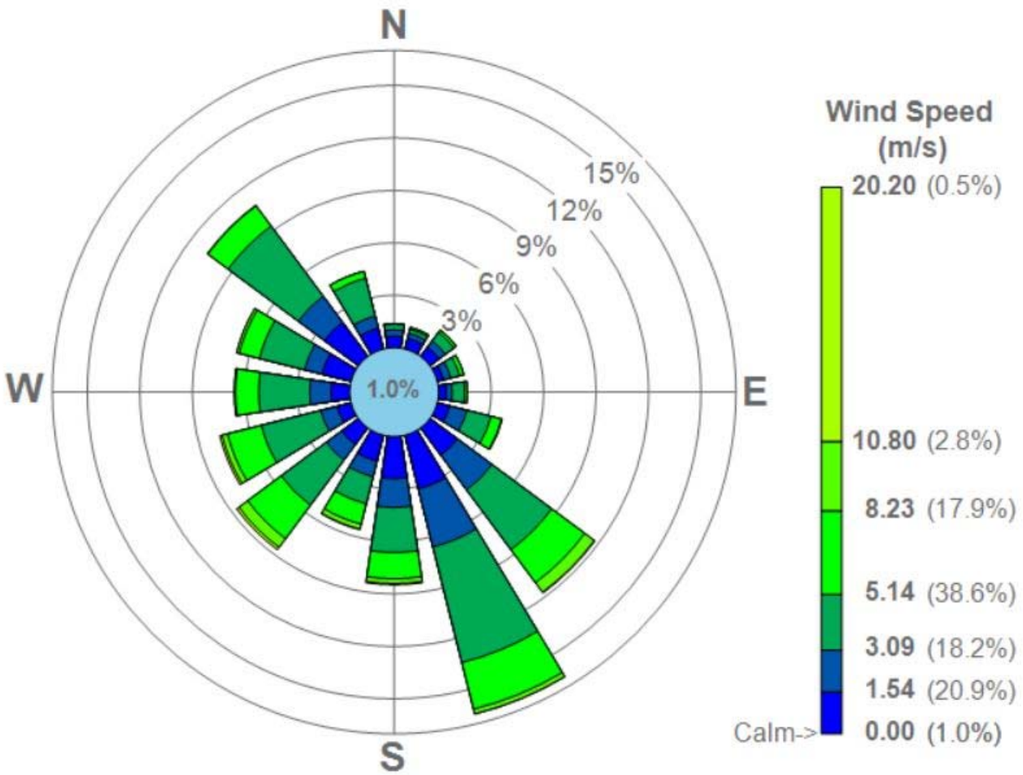


Figure 3.3 Windrose for 2014

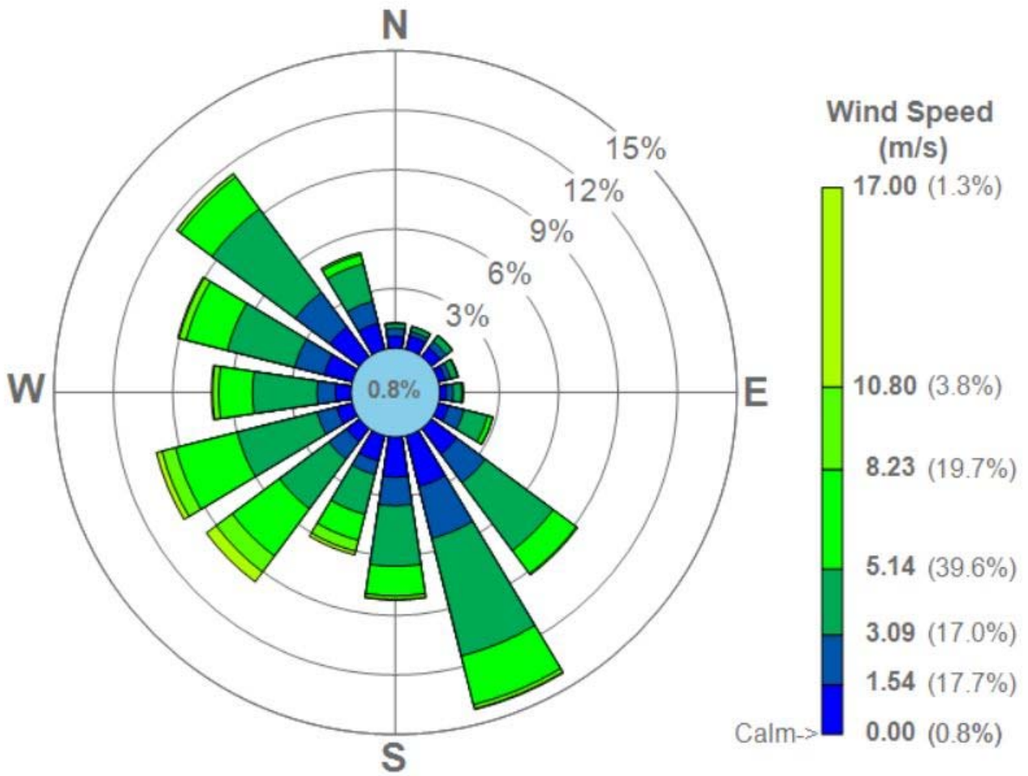


Figure 3.4 Windrose for 2015

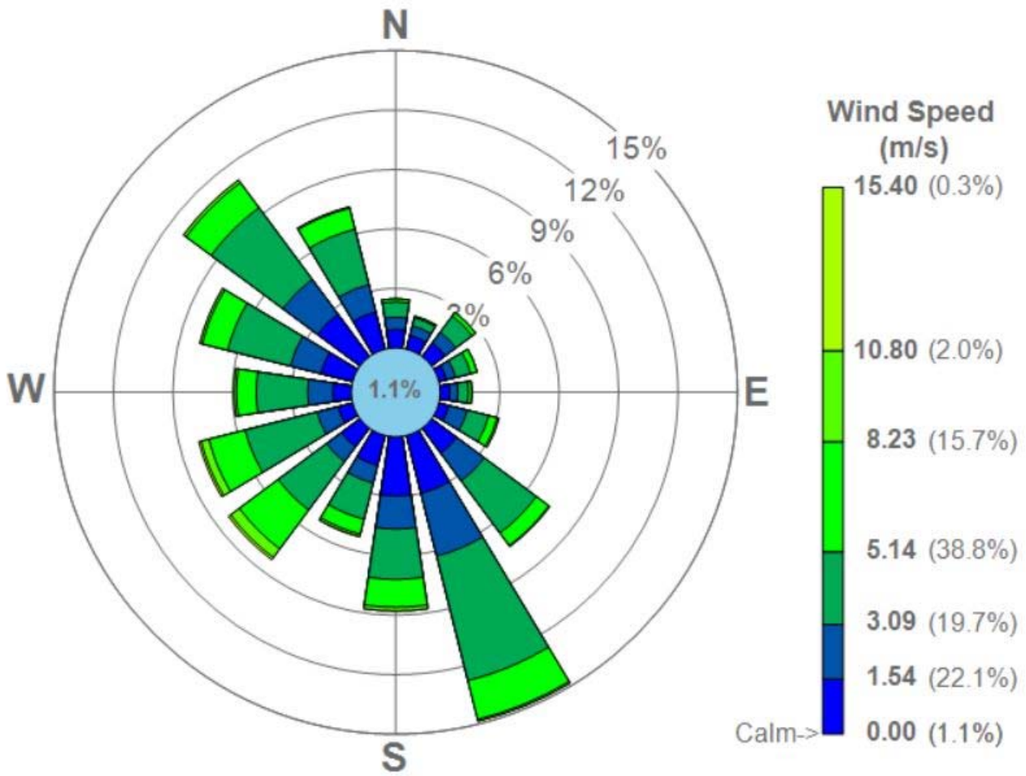


Figure 3.5 Windrose for 2016

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Document Status

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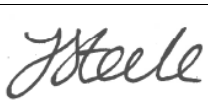
0	G McIntyre	D Gill		J Steele		10/01/2018

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