2017 Air Quality Annual Status Report (ASR)

In fulfilment of Part IV of the Environment Act 1995 Local Air Quality Management

June 2017

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Executive Summary: Air Quality in Our Area

Air Quality in Knowsley

Air pollution is associated with a number of adverse health impacts. It is recognised as a contributing factor in the onset of heart disease and cancer. Additionally, air pollution particularly affects the most vulnerable in society: children and older people, and those with heart and lung conditions. There is also often a strong correlation with equalities issues, because areas with poor air quality are also often the less affluent areas[1,2].

The annual health cost to society of the impacts of particulate matter alone in the UK is estimated to be around £16 billion[3].

Local monitoring data, the planning system, traffic information and control of industries by Environmental Permits have been utilised so that there is a continuing examination of the local air quality to ensure that all Air Quality Objectives set by the Government are met.

Previous Updating and Screening Assessments have been undertaken and all the pollutants included for the purpose of Local Air Quality Management were reassessed individually and the outcome of these reviews was that none of the Air Quality Objectives were predicted to be exceeded by the due dates and that a Detailed Assessment was not required.

The Council's background urban air quality monitoring site (2008–2015) indicates a stable level of pollutants and based on the findings of the most recent Updating and Screening Assessment, Knowsley Council has found that the levels of nitrogen dioxide and particulates (PM_{10}) do not exceed the specific Air Quality Objectives. No AQMA's have been declared in Knowsley.

The main sources of air pollution in Knowsley, as identified from previous air quality review and assessments and the work carried out in the Merseyside Atmospheric Emissions Inventory are from road traffic vehicle emissions and from industrial sources. Knowsley is home to a wide range of industrial and commercial developments and is an important location for employment in the Liverpool City

[1] Environmental equity, air quality, socioeconomic status and respiratory health, 2010
[2] Air quality and social deprivation in the UK: an environmental inequalities analysis, 2006
[3] Defra. Abatement cost guidance for valuing changes in air quality, May 2013

Region and a major source of workers for the area. The borough has a large industrial base concentrated mainly on Knowsley Business Park in Kirkby, the Huyton, Kings and Prescot Business Parks, as well as the Jaguar Land Rover car plant in Halewood.

Neighbouring Authorities also house large industries that can have an impact on the air quality of Knowsley. For example, Fiddlers Ferry power station in Warrington lies to the south of the borough and the Shell oil refinery and petro-chemical complex in Ellesmere Port lie to the south west of Knowsley as well as major glass manufacturing sites in St Helens.

Traffic movements within the borough also play a significant role when considering air quality. Knowsley has a variety of road communication links. The M57 is the 'backbone' of the Borough, running North West to South East. The M62 and A580 (East Lancashire Road) link with the M57 and cut through the Borough East to West. The southerly extension to the M57 has been given the Route Number A5300. The motorway and main A-roads are connected via a network of smaller roads which link the many towns in Knowsley.

Knowsley Council continues to work with neighbouring authorities, Merseytravel, Environment Agency and other partners to improve air quality within the borough.

Actions to Improve Air Quality

- Construction of a new free flow slip road from the A562 to the A5300 near Halewood to improve traffic flow and reduce congestion.

- Construction of junction improvements to introduce two previously banned right turn movements at the junction of Moorgate Road and A580 to improve traffic flow and reduce congestion.

- Two electrical charge points installed at Stretton Way Depot for the Council's new electric fleet vehicles. .

- Continuation of the programme of installing LED street lighting in the Borough

- Provision of additional shared use facilities to support walking and cycling in Knowsley as part of infrastructure improvements through STEP.

Conclusions and Priorities

Monitoring of air quality in Knowsley in 2017 demonstrated no exceedances of air quality objectives. However, the annual mean for nitrogen dioxide at the Cronton Road site is close to the objective. The priority for Knowsley in 2017 will be to further assess the air quality in this location. In addition, a Steering Group will be formed to raise the profile of air quality issues within the borough and to guide future work in this area. Knowsley Council faces significant budget cuts from central government and continuing to provide projects and services related to monitoring and improving air quality will be a major challenge.

Local Engagement and How to get Involved

The public can help improve air quality in Knowsley by:

- Reducing the use of cars by, walking, cycling, car-sharing or using public transport instead.
- Considering electric or hybrid vehicles when buying a new car.
- Not leaving vehicles idling. Turn off the engine instead and use the stop start technology in newer vehicles where available.
- Not burning waste on bonfires or wood burners. Dispose of household waste using the waste collection service or compost garden waste instead.
- Use the Energy Savings Trust website (www.energysavingtrust.org.uk) for advice on saving energy in the home and business.

Further information and live air quality information from Knowsley Council's automatic monitoring site is available from our website:

http://www.knowsley.gov.uk/residents/bins-waste-and-environment/air-quality

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1 Local Air Quality Management

This report provides an overview of air quality in Knowsley during 2016. It fulfils the requirements of Local Air Quality Management (LAQM) as set out in Part IV of the Environment Act (1995) and the relevant Policy and Technical Guidance documents.

The LAQM process places an obligation on all local authorities to regularly review and assess air quality in their areas, and to determine whether or not the air quality objectives are likely to be achieved. Where an exceedence is considered likely the local authority must declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives. This Annual Status Report (ASR) is an annual requirement showing the strategies employed by Knowsley Council to improve air quality and any progress that has been made.

The statutory air quality objectives applicable to LAQM in England can be found in Table E.1 in Appendix E.

2 Actions to Improve Air Quality

2.1 Air Quality Management Areas

Air Quality Management Areas (AQMAs) are declared when there is an exceedance or likely exceedance of an air quality objective. After declaration, the authority must prepare an Air Quality Action Plan (AQAP) within 12-18 months setting out measures it intends to put in place in pursuit of compliance with the objectives.

Knowsley currently does not have any AQMAs. For reference, a map of Knowsley Council's monitoring locations is available in Appendix D.

2.2 Progress and Impact of Measures to address Air Quality in Knowsley

Defra's appraisal of last year's ASR concluded that the report is well structured, detailed and provides the information specified in the Guidance. The following comments are made to inform future reports.

1. It is recommended that the local authority provide graphs illustrating five year trends in measured annual mean nitrogen dioxide concentrations in their next ASR and provide a discussion on these.

2. The local authority only monitors at a single urban background site, although has recently installed two new stations at roadside sites. They do not have a network of diffusion tube sites and therefore could consider providing a justification for this monitoring strategy to give confidence that they are not missing any worst case sites across the borough

Knowsley Council has taken forward a number of direct measures during the current reporting year of 2016 in pursuit of improving local air quality.

More detail on these measures can be found in the following documents;

- Joint Strategic Needs Assessment (Environment)

This report has been prepared jointly by Knowsley Council and Knowsley Clinical Commissioning Group (CCG) and it is one of a series of reports that contributes to Knowsley's Joint Strategic Needs Assessment (JSNA). Its purpose is to provide an analysis of the environment and related issues in order to address questions such as:

- How much impact do these issues have on local people?
- Can this impact be reduced through local action?
- Can local action reduce health inequalities?
- Will local action on this help address other issues too?

This report, along with others produced as part of the JSNA, will be used to inform strategies and plans produced by the Council and its partners. In particular, the JSNA meets the statutory responsibility that the Council and CCG share to study the needs of local people in order to inform the development of a Joint Health and Wellbeing Strategy. The JSNA is also the main source of intelligence used to develop the Knowsley Partnership's 'Strategy for Knowsley'.

- The Sustainable Transport Enhancements Package

The Sustainable Transport Enhancements Package (STEP) is a package of sustainable transport infrastructure measures integral to the Liverpool City Region (LCR) Growth Plan and Strategic Economic Plan (SEP), Although in its infancy, investment in STEP will be shaped around four interrelated strategic packages of works, which align with those set out in the SEP Investment Pipeline for the City Region as follows;

- Transport Investment for Growth;
- Sustainable Access to Employment and Opportunity;
- Transport and Low Carbon Opportunities; and
- Travel for the Visitor Economy.

Investment will be directed into seven Growth Zones, which align with the key areas for investment and development across the City Region, based on the growth sites identified in the SEP. The Environmental impact Assessment concludes there will be a likely slight beneficial impact on local and regional air quality as a result of the scheme.

Key completed measures are:

- Collecting and assessing air quality data from the new automatic monitoring stations. As these stations are in new locations, the data from the first year will provides an indicator of air quality in the local area and establishs a baseline for future assessments.
- Construction of a new free flow slip road from the A562 to the A5300 near Halewood to improve traffic flow and reduce congestion.
- Construction of junction improvements to introduce two previously banned right turn movements at the junction of Moorgate Road and A580 to improve traffic flow and reduce congestion.
- The feasibility of installing charge points for electric vehicles for public use will be explored. This is to encourage clean vehicle use and therefore improve air quality. One public electric charge point has been installed at Cypress Street car park in Prescot. A public electric charge point is planned in the Archway Road car park in Huyton, but this is currently delayed due to land ownership issues.
- Continuation of the programme of installing LED street lighting in the Borough
- Provision of additional shared use facilities to support walking and cycling in Knowsley as part of infrastructure improvements through STEP.

Knowsley Council expects the following measures to be completed over the course of the next reporting year:

- The formation of an Air Quality Steering Group and the appointment of a chair.
- The commencement of passive monitoring of NO_2 in the area around the Cronton Road automatic monitoring station.
- The production of the Annual Status Report 2018.
- Two electrical charge points will be installed at Stretton Way Depot for the Council's new electric fleet vehicles. Issues over procurement of suitable equipment have delayed this measure.
- Develop a communication strategy to encourage public engagement, deliver key messages related to air quality and to ensure effective joint working with external partners.

Knowsley's priorities for the coming year are to further assess the air quality in the proximity of the Cronton Road automatic monitoring site. The annual mean level for nitrogen dioxide at the Cronton Road for 2016 site is close to the objective.

The principal challenges and barriers to implementation that Knowsley Council anticipates facing are significant budget cuts from central government and continuing to provide projects and services related to monitoring and improving air quality.

2.3 $PM_{2.5}$ – Local Authority Approach to Reducing Emissions and/or Concentrations

As detailed in Policy Guidance LAQM.PG16 (Chapter 7), local authorities are expected to work towards reducing emissions and/or concentrations of $PM_{2.5}$ (particulate matter with an aerodynamic diameter of 2.5µm or less). There is clear evidence that $PM_{2.5}$ has a significant impact on human health, including premature mortality, allergic reactions, and cardiovascular diseases.

Knowsley Council is taking the following measures to address $PM_{2.5}$: Knowsley Council is taking the following measures to address $PM_{2.5}$:

- Continue to monitor, analyse and report on $PM_{2.5}$ at our three automatic monitoring sites.

- Identify developments that could increase $PM_{2.5}$ levels though the planning regime and Environmental Permitting and where necessary use conditions or enforcement to secure improvements. $PM_{2.5}$ will be a key focus for new planning applications and Environmental Permitting.

- Identify existing measures already in place that can help with reducing levels of $PM_{2.5}$

- The Public Health Outcome Framework for $PM_{2.5}$ is considered as part of Knowsley's JSNA Report. This outcome indicator is the percentage of all-cause death in adults over 30 attributed to small (<2.5 µm) particulate, man-made air pollution. It is a modelled estimate based on the relative risk incurred per 10 $\mu g/m^3$ increase above local average background levels. The attributable fraction in England is 5.4%, whilst for the North West as a whole this is lower, at 4.6%. In Knowsley the attributable fraction is 4.8%.

3 Air Quality Monitoring Data and Comparison with Air Quality Objectives and National Compliance

3.1 Summary of Monitoring Undertaken

3.1.1 Automatic Monitoring Sites

This section sets out what monitoring has taken place and how it compares with objectives.

Knowsley Council undertook automatic (continuous) monitoring at 3 sites during 2016. Table A.1 in Appendix A shows the details of the sites. NB. Local authorities do not have to report annually on the following pollutants: 1,3 butadiene, benzene, carbon monoxide and lead, unless local circumstances indicate there is a problem. National monitoring results are available at https://uk-air.defra.gov.uk/

Maps showing the location of the monitoring sites are provided in Appendix D. Further details on how the monitors are calibrated and how the data has been adjusted are included in Appendix C.

3.1.2 Non-Automatic Monitoring Sites

Knowsley Council has not undertaken non-automatic (passive) monitoring in 2016.

3.2 Individual Pollutants

The air quality monitoring results presented in this section are, where relevant, adjusted for bias, “annualisation” and distance correction. Further details on adjustments are provided in Appendix B.

3.2.1 Nitrogen Dioxide (NO_2)

Table A.3 in Appendix A compares the ratified and adjusted monitored NO_2 annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.4 in Appendix A compares the ratified continuous monitored NO_2 hourly mean concentrations for the past 5 years with the air quality objective of 200µg/m^3, not to be exceeded more than 18 times per year.

No exceedances of air quality objective were recorded. However, the recorded NO_2 levels at the Huyton site are a cause for concern. The actual level recorded is slightly below the air quality objective, however when annualised the level exceeds the

objecitve by 0.1µg/m^3. When a distance correction to the relevant receptor is applied the level drops to below the objective. These calcualtions are shown in Appendix B.

The data from the Kirkby monitoring location shows that concentrations of NO_2 have slightly declined following a noticable peak in 2014.

This is the first year of monitoring at the Huyton and Halewood monitoing locations and therefore no trends in the data can be identified.

3.2.2 Particulate Matter (PM_{10})

Table A.5 in Appendix A compares the ratified and adjusted monitored PM_{10} annual mean concentrations for the past 5 years with the air quality objective of 40µg/m^3.

Table A.6 in Appendix A compares the ratified continuous monitored PM_{10} daily mean concentrations for the past 5 years with the air quality objective of 50µg/m^3, not to be exceeded more than 35 times per year.

No exceedances of the air quality objectives were recorded.

The data from the Kirkby monitoring location shows that concentrations of PM10 have been steady for the last 3 years following a noticable decline between 2013 and 2014.

This is the first year of monitoring at the Huyton and Halewood monitoing locations and therefore no trends in the data can be identified.

3.2.3 Particulate Matter ($PM_{2.5}$)

Table A.7 in Appendix A presents the ratified and adjusted monitored $PM_{2.5}$ annual mean concentrations for the past 5 years.

Although there is no air quality objective for the England, it is noted that the recorded levels are below the EU Air Quality standard (25 µg/m^3) for all three sites.

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Appendix A: Monitoring Results

Table A.1 – Details of Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Monitoring Technique	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Inlet Height (m)
Kirkby	Briery Hey Avenue, Northwood	Urban Background	341774	398802	NO2; PM2.5 PM10,	NO	Chemiluminescent; BAMS	35	16	2.5
Huyton	Cronton Road, Huyton	Roadside	345552	389413	NO2; PM2.5 PM10,	NO	Chemiluminescent, TEOMS	17	2	2
Halewood	Higher Road, Halewood	Roadside	345213	384691	NO2; PM2.5 PM10,	NO	Chemiluminescent, TEOMS	10	2	2

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on the façade of a residential property).

(2) N/A if not applicable.

Table A.2 – Details of Non-Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Distance to Relevant Exposure (m) (1)	Distance to kerb of nearest road (m) (2)	Tube collocated with a Continuous Analyser?	Height (m)
N/A	N/A									

Notes:

(1) 0m if the monitoring site is at a location of exposure (e.g. installed on/adjacent to the façade of a residential property).

(2) N/A if not applicable.

Table A.3 – Annual Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 Annual Mean Concentration ($\mu g/m^3$) (3)				
					2012	2013	2014	2015	2016
Kirkby	Urban Background	Automatic	82.7	82.7	20.3	21	26.9	18.7	17.7
Huyton	Roadside	Automatic	99.2	61.6	N/A	N/A	N/A	N/A	38.8
Halewood	Roadside	Automatic	97.5	59.3	N/A	N/A	N/A	N/A	32.3

N/A Diffusion tube data has been bias corrected

✓ Annualisation has been conducted where data capture is <75%

✓ If applicable, all data has been distance corrected for relevant exposure

Notes:

Exceedances of the NO_2 annual mean objective of 40µg/m^3 are shown in **bold**.

NO_2 annual means exceeding 60µg/m^3, indicating a potential exceedance of the NO_2 1-hour mean objective are shown in **bold and underlined.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) Means for diffusion tubes have been corrected for bias. All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16 if valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.1 – Trends in Annual Mean NO_2 Concentrations

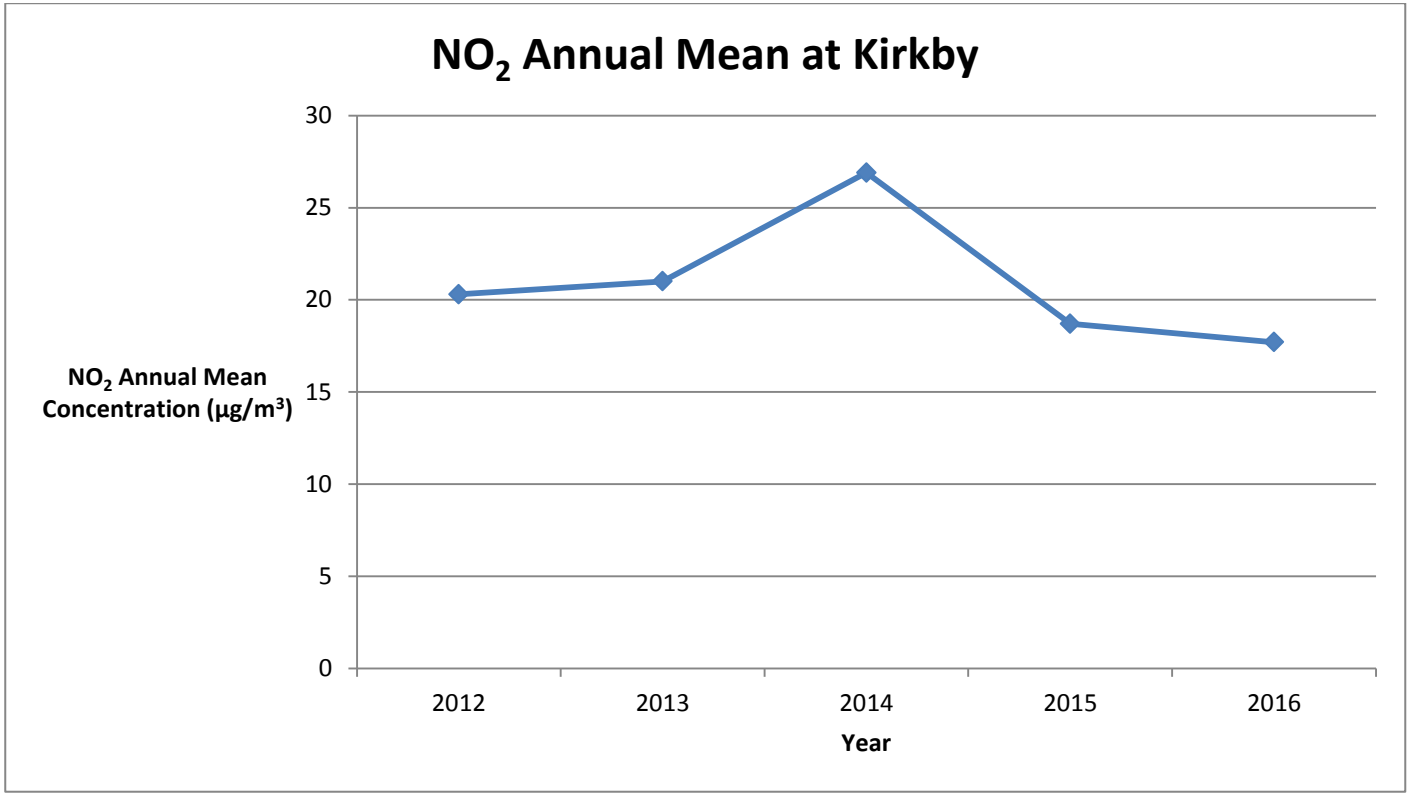


Table A.4 – 1-Hour Mean NO_2 Monitoring Results

Site ID	Site Type	Monitoring Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	NO_2 1-Hour Means > 200µg/m^3 (3)				
					2012	2013	2014	2015	2016
Kirkby	Urban Background	Automatic	82.5	82.5	0	0	0 (112.2)	0	0 (87.8)
Huyton	Roadside	Automatic	99.2	61.6	N/A	N/A	N/A	N/A	0 (130.4)
Halewood	Roadside	Automatic	96.9	96.4	N/A	N/A	N/A	N/A	0 (117.0)

Notes:

Exceedances of the NO_2 1-hour mean objective (200µg/m^3 not to be exceeded more than 18 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 99.8th percentile of 1-hour means is provided in brackets.

Table A.5 – Annual Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	PM_{10} Annual Mean Concentration ($\mu g/m^3$) (3)				
				2012	2013	2014	2015	2016
Kirkby	Urban Background	93.2	93.2	23	25	18	16.5	17.9
Huyton	Roadside	93.1	70.0	N/A	N/A	N/A	N/A	20.0
Halewood	Roadside	93.3	56.8	N/A	N/A	N/A	N/A	24.8

✓ **Annualisation has been conducted where data capture is <75%**

Notes:

Exceedances of the PM_{10} annual mean objective of 40µg/m^3 are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Figure A.2 – Trends in Annual Mean PM_{10} Concentrations

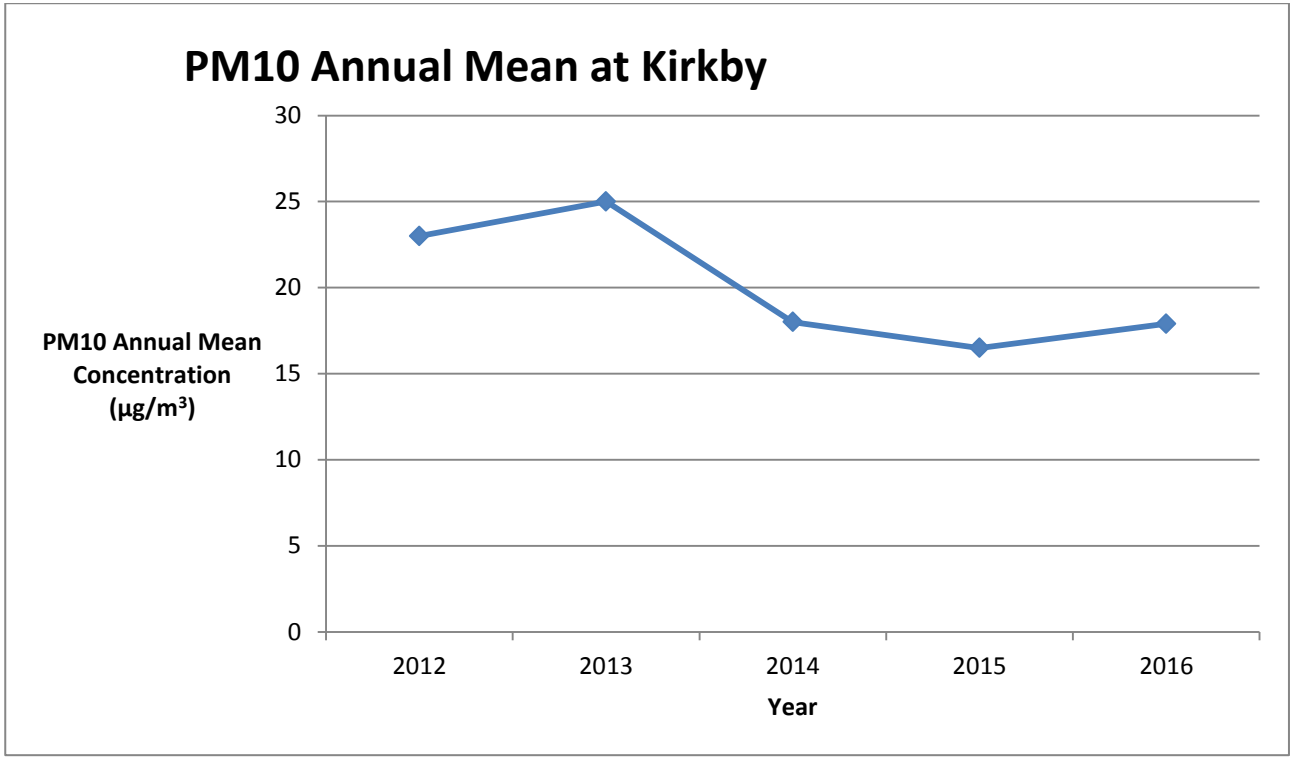


Table A.6 – 24-Hour Mean PM_{10} Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	PM_{10} 24-Hour Means > 50µg/m^3 (3)				
				2012	2013	2014	2015	2016
Kirkby	Urban Background	93.2	93.2	18	14	8	4 (30.8)	0
Huyton	Roadside	93.1	70.1	N/A	N/A	N/A	N/A	2 (32.9)
Halewood	Roadside	93.3	56.8	N/A	N/A	N/A	N/A	8 (43)

Notes:

Exceedances of the PM_{10} 24-hour mean objective (50µg/m^3 not to be exceeded more than 35 times/year) are shown in **bold.**

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) If the period of valid data is less than 85%, the 90.4th percentile of 24-hour means is provided in brackets.

Table A.7 – $PM_{2.5}$ Monitoring Results

Site ID	Site Type	Valid Data Capture for Monitoring Period (%) (1)	Valid Data Capture 2016 (%) (2)	$PM_{2.5}$ Annual Mean Concentration ($\mu g/m^3$) (3)				
				2012	2013	2014	2015	2016
Kirkby	Urban Background	92.1	92.1	N/A	N/A	N/A	6.8	10.9
Huyton	Roadside	91.3	68.1	N/A	N/A	N/A	N/A	10.1
Halewood	Roadside	93.7	57.6	N/A	N/A	N/A	N/A	11.1

✓ **Annualisation has been conducted where data capture is <75%**

Notes:

(1) Data capture for the monitoring period, in cases where monitoring was only carried out for part of the year.

(2) Data capture for the full calendar year (e.g. if monitoring was carried out for 6 months, the maximum data capture for the full calendar year is 50%).

(3) All means have been "annualised" as per Boxes 7.9 and 7.10 in LAQM.TG16, valid data capture for the full calendar year is less than 75%. See Appendix C for details.

Appendix B: Supporting Technical Information / Air Quality Monitoring Data QA/QC

B.1 Significant changes to sources

The following sources have been identified as part of the planning regime as being new sources of pollution in 2016.

Planning Reference: 16/00442/FUL

Address: Land Used For Storage By Enterprise Liverpool, Moorgate Point, Moorgate Road, Southdene, Kirkby, Knowsley,

Proposal: Construction of a reserve power generating facility comprising of 8no generation units housed within individual container units together with associated fencing, CCTV & lighting

Note: An air quality report was submitted with the application and reviewed prior to determination of the planning application. The report used a detailed AERMOD dispersion model and worst case scenarios and concluded that the development is highly unlikely to lead to a breach in DEFRA Air Quality objections. The report was approved by the Local Planning Authority and planning permission was granted with a condition requiring the plant is run in accordance with the assumptions made in the report.

Knowsley Metropolitan Borough Council has identified no new significant 'Road Traffic Sources" or other transportation sources in 2016.

B.2 QA/QC of monitoring data

The Kirkby station uses Beta Attenuation Monitors (BAM) to monitor particles matter.. As per TG16 the BAM meets the equivalence criteria for monitoring providing the results are corrected for slope. The data in this report has had the correction factor applied so it can be compared to the National Air Quality Objectives.

Data from an analyser is stored on the logger as 'raw' or 'uncorrected' data, therefore data needs to be corrected or 'validated'. To validate data, the analysers need to be checked against a referenced standard of 'zero' air and 'span' gas.

There are two methods available to correct data by using calibration checks to verify that the analyser is corrected for any response change:

- Daily automatic calibration checks
- Fortnightly manual calibration checks

The air quality monitoring stations use manual calibration checks

A regular manual calibration is performed at the AQMS. This check is performed to verify the response of the analyser in reference to the 'zero' and 'span' by introducing a high concentration of NO gas. These results are also used to validate the data for the NOx analyser.

All of the calibration results are then used to create a calibration factor, which is used to correct the data.

Conversion factors for ppb to µg/m3

Conversion rates at 20°C and 101.3kPa:

- NO_2

1.91 x ppb = $\mu g/m^3$

Annualisation of data for Nitrogen Dioxide (Huyton)

N.B. The Kirkby site was not used for the annualisation of NO_2 data at the other two sites due to the data capture being less than the recommended 85%.

Site	Site Type	Annual Mean ($\mu g/m^3$)	Period Mean ($\mu g/m^3$)	Ratio
Speke	AURN	23.0	22.1	1.040
Widnes	AURN	43.8	44.2	0.992
Warrington	AURN	25.0	23.6	1.058
			Average	1.030

Site period mean = 38.91$\mu g/m^3$

Annual Mean=38.91 x 1.030 = 40.1$\mu g/m^3$

Distance correction for relevant exposure (Huyton):

Monitored distance from kerb = 2.1m

Receptor distance from kerb = 2.7m

Local annual background mean of NO_2 =18.2 μg/m^3 (source: DEFRA: Background Mapping data for local authorities)

Using the DEFRA Nitrogen Dioxide fall off with distance calculator (ver 4.1) the corrected annual mean = 38.8μg/m^3

Annualisation of data for Particulate Matter <10 μm (Huyton)

Site	Site Type	Annual Mean (μg/m^3)	Period Mean (μg/m^3)	Ratio
Kirkby	Local Authority	18.00	18.10	0.995
Warrington	AURN	16.15	16.15	1.000
Speke	AURN	15.15	15.37	0.985
			Average	0.993

Site period mean 20.13 = μg/m^3

Annual Mean= 20.13 x 0.993 = 20.0 μg/m^3

Annualisation of data for Particulate Matter <2.5 μm (Huyton)

Site	Site Type	Annual Mean (μg/m^3)	Period Mean (μg/m^3)	Ratio
Kirkby	Local Authority	10.90	11.16	0.976
Warrington	AURN	10.59	10.60	0.999
Speke	AURN	10.05	9.82	1.023
			Average	0.999

Site period mean = 10.06 μg/m^3

Annual Mean= 10.06 x 0.999 = 10.05 μg/m^3

Annualisation of data for Nitrogen Dioxide (Halewood)

N.B. The Kirkby site was not used for the annualisation of NO_2 data at the other two sites due to the data capture being less than the recommended 85%.

Site	Site Type	Annual Mean (μg/m^3)	Period Mean (μg/m^3)	Ratio
Speke	AURN	23.0	22.2	1.033
Widnes	AURN	43.8	44.3	0.989
Warrington	AURN	25.0	23.8	1.052

	Average	1.025

Site period mean = 31.53 μg/m^3

Annual Mean= 31.53 x 1.025 = 32.3μg/m^3

Annualisation of data for Particulate Matter <10 μm (Halewood)

Site	Site Type	Annual Mean (μg/m^3)	Period Mean (μg/m^3)	Ratio
Kirkby	Local Authority	18.00	17.79	1.012
Warrington	AURN	16.15	15.95	1.012
Speke	AURN	15.15	15.09	1.004
			Average	1.009

Site period mean = 24.54 μg/m^3

Annual Mean= 24.54 x 1.009 = 24.8 μg/m^3

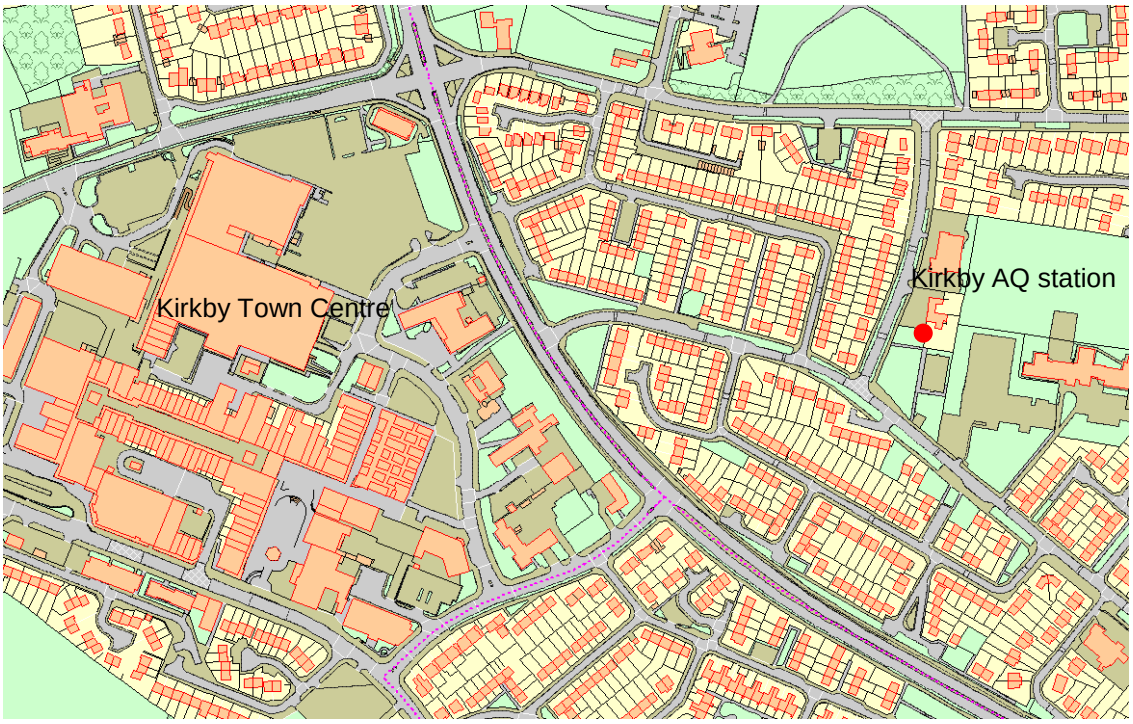
Annualisation of data for Particulate Matter <2.5 μm (Huyton)

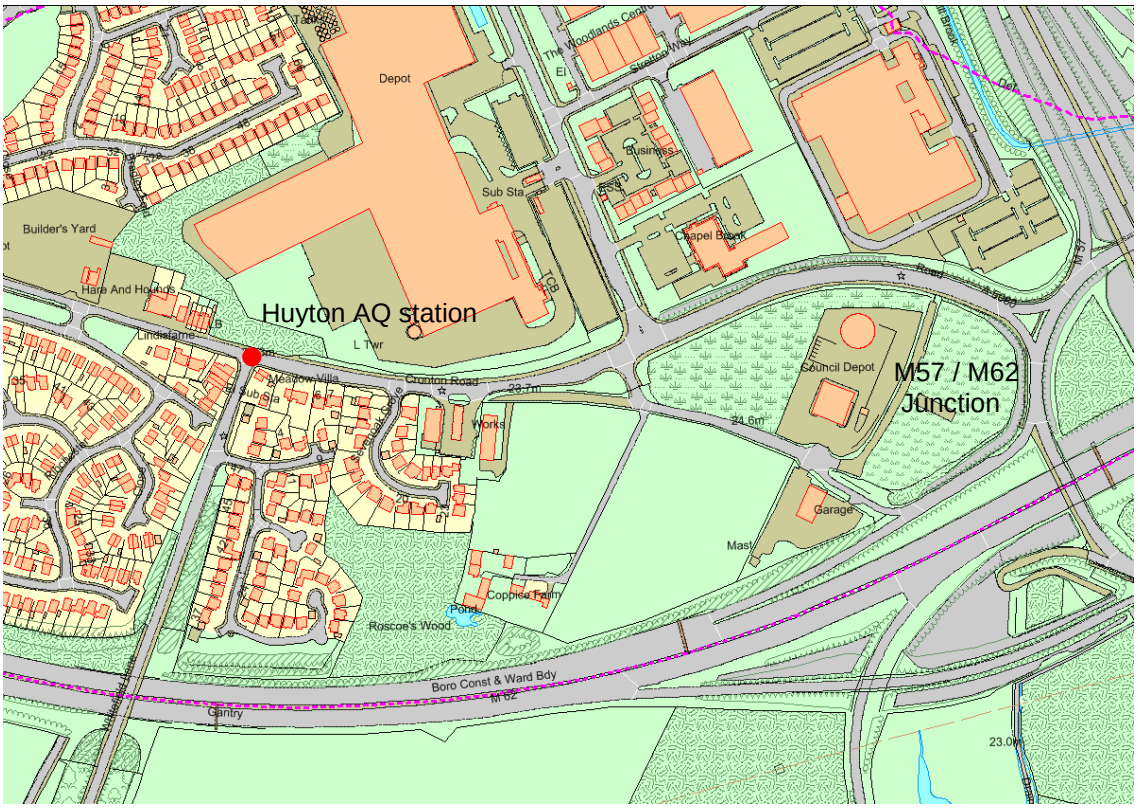
Site	Site Type	Annual Mean (μg/m^3)	Period Mean (μg/m^3)	Ratio
Kirkby	Local Authority	10.90	11.33	0.961
Warrington	AURN	10.59	10.56	1.002
Speke	AURN	10.05	9.62	1.045
			Average	1.003

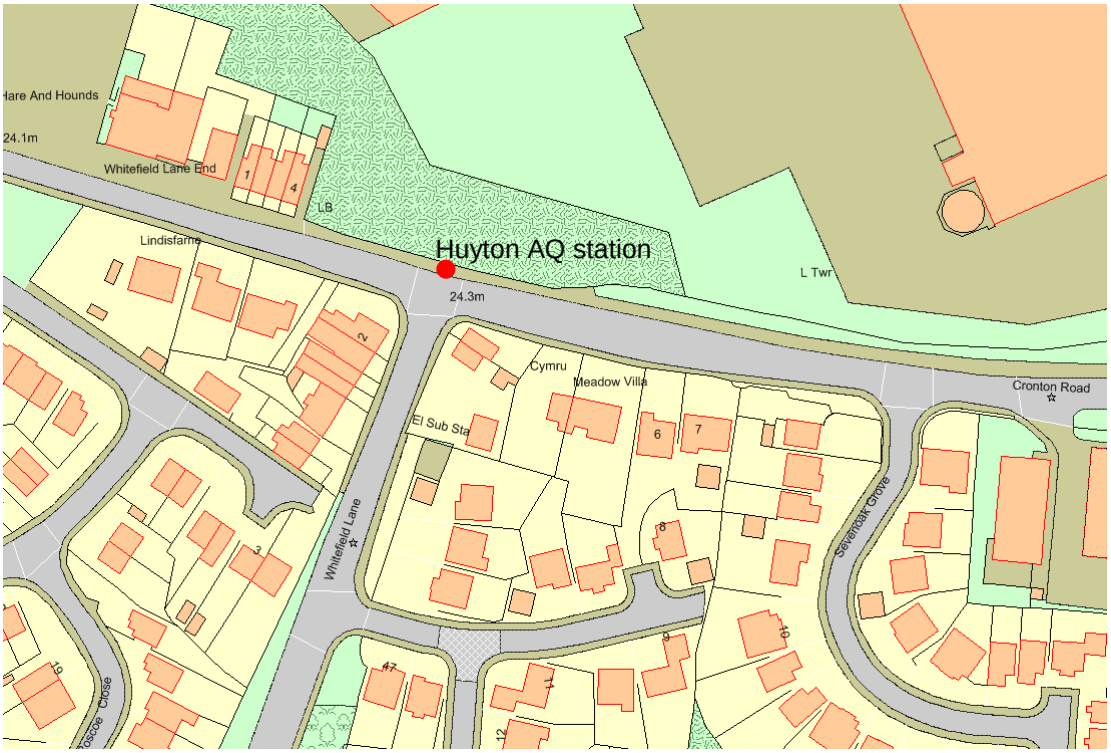
Site period mean = 11.10 μg/m^3

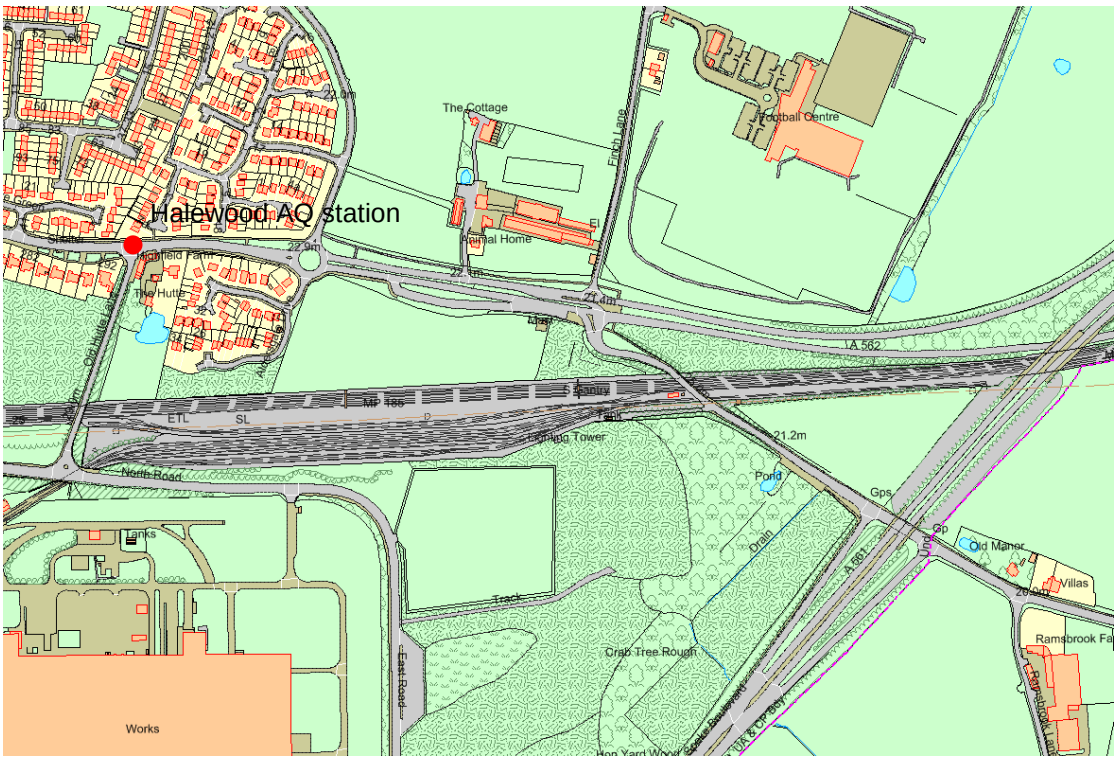
Annual Mean= 11.10 x 1.003 = 11.1 μg/m^3

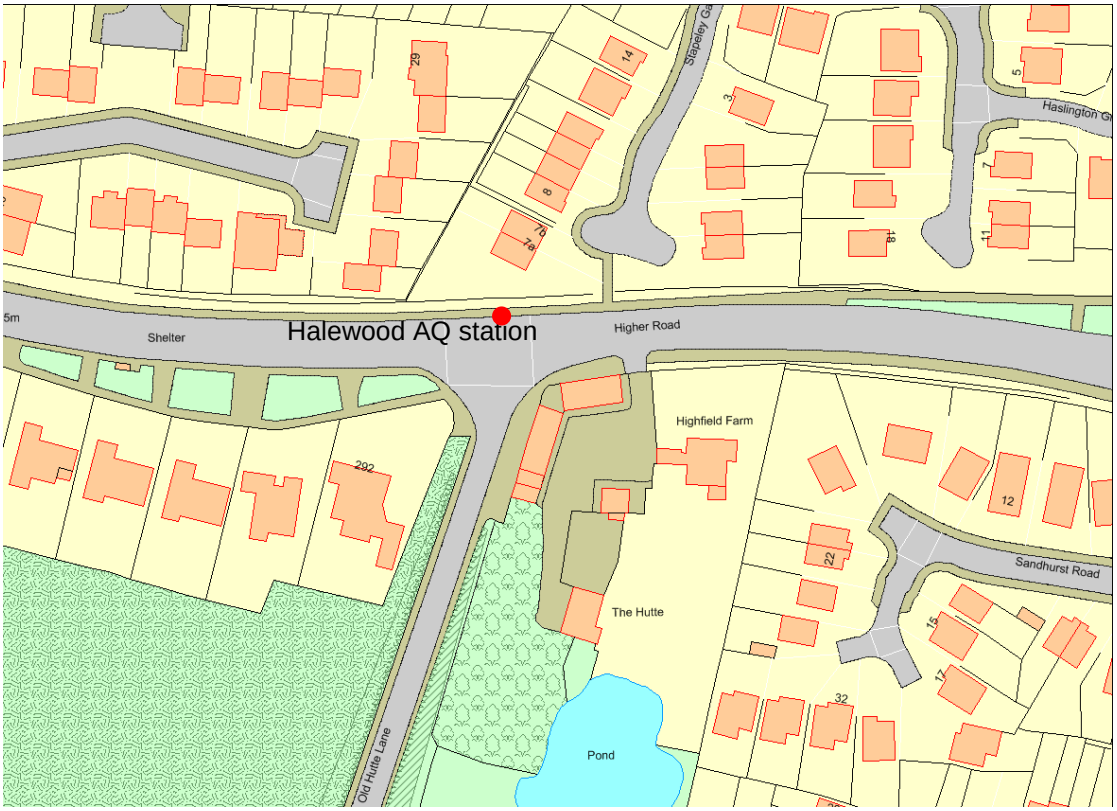
Appendix C: Map(s) of Monitoring Locations and AQMAs




Huyton AQ station
M57 / M62
Junction
Depot
Sub Sta
Builder's Yard
Hare And Hounds
Lindisfarne
L Twr
Meadow Villa
Cronton Road
23.7m
Works
Council Depot
24.6m
Garage
Mast
Coppice Farm
Pond
Roscoe's Wood
Boro Const & Ward Bdy
M 62
Gantry
23.0m
Chapel Brook
Business
Sub Sta


Hare And Hounds
24.1m
Whitefield Lane End
LB
Lindisfarne
Huyton AQ station
24.3m
L Twr
Cymru
Meadow Villa
Cronton Road
El Sub Sta
Whitefield Lane
Sevenoak Grove
Roscoe Close


Halewood AQ station
The Cottage
Football Centre
Finch Lane
Animal Home
Shelter
Highfield Farm
The Hutte
Old Hutte Lane
A 562
Stanley
MP 185
ETL
SL
Lighting Tower
21.2m
North Road
Pond
Gps
Gp
Old Manor
Villas
Lanks
Track
Drain
A 561
Crab Tree Rough
East Road
Works
Ramsbrook Fa


Halewood AQ station
Higher Road
Shelter
5m
Highfield Farm
The Hutte
Pond
Old Hutte Lane
Sandhurst Road
Haslington Gr
Wapeley Ga
292
62
14
8
7a
7b
3
5
7
18
11
12
22
32
17

Appendix D: Summary of Air Quality Objectives in England

Table E.1 – Air Quality Objectives in England

Pollutant	Air Quality Objective[4]	
	Concentration	Measured as
Nitrogen Dioxide (NO_2)	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean
	40 µg/m^3	Annual mean
Particulate Matter (PM_{10})	50 µg/m^3, not to be exceeded more than 35 times a year	24-hour mean
	40 µg/m^3	Annual mean
Sulphur Dioxide (SO_2)	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean

[4] The units are in microgrammes of pollutant per cubic metre of air (µg/m^3).

Glossary of Terms

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Abbreviation	Description
AQAP	Air Quality Action Plan - A detailed description of measures, outcomes, achievement dates and implementation methods, showing how the local authority intends to achieve air quality limit values'
AQMA	Air Quality Management Area – An area where air pollutant concentrations exceed / are likely to exceed the relevant air quality objectives. AQMAs are declared for specific pollutants and objectives
ASR	Air quality Annual Status Report
Defra	Department for Environment, Food and Rural Affairs
DMRB	Design Manual for Roads and Bridges – Air quality screening tool produced by Highways England
EU	European Union
FDMS	Filter Dynamics Measurement System
LAQM	Local Air Quality Management
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
PM_{10}	Airborne particulate matter with an aerodynamic diameter of 10µm (micrometres or microns) or less
$PM_{2.5}$	Airborne particulate matter with an aerodynamic diameter of 2.5µm or less
QA/QC	Quality Assurance and Quality Control
SO_2	Sulphur Dioxide
…	…

References

- DEFRA (2016) *Local Air Quality Management, Technical Guidance LAQM. TG(16)*

- Knowsley Council (2016) *Joint Strategic Needs Assessment Report (Environment)*

- Liverpool City Region Combined Authority (2015) *Sustainable Transport Enhancements Package*. http://www.merseytravel.gov.uk/about-us/local-transport-delivery/Pages/STEP.aspx