



2013 Air Quality Progress Report for **North Lincolnshire Council**

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

April 2013

Local Authority	North Lincolnshire Council
Local Authority Officer	Ayan Chakravartty
Department	Environmental Health (Commercial), Technical and Environment Services
Address	Church Square House Scunthorpe North Lincolnshire DN15 6XQ
Telephone	01724 297617
e-mail	ayan.chakravartty@northlincs.gov.uk
Date	30/04/2013

Executive Summary

The 2013 Progress Report highlighted that there are no new locations that breach the air quality objectives applicable to LAQM in England as set out in the Air Quality (England) Regulations 2000 (SI 928) and the Air Quality (England) (Amendment) Regulations 2002 (SI 3043). This report reconsiders all potential sources of pollution primarily industry and traffic related sources. The main purpose of the report is to identify those aspects that have changed since completion of the 2012 Updating & Screening Assessment.

Continuing problems have been highlighted within the local area relating to PM₁₀ daily mean exceedences which previously resulted in the declaration of two Air Quality Management Areas (AQMA) as below:

- 2005 Scunthorpe AQMA for breaches of PM₁₀ daily mean objective.
- 2008 Low Santon AQMA for breaches of the PM₁₀ annual mean objective.

Data from 2012 has shown an overall improvement at the relevant monitoring sites but the report suggests that any improvement should be met with caution because of changing meteorological conditions and reductions in steel production. Early indications from 2013 data have shown that monitoring sites around the Integrated Steelworks have exceeded the daily mean objective on a considerable number of days already.

All other sources assessed have not met the criteria required to proceed to a detailed assessment. These will be assessed again in the 2014 Progress Report to ensure that they do not have a detrimental effect on the air quality of North Lincolnshire.

Table of Contents

1	Introduction	6
1.1	Description of Local Authority Area	6
1.2	Purpose of Progress Report	6
1.3	Air Quality Objectives	7
1.4	Summary of Previous Review and Assessments	8
2	New Monitoring Data	17
2.1	Summary of Monitoring Undertaken	17
2.2	Comparison of Monitoring Results with Air Quality Objectives	34
3	New Local Developments	64
4	Local / Regional Air Quality Strategy	65
5	Air Quality Planning Policies	66
6	Local Transport Plans and Strategies	68
7	Climate Change Strategies	70
8	Implementation of Action Plans	71
9	Conclusion	78
9.1	Conclusions from New Monitoring Data	78
9.2	Conclusions relating to New Local Developments	78
9.3	Proposed Actions	78
10	References	79
11	Appendix 1: QA:QC Data	80

List of Tables

Table 1.1: Air Quality Objectives included in Regulations for the purpose of LAQM in England	7
Table 1.2: List of previous reports produced by North Lincolnshire Council	8
Table 2.1: Details of automatic monitoring sites	23
Table 2.2: Details of Non- Automatic Monitoring Sites	31
Table 2.3: Results of Automatic Monitoring for NO ₂ : Comparison with Annual Mean Objective	37
Table 2.4: Results of Automatic Monitoring for NO ₂ : Comparison with 1-hour Mean Objective	38
Table 2.5: Results of NO ₂ Diffusion Tubes 2012	39
Table 2.6: Results of NO ₂ Diffusion Tubes (2008 to 2012)	42
Table 2.7: Results of Automatic Monitoring for PM ₁₀ : Comparison with Annual Mean Objective	52
Table 2.8: Results of Automatic Monitoring for PM ₁₀ : Comparison with 24-hour Mean Objective	55
Table 2.9: Results of Automatic Monitoring for SO ₂ : Comparison with Objectives	60
Table 2.10: Heavy metal monitoring results for 2012 calendar year	61
Table 2.11: PAH monitoring results for 2012 calendar year	62
Table 8.1: Action Plan Progress	71
Table 11.1: Factors from local co-location studies	80
Table 11.2: Checking the diffusion tube precision and accuracy from co-location study	81

List of Figures

Figure 1-1: 2005 Scunthorpe Town AQMA Boundary	16
Figure 1-2: 2008 Low Santon AQMA Boundary	16
Figure 2-1: All Automatic monitoring location	20
Figure 2-2: Automatic Monitoring Stations (AQMA)	21
Figure 2-3: Automatic monitoring location (Killingholme)	22
Figure 2-4: Diffusion tube monitoring location	25
Figure 2-5: Diffusion Tube (Humberside International Airport)	26
Figure 2-6: Diffusion tube (AQMA)	27
Figure 2-7: Diffusion tube (Barton)	28
Figure 2-8: Diffusion Tube (Brigg)	29
Figure 2-9: Diffusion tube (South Killingholme)	30
Figure 2-10: Trends in Annual Mean NO ₂ Concentrations Measured at Automatic Monitoring Sites	34
Figure 2-11: Time series plot for NO ₂ automatic monitoring	36
Figure 2-12: Time variation plot for sites with automatic NO ₂ monitoring unit	36
Figure 2-13: Location of tube DT21 and DT22 at South Killingholme	45
Figure 2-14: Expected reduction in annual mean nitrogen dioxide concentration with distance from the Kerb	46
Figure 2-15: Bivariate polar plot of concentrations at the Santon Monitoring site	47
Figure 2-17: Calendar Plot showing the daily mean and wind direction for that day	49
Figure 2-18: PM ₁₀ time variation plot for wind direction between 135° to 280°	50
Figure 2-19: Total monthly rainfall in mm	50
2-20: Time series for all TEOM sites for 2012 calendar year	51
Figure 2-21: Trends in Annual Mean PM ₁₀ Concentrations	54
Figure 2-22: Trends Daily Mean Exceedences for PM ₁₀ Concentrations	57
Figure 2-23: Timeseries plot showing PM ₁₀ and Rainfall in different axis	58
Figure 5-1: 2010 AQMA Zone Map	66

1 Introduction

1.1 Description of Local Authority Area

North Lincolnshire is an area of around 85,000 hectares located on the southern side of the Humber estuary and occupying tracts of land on either side of the River Trent. Parliamentary Order created the administrative area of North Lincolnshire in March 1995 and on 1st April 1996 the new Unitary Authority area of North Lincolnshire came into being. North Lincolnshire covers a large, mainly agricultural area. The pattern of settlements in the area reflects this with market towns surrounded by many small villages. An important exception to this is the substantial urban area of Scunthorpe and the adjoining town of Bottesford. More than half of North Lincolnshire's population, approximately 89,260 people out of 167,446 total populations (2011 Census data), live in Scunthorpe and the adjacent town of Bottesford. Overall, according to 2011 Census data 85 percent of the population live in this main urban area and other towns. The local economy of North Lincolnshire was built on traditional industries such as steel manufacturing and related industries and agriculture. More recently there has been the establishment of two oil refineries and the introduction of several gas fired power stations. The M180 motorway and several primary and strategic routes, including the A18 and A15, are located within North Lincolnshire. By rail there are regular freight movements to and from Scunthorpe Steelworks and Humber port related industries. With several wharf facilities along the banks of the Humber and the Trent, North Lincolnshire is well positioned to take advantage of water transport.

1.2 Purpose of Progress Report

This report fulfils the requirements of the Local Air Quality Management process as set out in Part IV of the Environment Act (1995), the Air Quality Strategy for England, Scotland, Wales and Northern Ireland 2007 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 exceedences are considered likely, the local authority must then 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.

Progress Reports are required in the intervening years between the three-yearly Updating and Screening Assessment reports. Their purpose is to maintain continuity in the Local Air Quality Management process. They are not intended to be as detailed as Updating and Screening Assessment Reports, or to require as much effort. However, if the Progress Report identifies the risk of exceedence of an Air Quality Objective, the Local Authority (LA) should undertake a Detailed Assessment immediately, and not wait until the next round of Review and Assessment.

1.3 Air Quality Objectives

The air quality objectives applicable to LAQM in England are set out in the Air Quality (England) Regulations 2000 (SI 928), The Air Quality (England) (Amendment) Regulations 2002 (SI 3043), and are shown in Table 1.1. This table shows the objectives in units of micrograms per cubic metre $\mu\text{g}/\text{m}^3$ (milligrams per cubic metre, mg/m^3 for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

Table 1.1: Air Quality Objectives included in Regulations for the purpose of LAQM in England

Pollutant	Air Quality Objective	Measured as	Date to be achieved by
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2010
1,3-Butadiene	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
Carbon monoxide	10 mg/m^3	Running 8-hour mean	31.12.2003
Lead	0.50 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
	0.25 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2008
Nitrogen dioxide	200 $\mu\text{g}/\text{m}^3$ not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2005
Particulate Matter (PM ₁₀) (gravimetric)	50 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	24-hour mean	31.12.2004
	40 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2004
Sulphur dioxide	350 $\mu\text{g}/\text{m}^3$, not to be	1-hour mean	31.12.2004

Pollutant	Air Quality Objective	Measured as	Date to be achieved by
	exceeded more than 24 times a year		
	125 µg/m ³ , not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m ³ , not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

Under the Part IV of the Environment Act (1995) local authorities are required to review local air quality within their designated areas and assess whether any pollutants pose any risk of breaching air quality objectives. If it is predicted that these health based air quality objectives will not be achieved than an Air Quality Management Area must be declared.

Table 1.2 below shows a list of previous reports produced by North Lincolnshire Council as part of the Review and Assessment process.

Table 1.2: List of previous reports produced by North Lincolnshire Council

Report Number	Type of Report	Pollutants considered	Year produced	Outcome
1	Updating and Screening Assessment	Carbon Monoxide, Benzene, 1,3-Butadiene, Lead, Nitrogen Dioxide, Sulphur Dioxide, PM ₁₀	2003	<ul style="list-style-type: none"> Suggested a detailed PM₁₀ assessment
2	Detailed Assessment	Benzene, Sulphur Dioxide, Particulate Matter	2004	<ul style="list-style-type: none"> Suggested further data required for Benzene and Sulphur Dioxide. Recommended an AQMA shall be declared in Scunthorpe for breaching PM₁₀ exceedences
3	Detailed Assessment	Benzene	2005	<ul style="list-style-type: none"> Monitoring showed concentration within acceptable limit, therefore no further

Report Number	Type of Report	Pollutants considered	Year produced	Outcome
				action required
4	Progress Report	Benzene, Nitrogen Dioxide, Sulphur Dioxide, PM ₁₀ , PAH's	2005	<ul style="list-style-type: none"> Suggested Further Benzene diffusion tube survey for 12 months Identified two locations in Scunthorpe likely to breach PM₁₀ air quality objective for declaration of AQMA
5	Updating and Screening Assessment	Carbon Monoxide, Benzene, 1,3-butadiene, Lead, Nitrogen Dioxide, Sulphur Dioxide, PM ₁₀	2006	<p>Proposed detailed assessment required for:</p> <ul style="list-style-type: none"> 1,3-butadiene at North killingholme Lead at TATA Steelworks Nitrogen dioxide diffusion tube at Doncaster Rd / Hilton Avenue, Scunthorpe, Junction of Brigg Road and A18, Mortal Ash, Scunthorpe
6	Detailed Assessment	PM ₁₀	2008	<ul style="list-style-type: none"> Confirmed PM₁₀ objective has been breached in the vicinity of Low Santon TEOM monitoring station
7	Further Assessment	PM ₁₀	2008	<ul style="list-style-type: none"> Concluded PM₁₀ concentration level remained non compliant
8	Progress Report	Carbon Monoxide, Benzene, 1,3-butadiene, Lead, Nitrogen Dioxide, Sulphur Dioxide, PM ₁₀ , Heavy Metals, Ozone, PAH's, PM2.5	2008	<ul style="list-style-type: none"> Suggested NO₂ concentration within Killingholme had decreased
9	Updating and Screening Assessment	Carbon Monoxide, Benzene, 1,3-butadiene, Lead, Nitrogen	2009	<ul style="list-style-type: none"> The USA highlighted no new areas of non compliance. Report highlighted that the existing problem with PM₁₀ breaches within

Report Number	Type of Report	Pollutants considered	Year produced	Outcome
		Dioxide, Sulphur Dioxide, PM ₁₀		Scunthorpe AQMA's still on going
10	Progress Report	Carbon Monoxide, Benzene, 1,3-butadiene, Lead, Nitrogen Dioxide, Sulphur Dioxide, PM ₁₀	2010	<ul style="list-style-type: none"> No new exceedences found but highlighted the continuing issue with PM₁₀ exceedences which resulted declaration of two AQMA within Scunthorpe
11	Further Assessment	PM ₁₀	2010	<ul style="list-style-type: none"> Highlighted the number of factors likely to influence the elevated concentrations recorded at the Low Santon Monitoring site
12	Progress Report	Carbon Monoxide, Benzene, 1,3-butadiene, Lead, Nitrogen Dioxide, Sulphur Dioxide, PM ₁₀	2011	<ul style="list-style-type: none"> Highlighted a new exceedence due to potential breach of nitrogen dioxide in South Killingholme area and suggested detailed assessment
13	Updating and Screening Assessment	Carbon Monoxide, Benzene, 1,3-butadiene, Lead, Nitrogen Dioxide, Sulphur Dioxide, PM ₁₀	2012	<ul style="list-style-type: none"> No new exceedences found but highlighted the continuing issue with PM₁₀ exceedences which resulted declaration of two AQMA's within Scunthorpe

Previous rounds of review and assessment have led to a number of focused assessments of different pollutants and sources. Summaries of the assessment findings are as follows:

1.4.1 Updating & Screening Assessment 2003

Results of monitoring and the screening exercises in this Review & Assessment, proposed that a detailed assessment of PM₁₀ would be conducted in relation to the following:

- Industrial emissions of PM₁₀ in Scunthorpe.
- Emissions of PM₁₀ from quarries and landfills in Barnetby.
- Emissions of PM₁₀ and SO₂ from domestic solid fuel burning in Keadby.
- Industrial emissions of SO₂ in Killingholme
- Industrial emissions of Benzene in Killingholme and Scunthorpe

1.4.2 Detailed Assessment 2004

Continuing on from the 2003 USA, recommendations for each pollutant were as follows:

Benzene

To gather further data in both Scunthorpe and Killingholme and review and report findings in the next annual Progress Report.

Sulphur Dioxide

To gather further data at Keadby and review and report findings in the next annual Progress Report. No further action was required in respect of sulphur dioxide at Killingholme. No further action was required in connection with stationary railway locomotives at Scunthorpe Station.

PM₁₀

An Air Quality Management Area or Areas shall be defined and then designated for the Scunthorpe area where there is likely exceedence of the Air Quality Objectives. Gather additional PM₁₀ data at Keadby and subsequently review and report conclusions in the next annual Progress Report. No further action is required in respect of PM₁₀ in Croxton/Barnetby.

1.4.3 Benzene Detailed Assessment 2005

The annual mean of benzene concentrations at relevant locations did not exceed the 2010 objective, although at one location at Santon, Scunthorpe some monthly concentrations did exceed 5µg/m³ and consequently further investigations were

required. The monthly concentrations at certain boundary locations were greater than $5\mu\text{g}/\text{m}^3$ at installations in Scunthorpe and Killingholme, however where there were no relevant receptors and exposure is unlikely to effect human health, no further investigation was required in relation to air quality assessment.

1.4.4 Progress Report 2005

From the results of the monitoring data in this Progress Report, it was proposed that the following actions be implemented; A benzene diffusion tube survey would continue for a further 12-month period commencing March 2005 at two sites in Scunthorpe identified as having the potential to breach the 2010 annual mean objective of $5\mu\text{g}/\text{m}^3$. The two locations identified in Scunthorpe as likely to breach the annual mean air quality objective for nitrogen dioxide of $40\mu\text{g}/\text{m}^3$, a chemiluminescence NO_x analyser was installed.

The council will declare an Air Quality Management Area for PM_{10} in Scunthorpe, in relation to the 24 hour mean objective of $50\mu\text{g}/\text{m}^3$ not to be exceeded more than 35 times a year, and continue with the further assessment work to determine the relative contributions of different sources of PM_{10} .

1.4.5 Updating & Screening Assessment 2006

From the results of the monitoring and the screening exercises in this Review & Assessment, it was proposed that detailed assessments would be conducted in relation to the following: -

- Industrial emissions of 1,3-butadiene in the vicinity of the Conoco Phillips Ltd and Total UK Ltd Oil Ltd Refineries, North Killingholme.
- Industrial emissions of Lead in the vicinity of the Corus (UK) Ltd Integrated Steelworks, Scunthorpe.
- Emissions of Nitrogen Dioxide in the vicinity of Doncaster Rd / Hilton Avenue, Scunthorpe, Junction of Brigg Road and A18, Mortal Ash, Scunthorpe

1.4.6 Detailed Assessment PM_{10} in Scunthorpe 2008

The results presented indicate that the annual PM_{10} objective has been breached in the vicinity of the Low Santon TEOM monitoring station in 2006 and 2007. The mean

concentration recorded between October and December 2005 was also greater than $40 \mu\text{g}/\text{m}^3$.

1.4.7 Further Assessment of PM₁₀ in Scunthorpe 2008

Further assessment of past monitoring data recorded at continuous sites within the AQMA Scunthorpe shows levels remain non-compliant with the short-term objective. The Council has no current plans to move the monitors within the AQMA.

1.4.8 Progress Report 2008

The progress report concluded that NO₂ concentrations within Killingholme had decreased and there had been no significant changes to road traffic flows or other transportation.

1.4.9 Updating & Screening Assessment 2009

The Updating & Screening Assessment 2009 highlighted no new areas of non-compliance. Existing problems such as the ongoing issues with the Integrated Steel Works were again noted and are due to be addressed within forthcoming Further Assessments and Action Plans.

1.4.10 Progress Report 2010

The 2010 Progress Report did not highlight any new exceedences of the air quality objectives. The report reconsidered all potential sources of pollution (primarily industry and traffic related sources) with respect to PM₁₀ (particulate matter), nitrogen dioxide, sulphur dioxide & benzene.

Continuing problems have been highlighted within the local area relating to PM₁₀ and at present have resulted in the declaration of two Air Quality Management Areas; (AQMA)

- 2005 Scunthorpe AQMA for breaches of PM₁₀ daily mean objective.
- 2008 Low Santon AQMA for breaches of the PM₁₀ annual mean objective.

Problems persisted at both of these locations although improvements are beginning to show. Daily objective breaches are becoming less frequent throughout the AQMA although East Common Lane and Santon, which surround the Integrated Steelworks site, still exceed the objective. The annual mean objective at Santon has also seen a

decrease since 2006 and the application of the Volatile Correction Model in 2008 has resulted in the site being compliant. These results should be treated with caution due to the downturn in the manufacturing industry and the relevance of the VCM FDMS correction which up until 2010 was taken from over 100km away.

1.4.11 Further Assessment of PM₁₀ at Low Santon

This Further Assessment was undertaken because of continued exceedences of the Annual Mean Objective of 40µg/m³ at Low Santon, Scunthorpe. Because of this an Air Quality Management Area was declared on the 10th December 2008.

The study looked at a number of factors likely to influence the elevated concentrations being recorded at Low Santon including:

- Location of the monitoring stations
- Method of measurement
- Historical MET data
- Particle size fractions
- Relationships with other pollutants
- Triangulation with other monitoring stations
- Directional analysis

The study also reviewed ongoing work designed to inform interested parties of exceedance risk and ongoing area contributions including:

- North Lincolnshire Council Tea Break Report
- North Lincolnshire Council Daily Review Analysis
- North Lincolnshire Council PM₁₀ Alert System
- North Lincolnshire Council Low Santon PM₁₀ Risk Assessment
- AEA Low Santon Modelling Report
- Environment Agency PM₁₀ Action Plan

1.4.12 Progress Report 2011

The 2011 Progress Report highlighted a new exceedance of the air quality objectives. The report reconsidered all potential sources of pollution (primarily industry and traffic related sources) with respect to PM₁₀ (particulate matter), nitrogen dioxide, sulphur dioxide & benzene. Additional NO₂ tubes identified a potential exceedance along the

A160 Road in South Killingholme. This is currently being investigated. Problems persisted within the two declared AQMA's:

- 2005 Scunthorpe AQMA for breaches of PM₁₀ daily mean objective.
- 2008 Low Santon AQMA for breaches of the PM₁₀ annual mean objective.

Low Santon demonstrated an improvement on previous years but was still well in excess of the Daily Mean Objective. Sites within Scunthorpe recorded compliant results for both Objectives.

1.4.13 Updating & Screening Assessment 2012

This report considers all potential sources of air pollution within North Lincolnshire which are made up primarily of industrial and traffic sources. Continuing problems have been highlighted within the local area relating to PM₁₀ which has previously resulted in the declaration of two Air Quality Management Areas (AQMA):

- 2005 Scunthorpe AQMA for breaches of PM₁₀ daily mean objective.
- 2008 Low Santon AQMA for breaches of the PM₁₀ annual mean objective.

2011 PM₁₀ data has shown an overall increase in the number of exceedences across the network due to unusual meteorological conditions throughout the year 2011.

A potential new exceedance of the air quality objective for NO₂ was identified at South Killingholme in the 2011 Progress Report. A Detailed Assessment of this location is currently being prepared and will be sent to DEFRA when finalised. All other sources assessed have not met the criteria required to proceed to a Detailed Assessment.

1.4.14 North Lincolnshire Council Air Quality Management Areas

North Lincolnshire Council has declared two Air Quality Management areas as below due to the continuing problems relating to PM₁₀ air quality objective breaches:

- 2005 Scunthorpe AQMA for breaches of PM₁₀ daily mean objective (Figure 1.1).
- 2008 Low Santon AQMA for breaches of the PM₁₀ annual mean objective (Figure 1.2).

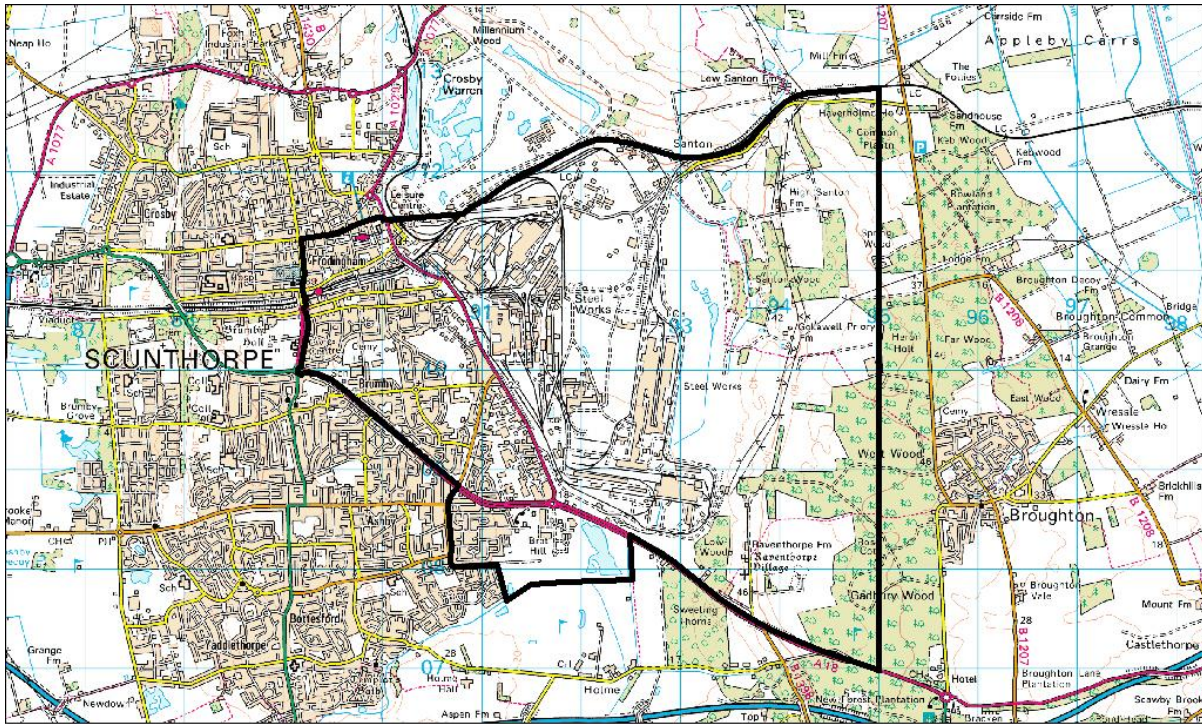


Figure 1-1: 2005 Scunthorpe Town AQMA Boundary

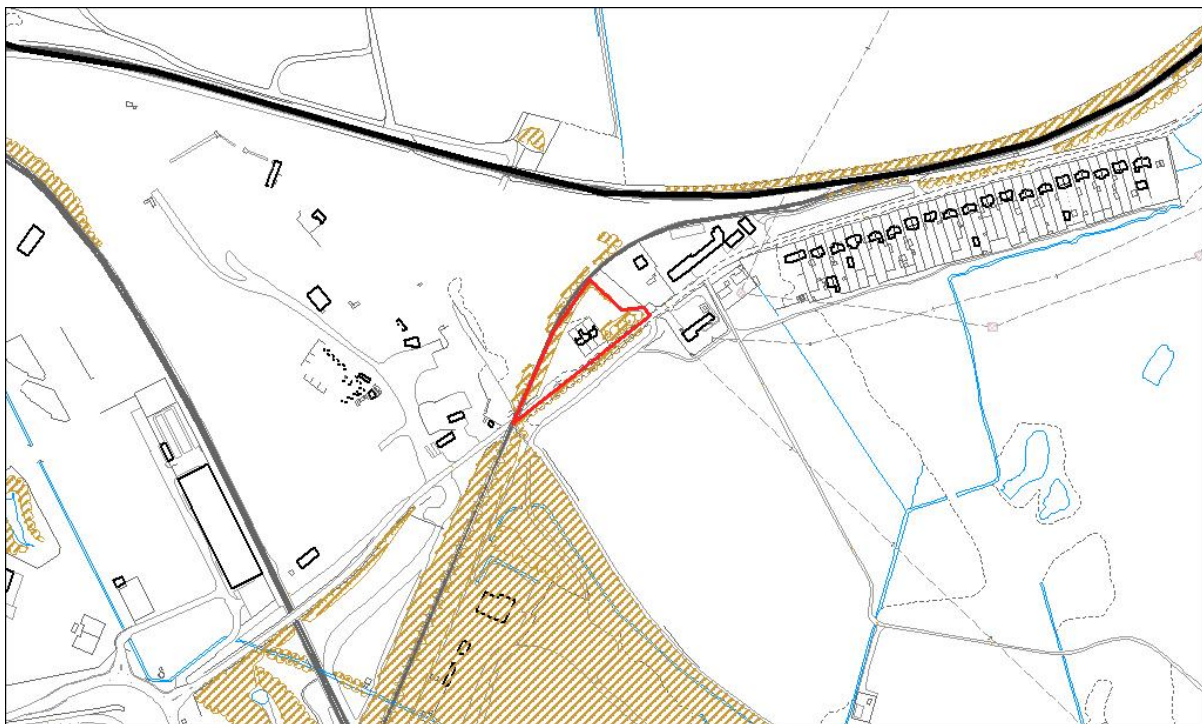


Figure 1-2: 2008 Low Santon AQMA Boundary

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

1. Scunthorpe Town AURN (Rowland Road)

This monitoring station is housed within an enclosed air-conditioned unit in the northeast of Scunthorpe approximately 10 metres to the north of Rowland Road. The nearest busy road is Brigg Road (A1029), at its closest point it is 124 metres to the northeast of the monitoring site. The monitoring equipment at the station consists of an Enviro-Technology Services model 100A Fluorescent sulphur dioxide (SO₂) analyser, a Monitor Labs Inc ML9841B oxides of nitrogen chemi-luminescence analyser and a Rupprecht & Patterschnick TEOM 1400a PM₁₀ monitor. The logging system used is an Odessa DSM3260. In addition wind direction and wind speed are measured at this site. The PM₁₀, NO_x and SO₂ analysers are affiliate members of the AURN (Automatic and Urban Rural Network). The site also comprises of an equivalent Partisol Particulate Monitor (Now Suspended 31/03/2010), a National Physical Laboratory funded Heavy Metals sampler and a Digital DHA-80 High volume PAH sampler. An FDMS C was installed in the Monitoring Station in January 2010 designed to increase confidence in the Volatile Correction Model currently used to correct the TEOM network.

2. East Common Lane

PM₁₀ is monitored at this site using a TEOM 1400a. This site is located behind a block of flats, 34m south of East Common Lane, to the west of the site is a residential area; whilst to the northeast and southeast are several industrial estates. The site is approximately 500 m west of the steelworks site boundary.

3. Low Santon

This monitoring station is housed within an enclosed air-conditioned unit to the north east of Scunthorpe on the eastern boundary of the steelworks. Dawes Lane is 5m to the south of the station, running from a rural location in the east through the steelworks and into Scunthorpe. A raised embankment 5m north of the site carries freight traffic along one of the major rail lines into the steelworks. The surrounding area consists of arable fields with a number of trees and to the east, a small

residential area. The monitoring equipment at this station consists of a Signal Ambitech Ambirak analyser, monitoring sulphur dioxide and oxides of nitrogen, and a Rupprecht & Patterschnick TEOM 1400a monitoring PM₁₀. In addition, a Digitel DHA-80 High volume PAH sampler began operation at the site in September 2007. A Partisol 2000 was installed in April 2008 to measure concentrations of heavy metals. Further to this an additional Rupprecht & Patterschnick TEOM 1400a was installed in June 2008 to monitor PM_{2.5}. An FDMS C was installed in the Monitoring Station in March 2010 designed to increase confidence in the Volatile Correction Model currently used to correct the TEOM network and to aid the Further Assessment at Low Santon.

4. High Santon

This monitoring station is located in a domestic garden 400m from the Low Santon monitoring station. The site comprises of a Partisol 2000 equivalent particulate monitor and was installed in January 2008.

5. Redbourn Club

PM₁₀ is monitored at this site using a TEOM 1400a. Redbourn Club is a sports and social club situated 1km from the boundary of the local Integrated Steelworks. The monitoring station is sited away from buildings and trees close to the boundary of the clubs cricket pitch.

6. Lakeside

The Lakeside monitoring station sits within a newly built housing development 600m to the South of the local Integrated Steelworks. Its placement was due to the introduction of receptors close to the boundary of the steel making facility. It is sited within the front garden of a house.

7. Appleby Village

This site is located on a playing field in the village of Appleby, see figure 1.4; the village is surrounded by arable fields and open fields and is 6 km northeast of Scunthorpe. PM₁₀ is monitored at this site using a TEOM 1400a.

8. Killingholme

The site is located within the grounds of South Killingholme Primary School and is approximately 200m north of the dual-carriage A160; see figure 2.3. Two refineries

are located to the northeast and east of the site. The site is approximately 4 km west of the River Humber and the Immingham docks. The site is approximately 20 km east of the Air Quality Management Area in Scunthorpe. Sulphur dioxide, oxides of nitrogen and PM₁₀ are the three pollutants measured at this site. In addition wind direction and speed, relative humidity, pressure and temperature are also measured. A pumped Benzene Tube was installed in September 2008 as part of the National Hydrocarbon Network.

The following figures 2.1 to 2.3 below show the location of the North Lincolnshire Council automatic monitoring stations and table 2.1 shows the details of the automatic monitoring stations.

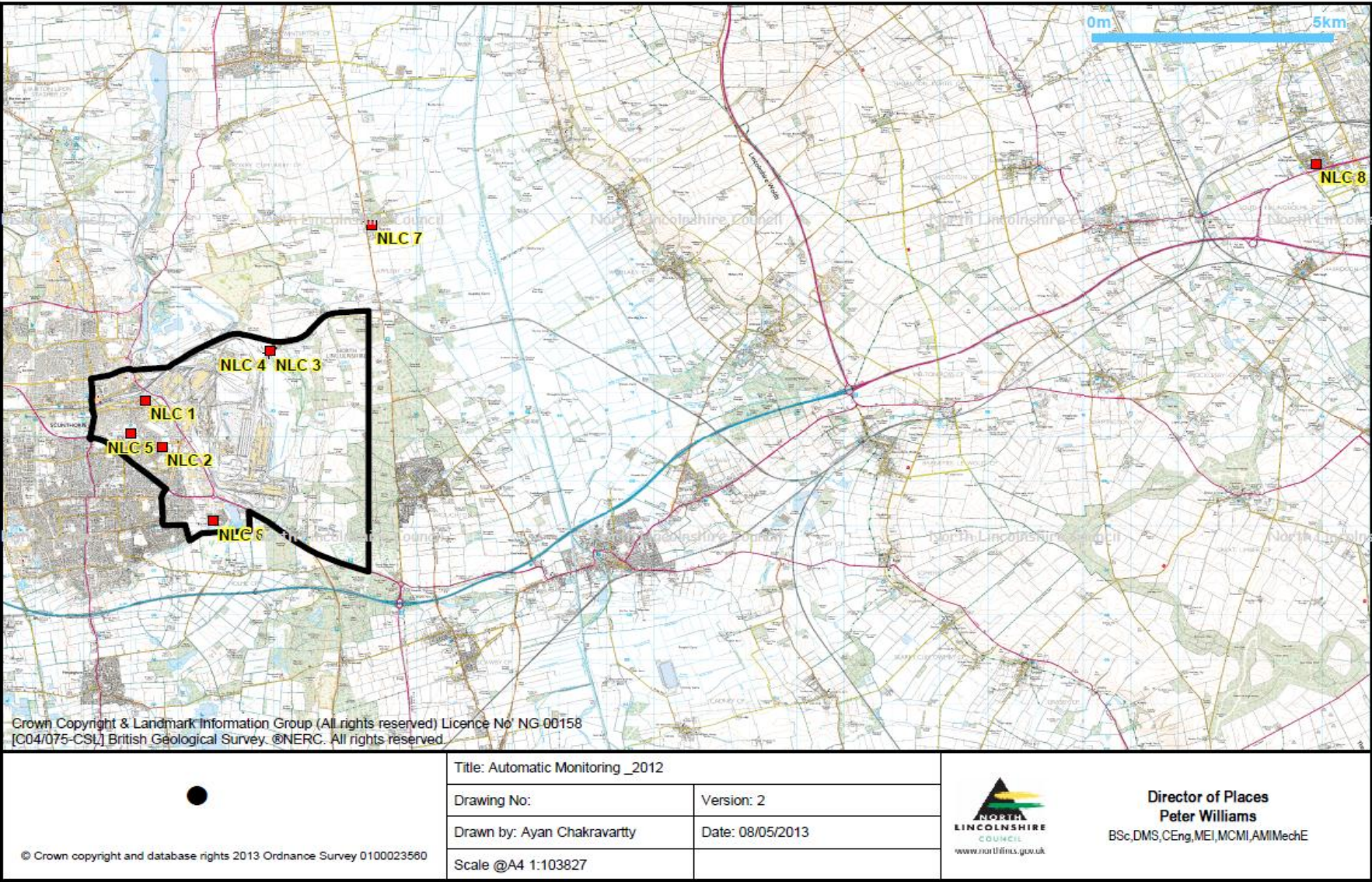


Figure 2-1: All Automatic monitoring location

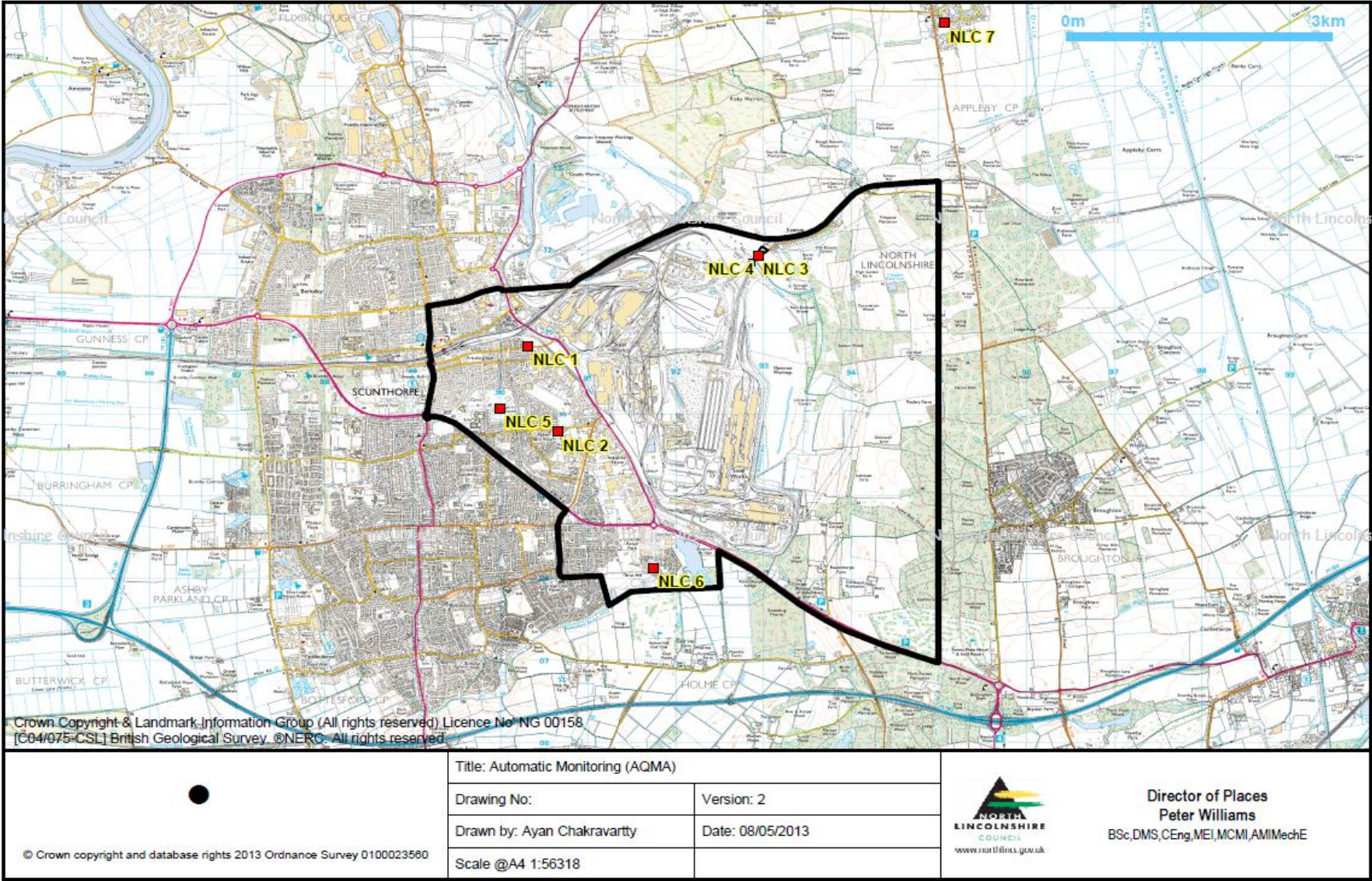


Figure 2-2: Automatic Monitoring Stations (AQMA)

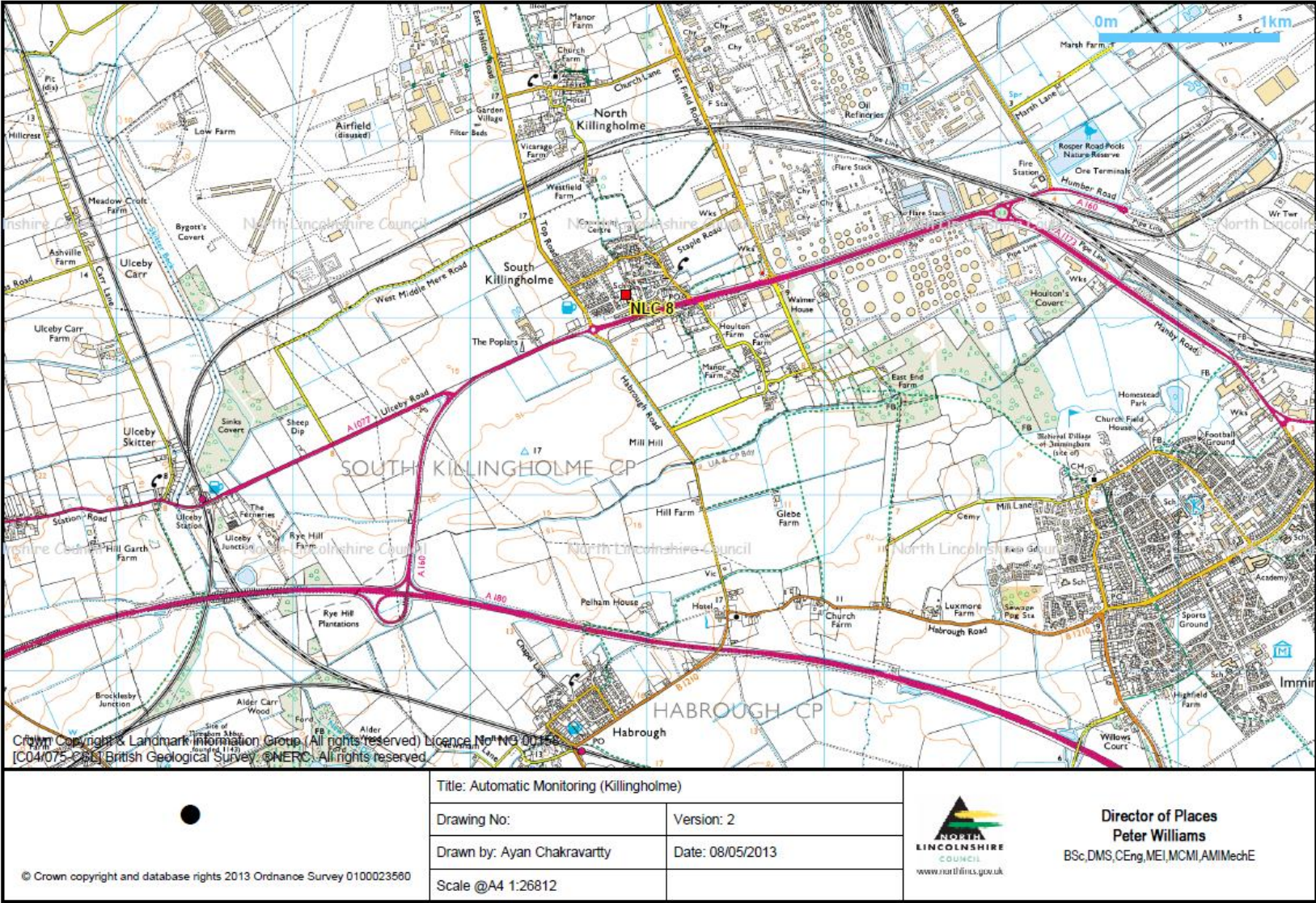


Figure 2-3: Automatic monitoring location (Killingholme)

Table 2.1: 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	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Does this location represent worst-case exposure?
NLC 1	Scunthorpe Town (AURN)	Urban Industrial	490320	410831	PM ₁₀ , SO ₂ , NO ₂	Yes	FDMS, TEOM, Gas	Y (21m)	7m	N
NLC 2	East Common Lane	Urban Industrial	490663	409789	PM ₁₀	Yes	TEOM	Y (3m)	28m	N
NLC 3	Low Santon	Industrial	492945	411931	PM ₁₀ , SO ₂ , NO ₂	Yes	FDMS, TEOM, Gas	Y (41m)	5m	N
NLC 4	High Santon	Industrial	492945	411931	PM ₁₀	Yes	Partisol	Y (8m)	5m	N
NLC 5	Redbourn Club	Urban	490002	410069	PM ₁₀	Yes	TEOM	Y (15m)	N/A	N
NLC 6	Lakeside	Urban Industrial	491750	408127	PM ₁₀	Yes	TEOM	Y (4m)	8m	N
NLC 7	Appleby	Rural	495075	414767	PM ₁₀	No	TEOM	Y (17m)	N/A	N
NLC 8	Killingholme	Urban Industrial	514880	416133	PM ₁₀ , SO ₂ , NO ₂	No	TEOM, Gas	Y (9m)	N/A	N

2.1.2 Non-Automatic Monitoring Sites

North Lincolnshire Council operated a nitrogen dioxide diffusion tube network consisting of 36 sites in 2011. The number of tubes has been reduced in 2012 to 23; the tubes which have been removed have demonstrated compliance over a number of years.

The diffusion tubes are supplied and analysed by Environmental Scientifics Group (ESG). Each diffusion tube samples have been analysed in accordance with ESG's standard operating procedure HS/WI/1015 issue 15. This method meets the guidelines set out in DEFRA's 'Diffusion Tubes for Ambient NO₂ Monitoring: Practical Guidance.

The tubes were prepared by spiking acetone:triethanolamine (50:50) onto the grids prior to the tubes being assembled. The tubes were desorbed with distilled water and the extract analysed using a segmented flow autoanalyser with ultraviolet detection.

North Lincolnshire Council has followed the guidance in relation to applying a bias adjustment calculation. Only one collocation study was conducted within North Lincolnshire in 2012 at Scunthorpe Town AURN site. The bias adjustment was calculated using data from Scunthorpe Town NO₂ triplicate study and the collocated AURN chemiluminescence NO_x analyser. Data capture for the AURN site over the period was good for both the automatic and non-automatic methods allowing for the local bias to be applied.

A summary of precision results for nitrogen dioxide diffusion tube collocation studies indicates that Environmental Scientific Group operates to a high level of precision in accordance with the Laboratory Workplace Analysis Scheme for Proficiency, (WASP) scheme. This can be viewed in the appendix of this document.

The following figures 2.4 to 2.9 below show the location of North Lincolnshire Council non-automatic monitoring stations and the table 2.2 showing the details of the non-automatic monitoring stations.

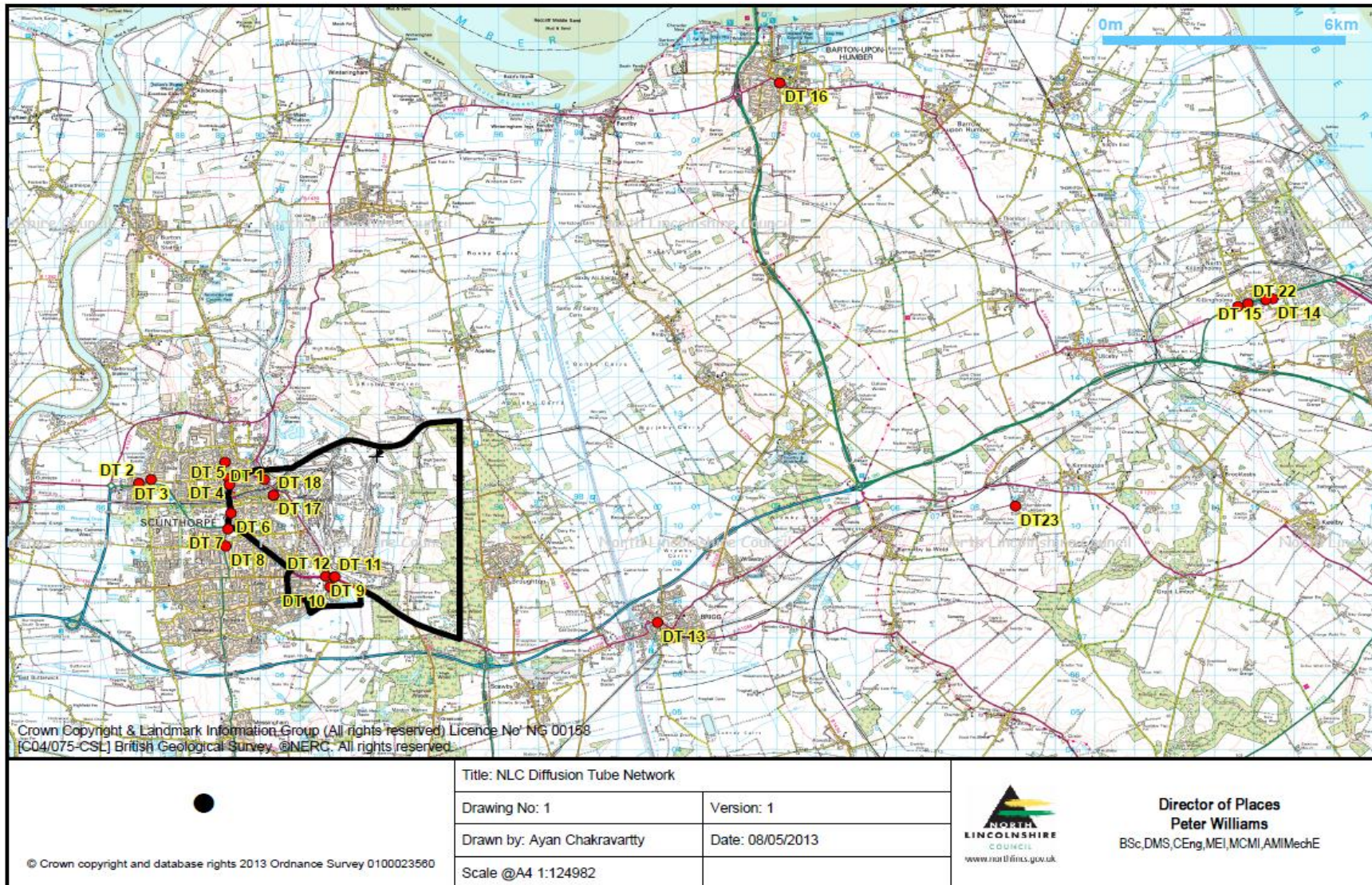


Figure 2-4: Diffusion tube monitoring location

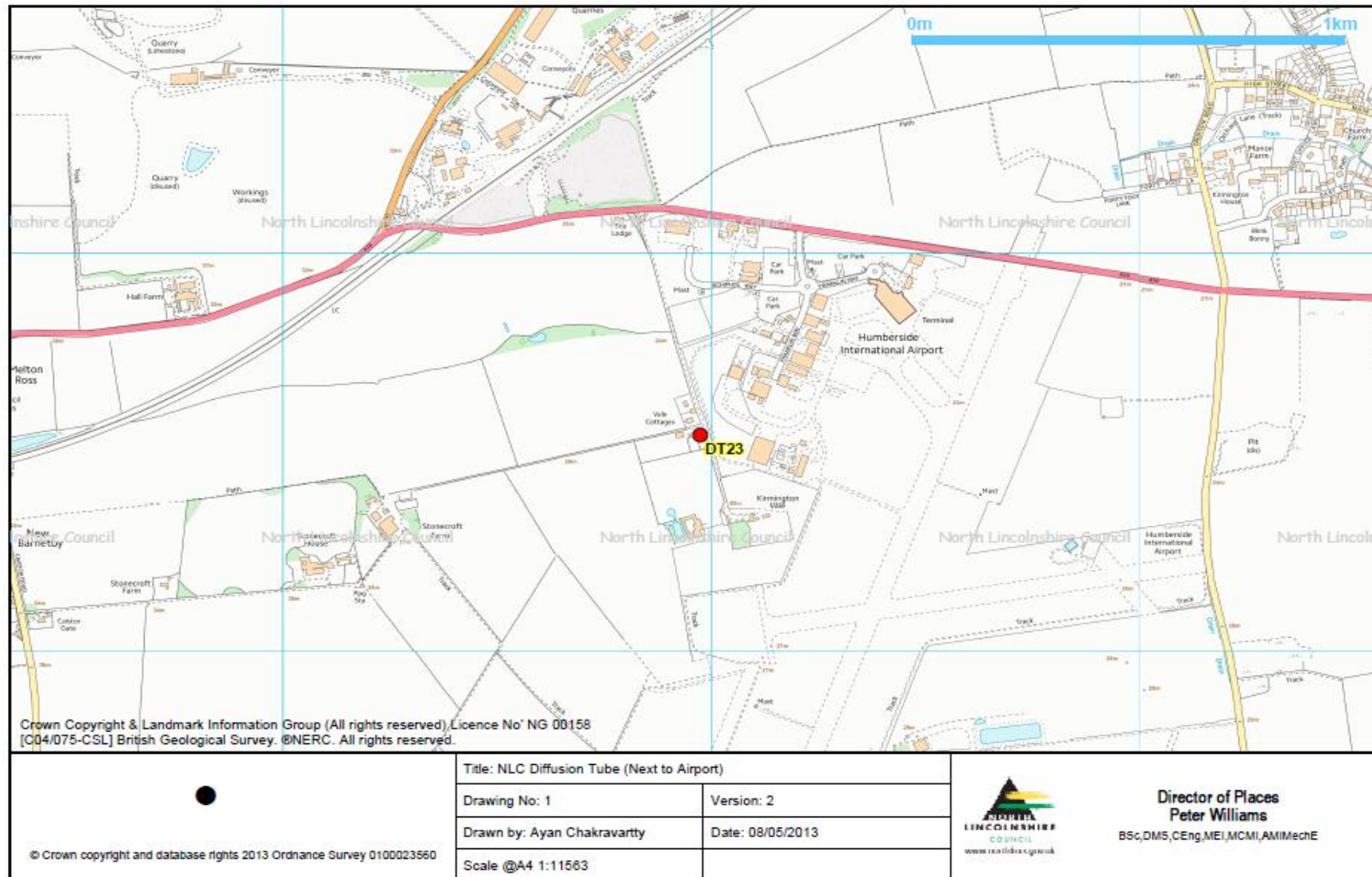


Figure 2-5: Diffusion Tube (Humberside International Airport)

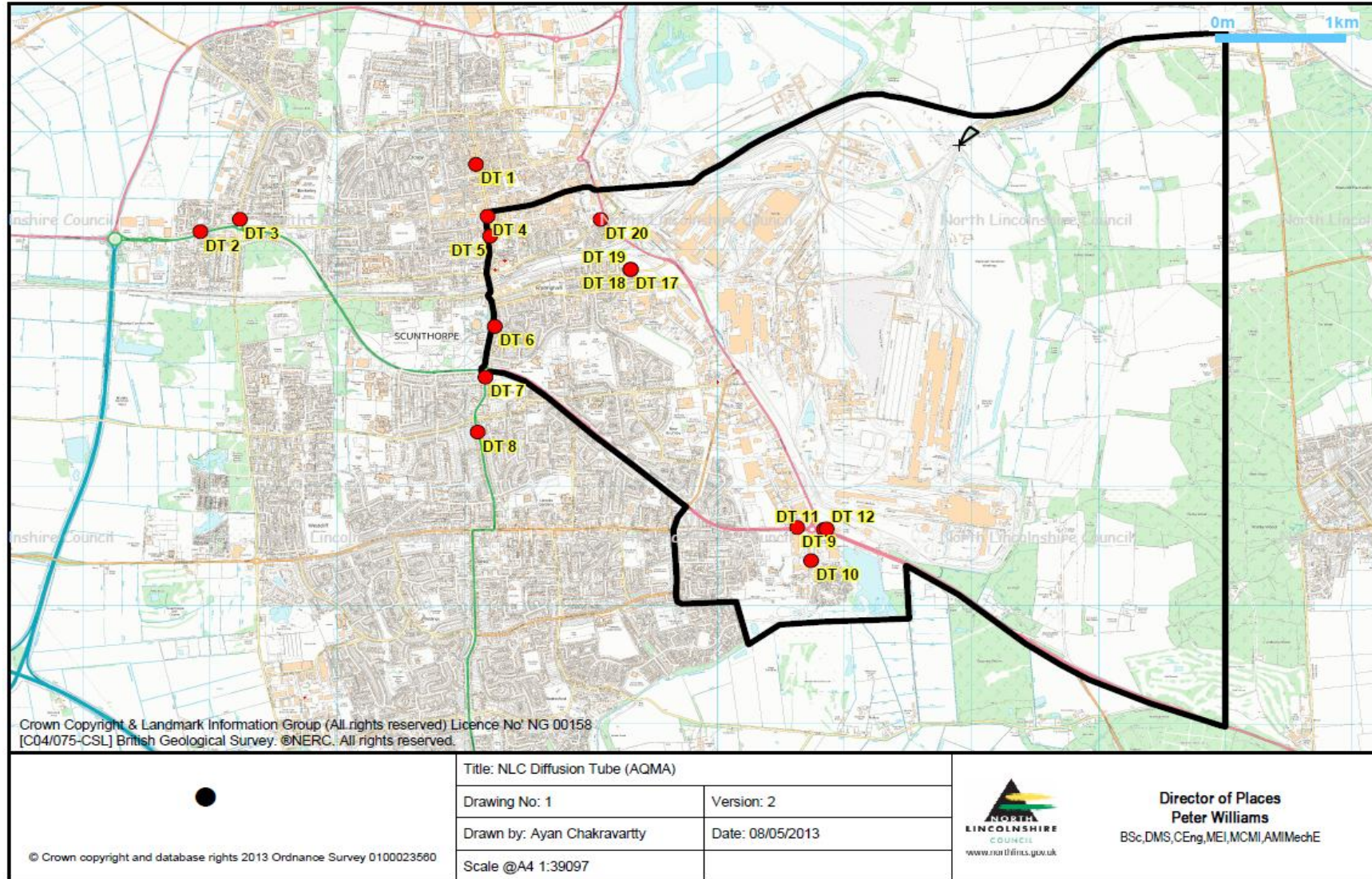


Figure 2-6: Diffusion tube (AQMA)

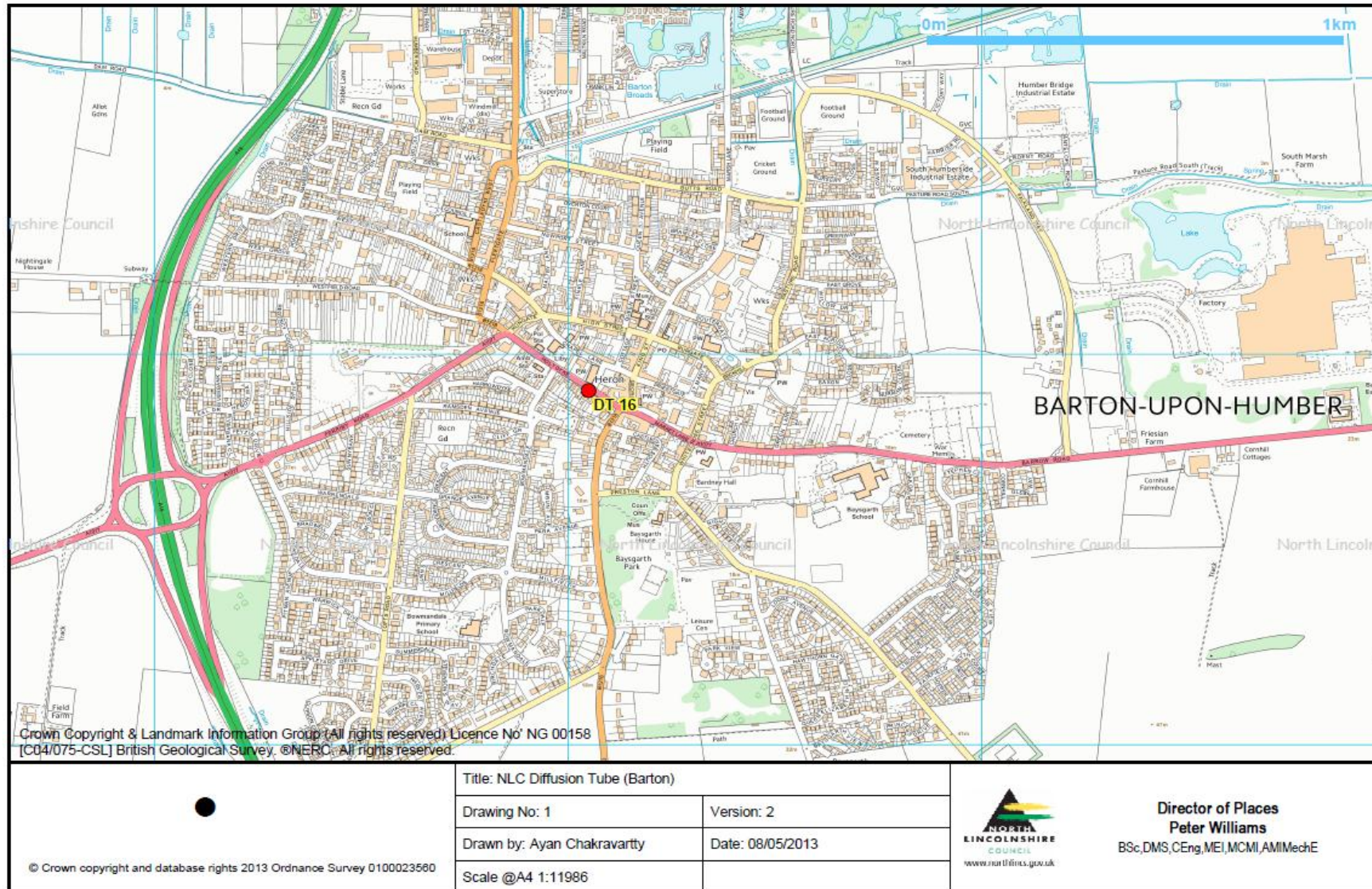


Figure 2-7: Diffusion tube (Barton)

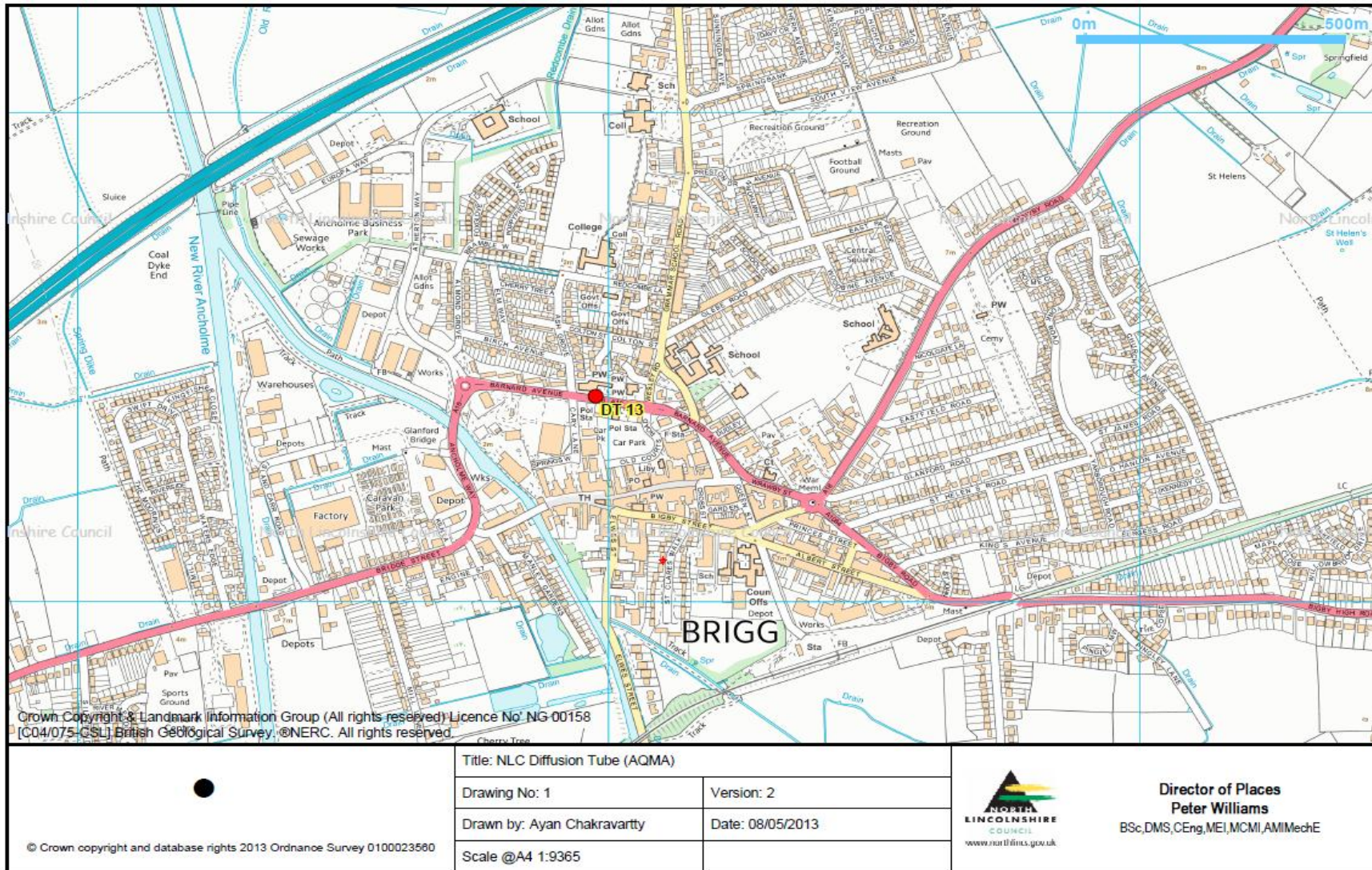


Figure 2-8: Diffusion Tube (Brigg)

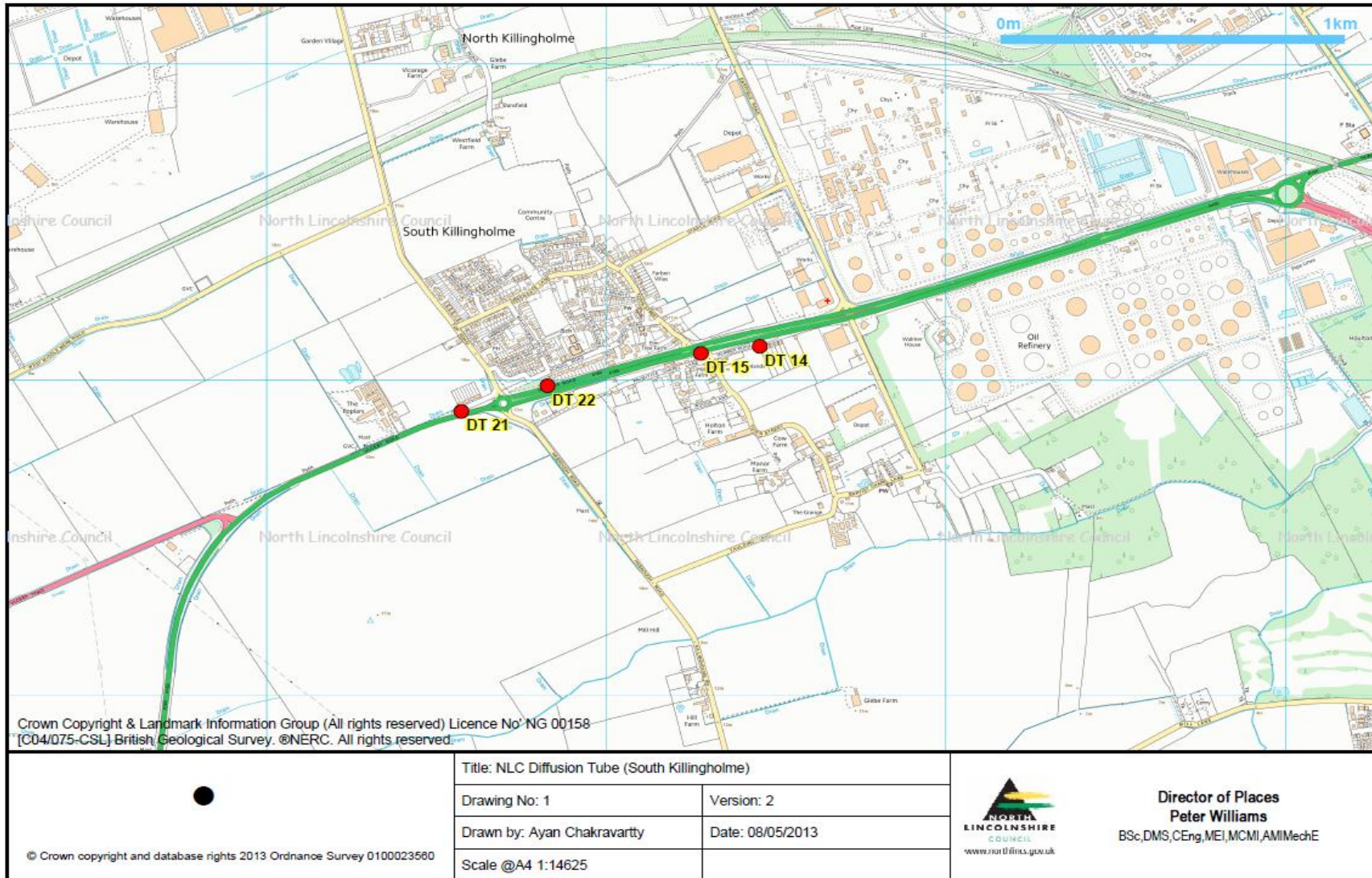


Figure 2-9: Diffusion tube (South Killingholme)

Table 2.2: Details of Non- Automatic Monitoring Sites

Site ID	Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Site Height (m)	Pollutants Monitored	In AQMA ?	Is Monitoring Co-located with a Continuous Analyser (Y/N)	Relevant Exposure ? (Y/N with distance (m) from monitoring site to relevant exposure)	Distance to Kerb of Nearest Road (m) (N/A if not applicable)	Does this Location Represent Worst-Case Exposure ?
DT 1	Frodingham Road	Urban	489099	411723	2-2.5(m)	NO ₂	No	N	3m	1m	N
DT 2	Doncaster Road Hilton Avenue	Suburban Roadside	486928	411156	2-2.5(m)	NO ₂	No	N	12m	3m	N
DT 3	Scotter Road (North side of roundabout)	Suburban Kerbside	487239	411259	2-2.5(m)	NO ₂	No	N	9m	2m	N
DT 4	Britannia Corner	Urban Roadside	489190	411285	2-2.5(m)	NO ₂	Yes	N	4m	2m	N
DT 5	Oswald Road	Urban Kerbside	489209	411118	2-2.5(m)	NO ₂	Yes	N	4m	3m	N
DT 6	Ashby Road	Urban Kerbside	849247	410355	2-2.5(m)	NO ₂	Yes	N	20m	1m	N

DT 7	Jct A18/Ashby Road	Urban Kerbside	489172	409926	2-2.5(m)	NO ₂	Yes	N	20m	2m	N
DT 8	Ashby Road (Brumby Street)	Urban Kerbside	489112	409463	2-2.5(m)	NO ₂	No	N	15m	1m	N
DT 9	Dudley Road/Queensway	Urban Roadside	491628	408658	2-2.5(m)	NO ₂	Yes	N	30m	2m	N
DT 10	Lakeside Parkway (Towards partisol)	Suburban Roadside	491737	408378	2-2.5(m)	NO ₂	Yes	N	NA	2m	N
DT 11	Junction Brigg Road/A18	Industrial Roadside	491838	408641	2-2.5(m)	NO ₂	Yes	N	NA	9m	N
DT 12	Front of Ashby Lodge Pub	Industrial Roadside	491859	408645	2-2.5(m)	NO ₂	Yes	N	13m	9m	N
DT 13	Barnard Avenue Brigg	Urban Kerbside	499975	407421	2-2.5(m)	NO ₂	No	N	60m	3m	N
DT 14	Humber Road, Chip shop	Industrial Roadside	515452	416107	2-2.5(m)	NO ₂	No	N	35m	20m	N
DT 15	Humber Road, LP 695	Industrial Kerbside	515279	416085	2-2.5(m)	NO ₂	No	N	10m	1m	N

DT 16	Holydyke Barton	Suburban Kerbside	503048	421907	2-2.5(m)	NO ₂	No	N	10m	1m	Y
DT 17	Rowland Road AQ station	Industrial Roadside	490316	410837	2-2.5(m)	NO ₂	Yes	Y	NA	6m	N
DT 18	Rowland Road AQ station	Industrial Roadside	490316	410837	2-2.5(m)	NO ₂	Yes	Y	NA	6m	N
DT 19	Rowland Road AQ station	Industrial Roadside	490316	410837	2-2.5(m)	NO ₂	Yes	Y	NA	6m	N
DT 20	Station Road (Outside Asda)	Industrial Roadside	490080	411258	2-2.5(m)	NO ₂	Yes	N	NA	2m	N
DT 21	Killingholme 4	Suburban Roadside	514573	415901	2-2.5(m)	NO ₂	No	N	15m	2m	N
DT 22	Killingholme 5	Suburban Roadside	514827	415982	2-2.5(m)	NO ₂	No	N	19m	1m	Y
DT23	Humberside Airport	Suburban Roadside	508974	410543	2-2.5(m)	NO ₂	No	N	NA	NA	NA

2.2 Comparison of Monitoring Results with Air Quality Objectives

This section will outline the ratified 2012 monitoring data for internal and external monitoring network. During 2012 North Lincolnshire Council operated 8 automatic monitoring sites and 23 non-automatic (diffusion tube) monitoring sites. North Lincolnshire Council also continued to facilitate a number of external networks within its boundary such as the PAH network and Heavy Metals network. The most recent results available from the external monitoring network will also be presented in this section. The guidelines stated in LAQM.TG(09) was used for air quality data review and assessment and where data capture is less than 75% of a full calendar year, available data was annualised before being compared to annual mean objectives.

2.2.1 Nitrogen Dioxide (NO₂)

Automatic Monitoring

North Lincolnshire Council currently operate 3 sites for monitoring NO₂ as shown in table 2.3.



Figure 2-10: Trends in Annual Mean NO₂ Concentrations Measured at Automatic Monitoring Sites

The figure 2.10 above shows trends of annual mean NO₂ concentrations measured at 3 automatic sites and the results show no exceedence during the past 5 years of monitoring. Previous Air Quality reports also have no record of any exceedence of

the annual mean objective since the NO₂ automatic monitoring began. All sites are well within the relevant Objective. North Lincolnshire Council does not anticipate any change in these results in the near future for the current automatic monitors. However, 2011 diffusion tube results suggested a possible issue with higher NO₂ concentrations at South Killingholme due to the traffic related emission at the A160 road to Immingham. As part of the detailed assessment procedure an automatic NO₂ analyser will be installed shortly at South Killingholme for further investigation of the NO₂ exceedences. The analyser will measure NO₂ concentrations at properties adjacent to the A160 road to Immingham.

A time series plot for all 3 automatic monitoring sites can be seen in figure 2.11. Figure 2.11 shows the impact of temperature on NO₂ concentration as during winter the level of concentration seems to be higher and during summer considerably lower. This is generally due to the change in photolytic formation of ozone which leads to enhanced NO₂ concentration. There are other impacts which could also have impact on the elevated NO₂ concentration in winter such as cold start emission, increase in heating usage etc. Figure 2.12 shows the variation of level of NO₂ concentration for time of the day, day of the week and monthly. Plot indicates the impact of traffic on NO₂ concentrations at the Killingholme and Scunthorpe Town monitoring unit. Most of the peaks can be noticed during rush hour traffic. NO₂ concentration is considerably lower at the Santon site due to low traffic flow compared to other sites.

Table 2.4 below shows the results for hourly mean objective breaches and the results indicate no automatic monitoring site within North Lincolnshire Council has measured any exceedence of the hourly mean objective for Nitrogen Dioxide during 2012 monitoring period. Previous years reports also have no record of any exceedence of the hourly mean objective.

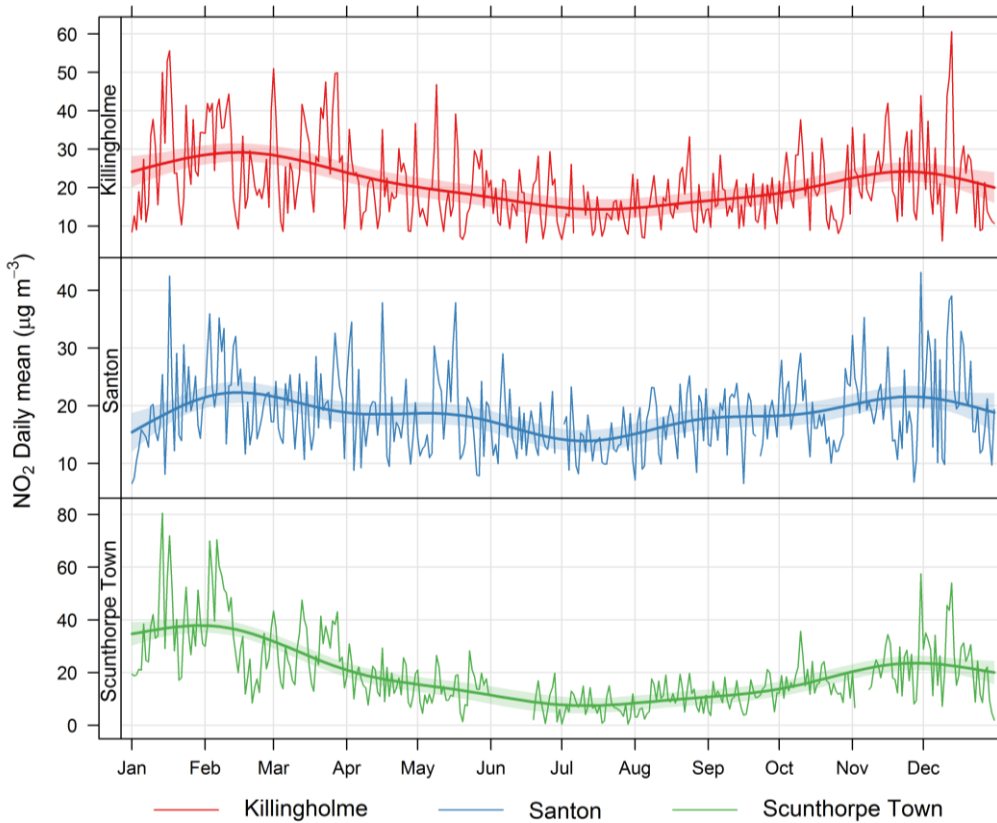


Figure 2-11: Time series plot for NO₂ automatic monitoring
 Method source: (Carslaw and Ropkins 2012)

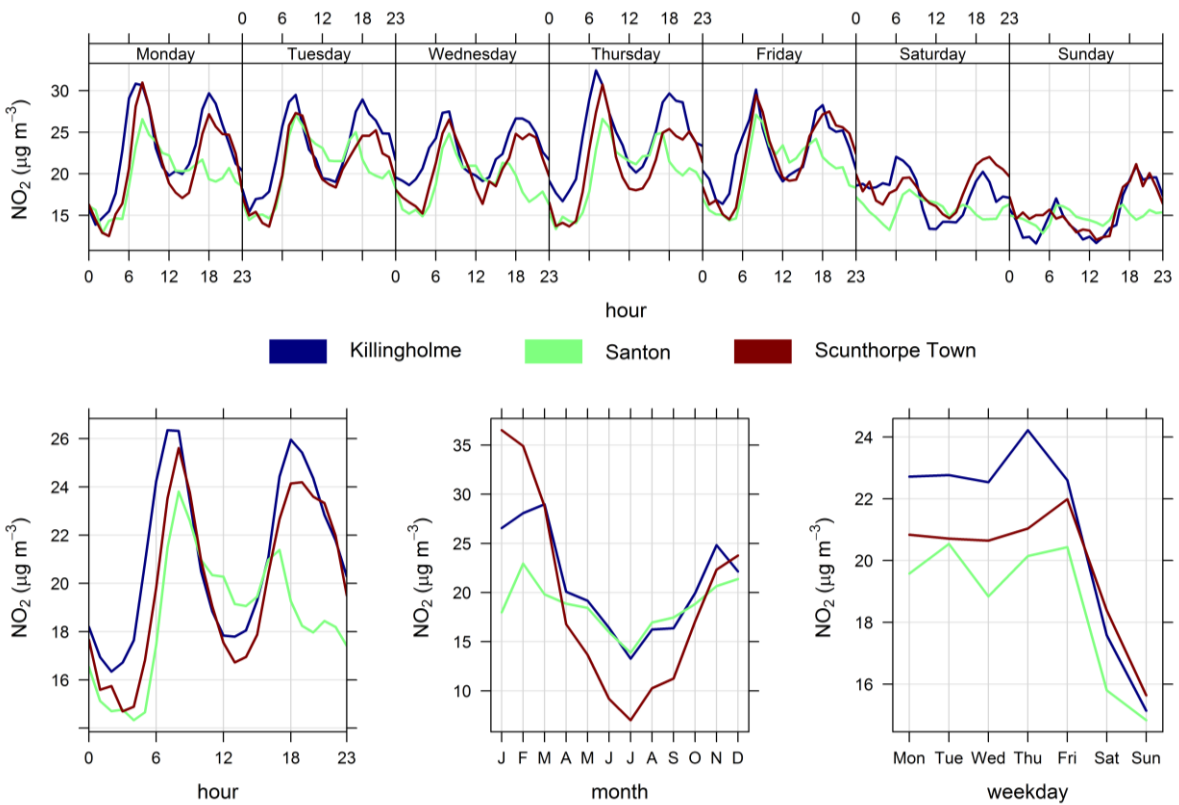


Figure 2-12: Time variation plot for sites with automatic NO₂ monitoring unit
 Method source: (Carslaw and Ropkins 2012)

Table 2.3: Results of Automatic Monitoring for NO₂: Comparison with Annual Mean Objective

Site Name	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % ^a	Valid Data Capture 2012 % ^b	Annual Mean Concentration (µg/m ³)				
					2008 ^c	2009 ^c	2010 ^c	2011 ^c	2012 ^c
Scunthorpe Town	Urban Industrial	Yes	NA	93.4	18.9	17.8	19.7	19.9	19.7
Low Santon	Industrial	Yes	NA	98.9	20.3	18.7	18.9	19.1	18.6
Killingholme	Urban Industrial	No	NA	99.2	21.8	18.7	21	21.4	21.1

- In bold, exceedence of the NO₂ annual mean AQS objective of 40µg/m³
- ^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
- ^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
- ^c Means were “annualised” [as in Box 3.2 of TG\(09\)](http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38) (<http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38>) where valid data capture is less than 75%

Table 2.4: Results of Automatic Monitoring for NO₂: Comparison with 1-hour Mean Objective

Site Name	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % ^a	Valid Data Capture 2012 % ^b	Number of Hourly Means > 200µg/m ³				
					2008 ^c	2009 ^c	2010 ^c	2011 ^c	2012 ^c
Scunthorpe Town	Urban Industrial	Yes	NA	93.4	0	0	0	0	0
Low Santon	Industrial	Yes	NA	98.9	0	0	0	0	0
Killingholme	Urban Industrial	No	NA	99.2	0	0	0	0	0

- In bold, exceedence of the NO₂ hourly mean AQS objective (200µg/m³ – not to be exceeded more than 18 times per year)
- ^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
- ^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
- ^c If the data capture for full calendar year is less than 90%, include the 99.8th percentile of hourly means in brackets

Diffusion Tube Monitoring Data

North Lincolnshire Council conducted a review of existing diffusion tube networks since many of the tubes within the network have demonstrated compliance for a number of years; as an outcome of the review the number of diffusion tube monitoring locations has been reduced to 23 during 2012. Table 2.5 below shows the results of the 2012 diffusion tube network and table 2.6 shows the comparison of 2012 results with previous years results.

Table 2.5: Results of NO₂ Diffusion Tubes 2012

Site ID	Location	Site Type	Within AQMA?	Triplicate or Co-located Tube	Full Calendar Year Data Capture 2012 (Number of Months or %) ^a	Uncorrected results	2012 Annual Mean Concentration (µg/m ³) - Bias Adjustment factor = 0.67 ^b
DT 1	Frodingham Road	Urban	No	Single	11	39.9	26.7
DT 2	Doncaster Road Hilton Avenue	Suburban Roadside	No	Single	6 ^a	35.5	23.8 ^a
DT 3	Scotter Road (North side of roundabout)	Suburban Kerbside	No	Single	9	39.2	26.2
DT 4	Britannia Corner	Urban Roadside	Yes	Single	12	45.2	30.3
DT 5	Oswald Road	Urban Kerbside	Yes	Single	12	39.8	26.6
DT 6	Ashby Road	Urban Kerbside	Yes	Single	12	37.6	25.2
DT 7	Jct A18/Ashby Road	Urban Kerbside	Yes	Single	12	40.2	26.9
DT 8	Ashby Road (Brumby Street)	Urban Kerbside	No	Single	12	41.7	27.9
DT 9	Dudley Road/Queensway	Urban Roadside	Yes	Single	12	32.4	21.7

DT 10	Lakeside Parkway (Towards partisol)	Suburban Roadside	Yes	Single	12	32.7	21.9
DT 11	Junction Brigg Road/A18	Industrial Roadside	Yes	Single	12	64.8	43.4
DT 12	Front of Ashby Lodge Pub	Industrial Roadside	Yes	Single	12	36.9	24.8
DT 13	Barnard Avenue Brigg	Urban Kerbside	No	Single	11	31.4	27.1
DT 14	Humber Road, Chip shop	Industrial Roadside	No	Single	11	29.6	20.7
DT 15	Humber Road, LP 695	Industrial Kerbside	No	Single	12	28.3	30.3
DT 16	Holydyke Barton	Suburban Kerbside	No	Single	12	37.6	25.2
DT 17	Rowland Road AQ station	Industrial Roadside	Yes	Triplicate & Colocated	11	37.7	21.0
DT 18	Rowland Road AQ station	Industrial Roadside	Yes	Triplicate & Colocated	12	40.4	19.9
DT 19	Rowland Road AQ station	Industrial Roadside	Yes	Triplicate & Colocated	12	30.9	19.0
DT 20	Station Road (Outside Asda)	Industrial Roadside	Yes	Single	11	45.2	20.9
DT 21	Killingholme 4	Suburban Roadside	No	Single	12	56.1	37.6
DT 22	Killingholme 5	Suburban Roadside	No	Single	12	63.5	42.5
DT23	Humberside Airport	Suburban Roadside	No	Single	12	18.4	12.3

- In bold, exceedence of the NO₂ annual mean AQS objective of 40µg/m³
- Underlined, annual mean > 60µg/m³, indicating a potential exceedence of the NO₂ hourly mean AQS objective
- ^a Means were “annualised” as in Box 3.2 of TG(09) (<http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38>), if full calendar year data capture is less than 75%
- ^b If an exceedence is measured at a monitoring site not representative of public exposure, NO₂ concentration at the nearest relevant exposure was estimated based on the “NO₂ fall-off with distance” calculator (<http://laqm.defra.gov.uk/tools-monitoring-data/no2-falloff.html>). The procedure is also explained in Box 2.3 of Technical Guidance LAQM.TG(09) (<http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=30>).

Table 2.6: Results of NO₂ Diffusion Tubes (2008 to 2012)

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (µg/m ³) - Adjusted for Bias ^a				
			2008 (Bias Adjustment Factor = 0.9)	2009 (Bias Adjustment Factor = 0.69)	2010 (Bias Adjustment Factor = 0.71)	2011 (Bias Adjustment Factor = 0.68)	2012 (Bias Adjustment Factor = 0.67)
DT 1	Frodingham Road	Urban	27.5	22.0	23.7	25.0	26.7
DT 2	Doncaster Road Hilton Avenue	Suburban Roadside	28.5 ^a	23.1	22.3	25.6	23.8 ^a
DT 3	Scotter Road (North side of roundabout)	Suburban Kerbside	37.7 ^a	32.8	32.8 ^a	27.9 ^a	26.2
DT 4	Britannia Corner	Urban Roadside	34.4	27.1	29.5	29.5	30.3
DT 5	Oswald Road	Urban Kerbside	32.2	24.4	26.7	27.0	26.6
DT 6	Ashby Road	Urban Kerbside	24.3	21.3	24.2	23.6	25.2
DT 7	Jct A18/Ashby Road	Urban Kerbside	31.4	24.2	26.1	26.2	26.9
DT 8	Ashby Road (Brumby Street)	Urban Kerbside	33.5	26.8	28.8	28.1	27.9
DT 9	Dudley Road/Queensway	Urban Roadside	28.4	19.6	22.8	21.4	21.7
DT 10	Lakeside Parkway (Towards partisol)	Suburban Roadside	24.6	19.1	22.5	20.1	21.9
DT 11	Junction Brigg Road/A18	Industrial Roadside	47.4	35.9	41.9	43.5	43.4
DT 12	Front of Ashby Lodge Pub	Industrial Roadside	27.0	23.9	22.2	26.1	24.8
DT 13	Barnard Avenue Brigg	Urban Kerbside	30.1	25.5	25.6	22.0	27.1

DT 14	Humber Road, Chip shop	Industrial Roadside	30.5	23.8	22.9	19.4	20.7
DT 15	Humber Road, LP 695	Industrial Kerbside	37.0	28.5	29.5	29.7	30.3
DT 16	Holydyke Barton	Suburban Kerbside	29.4	20.7	24.8	22.4	25.2
DT 17	Rowland Road AQ station	Industrial Roadside	23.0	17.9	19.8	18.8	21.0
DT 18	Rowland Road AQ station	Industrial Roadside	22.8	17.1	20.0	20.1	19.9
DT 19	Rowland Road AQ station	Industrial Roadside	24.7	19.0	19.7	20.2	19.0
DT 20	Station Road (Outside Asda)	Industrial Roadside	29.5	21.7	24.1	22.1	20.9
DT 21	Killingholme 4	Suburban Roadside				44.3	37.6
DT 22	Killingholme 5	Suburban Roadside				40.1	42.5
DT23	Humberside Airport	Suburban Roadside				11.6 ^a	12.3

- In bold, exceedence of the NO₂ annual mean AQS objective of 40µg/m³
- Underlined, annual mean > 60µg/m³, indicating a potential exceedence of the NO₂ hourly mean AQS objective
- ^a Means were “annualised” [as in Box 3.2 of TG\(09\)](http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38) (<http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38>), if full calendar year data capture is less than 75%

North Lincolnshire Council elected to use its own bias adjustment for the 2012 Nitrogen Dioxide diffusion tube study as it has done in previous years. The method is explained in the Appendix 1 of this document. Table 2.5 above shows during 2012 two of the NO₂ diffusion tube locations (tube DT11 and DT22) have breached annual mean objective of 40µg/m³. Previous Air Quality reports also highlighted that both 'Brigg Road/ A18 junction' (DT 11) and 'Killingholme 5' (DT22) tube locations had breached previous years annual mean objective.

The Brigg Road/ A18 junction tube is situated in an industrial background site close to a busy road junction. The 2009 Updating and Screening Assessment investigated this location further to rule out the need to progress to a Detailed Assessment. The report highlighted the nearest relevant receptor is a residential estate located 300m to the South. According to the method stated in LAQM TG(09) guidance to measure Nitrogen Dioxide fall off with distance, the predicted levels of Nitrogen Dioxide at 50m distance was 27.6 µg/m³ which was well within the permitted Air Quality Objective of 40 µg/m³. Tube DT12 (Front of Ashby Lodge Pub) is also very close to DT11 and sits adjacent to a pub, which is also a residential property with the owners living upstairs. The pub was identified as a potential receptor to breach air quality objective for NO₂ concentration in previous rounds of review and assessment, hence the tube DT12 was installed to measure the concentration close to the receptor. During 2012, DT12 is measured at 24.8 µg/m³ and therefore falls well within the compliance thresholds removing the need for any further investigation at this location. Therefore North Lincolnshire Council concluded no need to proceed to a Detailed Assessment.

The other tube located in Killingholme (DT22) measured 42.5µg/m³ which exceeds the NO₂ Annual Mean Air Quality Objective. Tube DT21 also a potential location to breach the air quality objective as the annual mean is very close to the air quality objective. Both the tubes are situated in South Killingholme at the roadside of A160.

The A160 is a road that links the M180 and the local port of Immingham, which is predicted to be the subject of major growth in the future. The Highways Agency recently consulted on a number of schemes to improve the road networks in this area. As part of the A160 improvement North Lincolnshire Council in conjunction with the Highways Agency have conducted monitoring of Nitrogen Dioxide since 2010 using diffusion tubes.

The location of tubes DT21 and DT22 can be seen on the map below (figure 2.13).



Figure 2-13: Location of tube DT21 and DT22 at South Killingholme

Map Source: (Google Maps 2013)

The monitoring locations are close to the boundary of residential properties. The DEFRA screening tool (NO_x fall off with distance calculator) was used to calculate the actual concentration at a property boundary from the DT22 tube which breached air quality objective during 2012. The result shows tube DT22 will remain compliant as the level of NO₂ will drop with distance (Figure 2.14). As recommended in 2011 progress report, a new automatic NO_x analyser will be installed shortly as part the Detailed Assessment process.

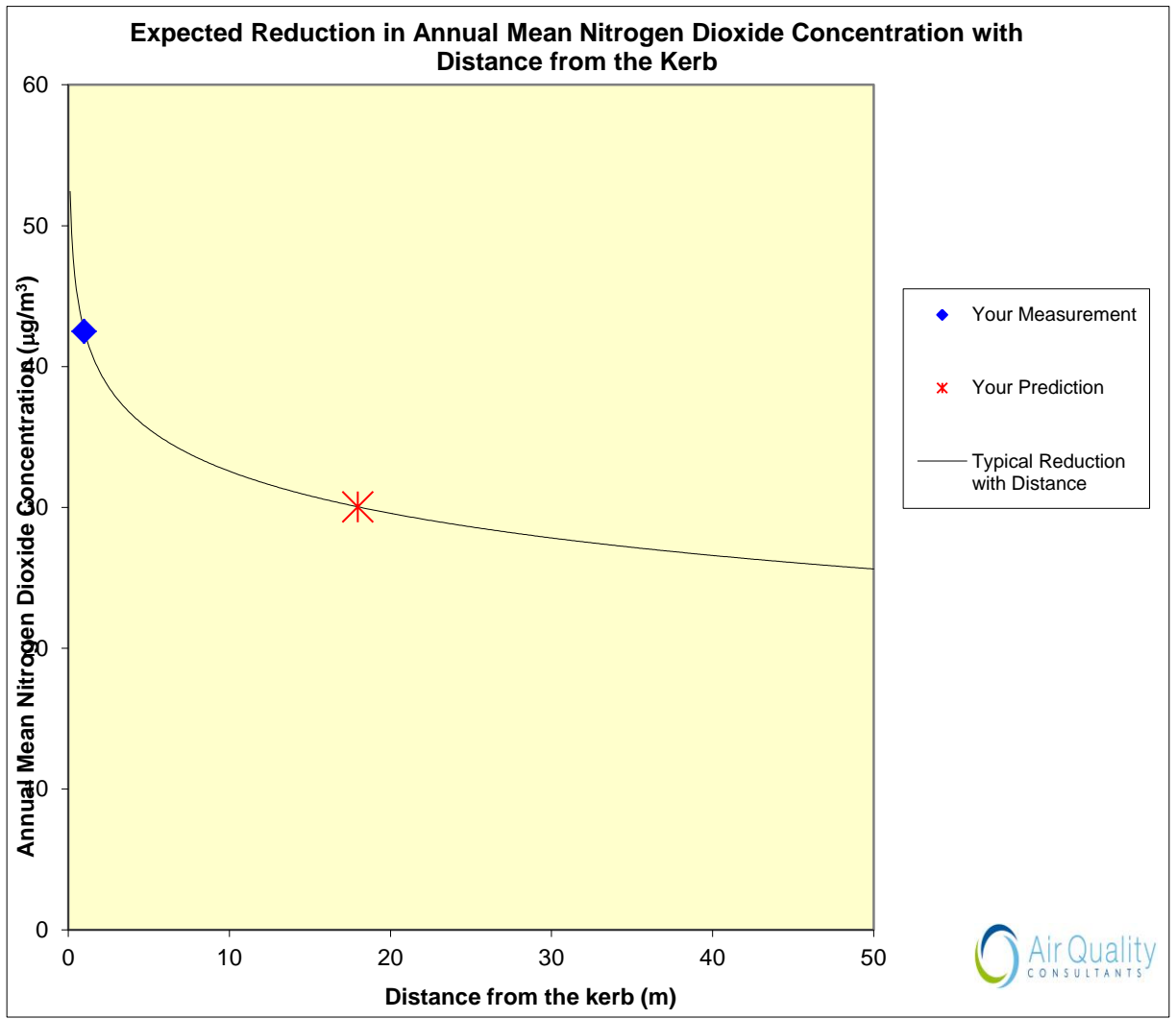


Figure 2-14: Expected reduction in annual mean nitrogen dioxide concentration with distance from the Kerb

2.2.2 Particulate Matter (PM₁₀)

North Lincolnshire Council has declared two AQMA's for breaches of both PM₁₀ Objectives. Many of these issues are focused around the Integrated Steelworks and have been covered in the 2010 Further Assessment of PM₁₀ for Low Santon monitoring unit. Figure 2.15 below shows a polar plot (Carslaw and Ropkins 2012) for source identification to understand where the pollution arises from and it can be clearly seen that during 2012 most of the PM₁₀ at the Low Santon monitoring site originated from the Steelworks. The polar plot below indicates that the westerly, south westerly and north westerly wind directions recorded the highest level of PM₁₀ concentrations (figure 2.15).

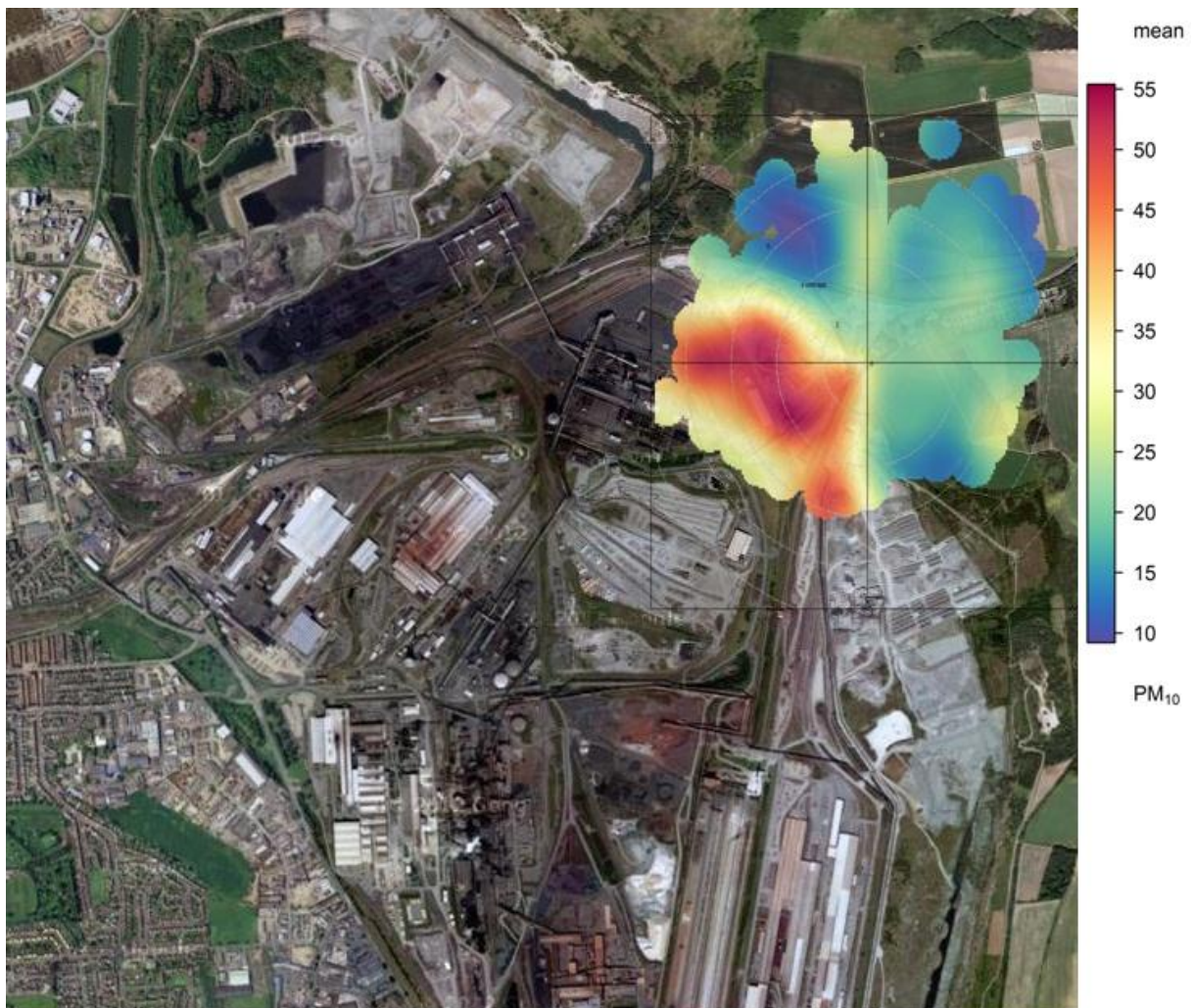


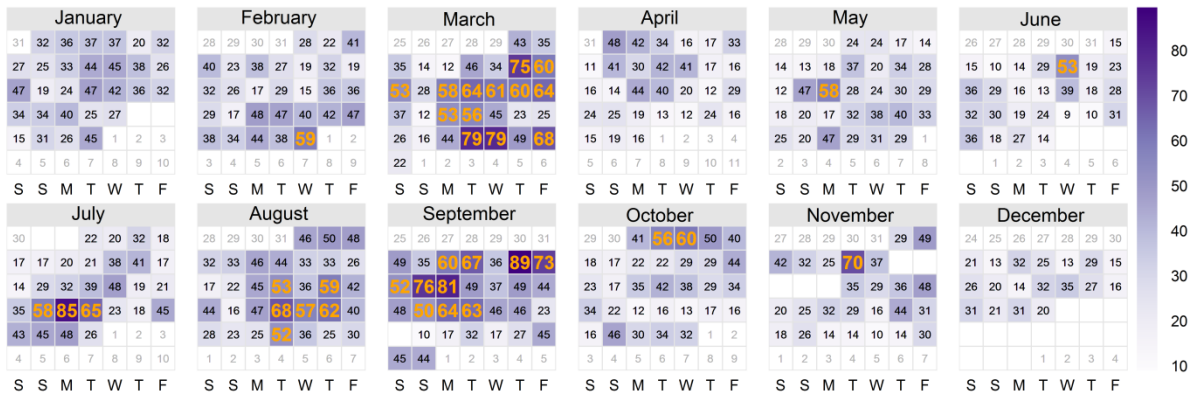
Figure 2-15: Bivariate polar plot of concentrations at the Santon Monitoring site
Method source: (Carslaw and Ropkins 2012)

A breakdown of the 2012 Low Santon daily exceedences and the direction of the prevailing wind on that day are shown in figure 2.17. The top plot shows daily PM₁₀ concentrations with annotations highlighting those days where the concentration of PM₁₀ exceeded the 50 µg/m³ daily mean objective; the bottom plot showing the wind direction that is scaled to wind speed where the length of arrow suggest how high or low the wind speed at that particular direction. The figure highlights most of the exceedence days are recorded during March and September. Figure 2.18 shows how the concentration of PM₁₀ varies with time of the day, day of the week and also monthly during 2012. The plot has been produced for better indication of the effect of the sources identified in the polar plot (figure 2.15) by limiting the wind direction between 135° - 280°. It can be seen that the PM₁₀ concentration tends to be higher during normal office hours and weekdays. The weekend concentrations are considerably lower compared to weekdays. Highest hourly peaks are noted during late afternoon. The highest monthly concentrations were recorded during March and September. The monthly rainfall data (figure 2.19) indicates that the total monthly rainfall recorded in these two months was low compared to all other months from April to December.

A time series of all the automatic TEOM x 1.3 corrections can be seen in figure 2.20. The dotted line is the daily mean objective of 50 µg/m³. The purpose of the plot is to identify any pattern in exceedence days across the sites and it can be seen that there are indication of higher than average regional event counts during March and November as all the sites show increase in level of PM₁₀ concentration. The figure also confirms the issue with certain easterly winds that causes exceedences to sites located at the west of the Steelworks.

Table 2.7 reports data collected using the TEOM, FDMS and Partisol measurement methods. The TEOM measurement data for 2012 in Table 2.7 has been subject to the Volatile Correction Model (VCM) which is an equivalent method of FDMS and Partisol measurements. Where data capture was less than the minimum annual requirement, data has been annualised as per Box 3.2 of TG (09).

PM₁₀ in 2012



PM₁₀ in 2012

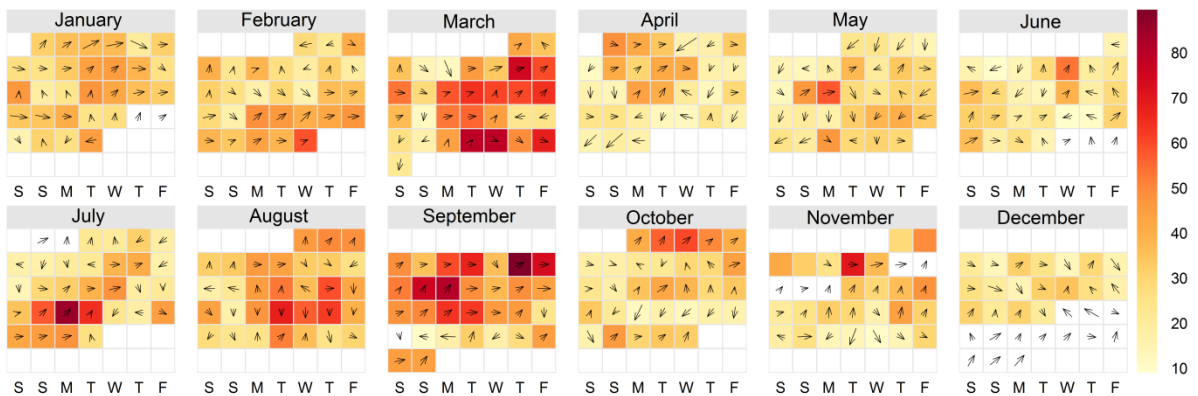


Figure 2-16: Calendar Plot showing the daily mean and wind direction for that day

Method source: (Carslaw and Ropkins 2012)

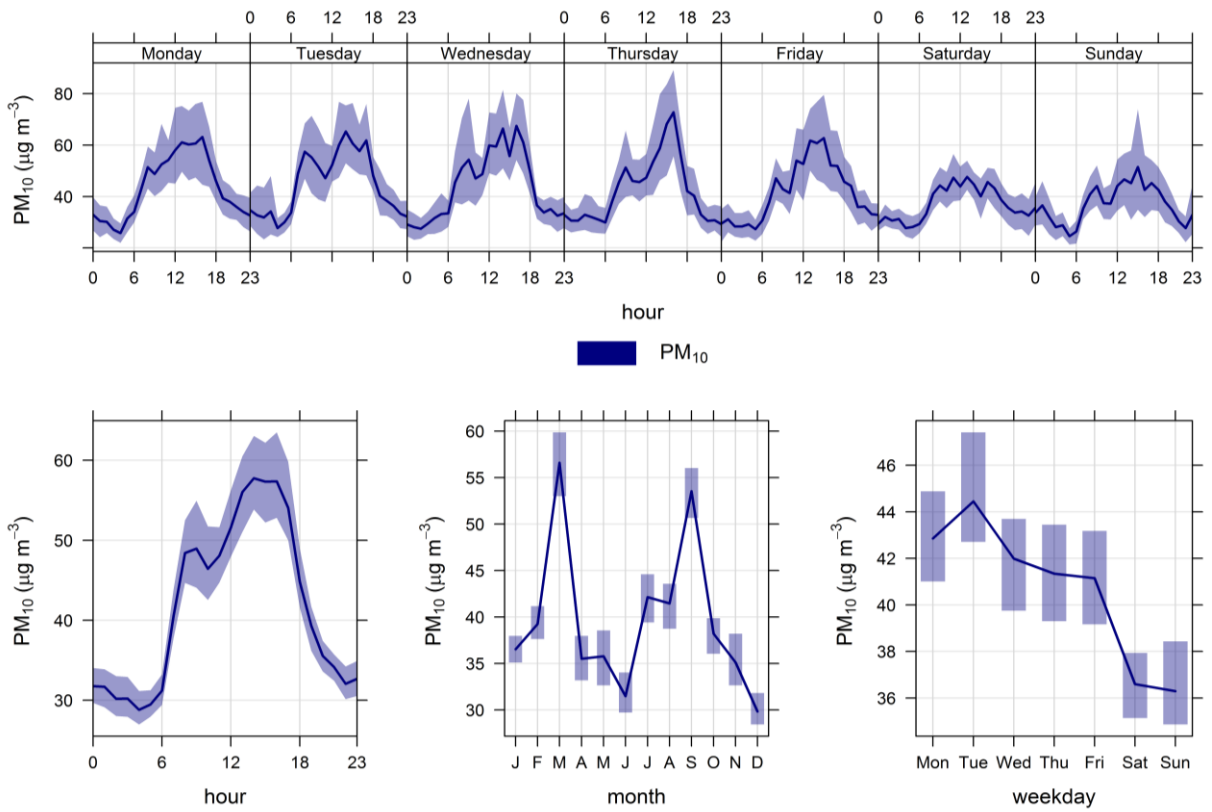


Figure 2-17: PM₁₀ time variation plot for wind direction between 135° to 280°
 Method source: (Carslaw and Ropkins 2012)

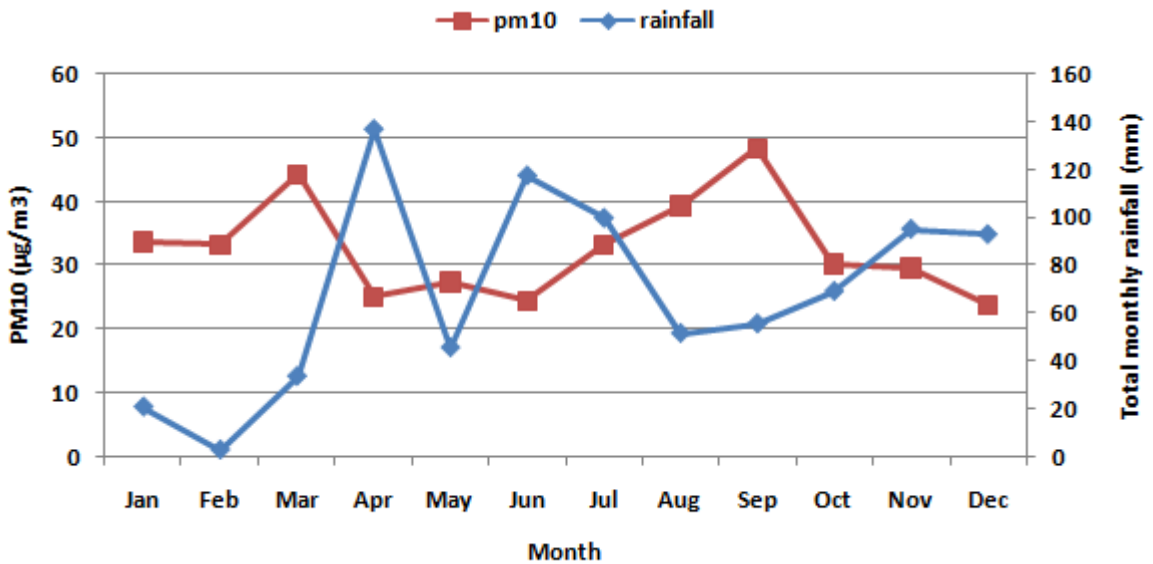
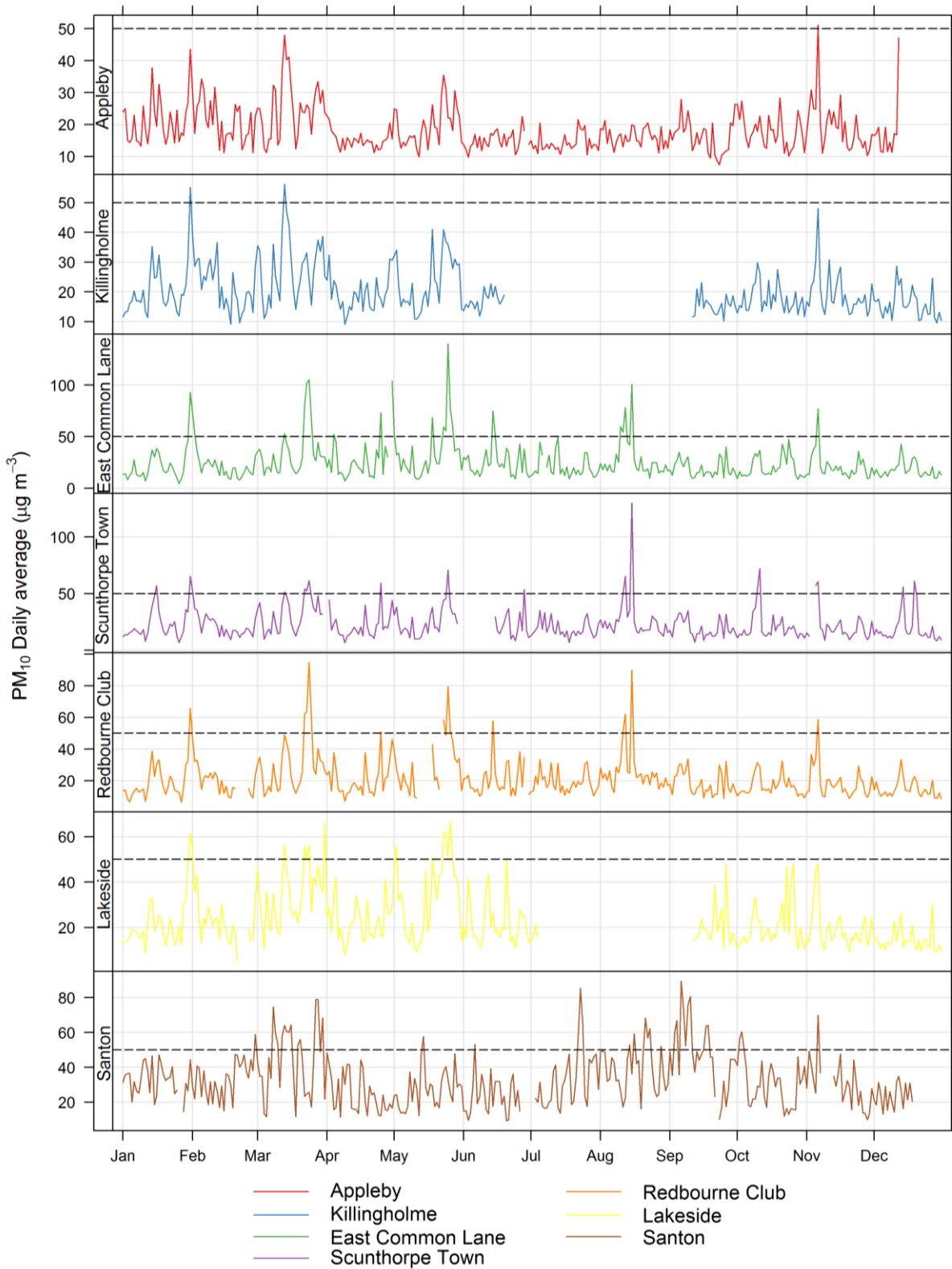


Figure 2-18: Total monthly rainfall in mm



2-19: Time series for all TEOM sites for 2012 calendar year

Method source: (Carslaw and Ropkins 2012)

Table 2.7: Results of Automatic Monitoring for PM₁₀: Comparison with Annual Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % ^a	Valid Data Capture 2012 % ^b	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration (µg/m ³)				
						2008* ^c	2009* ^c	2010* ^c	2011* ^c	2012 ^c
NLC 1. Scunthorpe Town (FDMS)	Urban Industrial	Y	N/A	86.6	Y			23	22.2	20.8
NLC 1. Scunthorpe Town (TEOM)	Urban Industrial	Y	N/A	94	Y	21.8	20.9	21.3 ^c	22.5	20.9
NLC 2. East Common Lane	Urban Industrial	Y	N/A	99.2	Y	23.6	21.1	22.7	24.3	22.3
NLC 3. Low Santon (FDMS)	Industrial	Y	N/A	94	Y			34.3 ^c	34.5	26.4
NLC 3. Low Santon (TEOM)	Industrial	Y	N/A	92.6	Y	36.6	37.8	32.6	38.7	28.5
NLC 4. High Santon	Industrial	Y	N/A	90.7	Y	30.6	26.8	23.7	29.5	4.8
NLC 5. Redbourne Club	Urban	Y	N/A	96.2	Y			19.9 ^c	22.2	19.7

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % ^a	Valid Data Capture 2012 % ^b	Confirm Gravimetric Equivalent (Y or N/A)	Annual Mean Concentration ($\mu\text{g}/\text{m}^3$)				
						2008* ^c	2009* ^c	2010* ^c	2011* ^c	2012 ^c
NLC6. Lakeside	Urban Industrial	N	N/A	79.8	Y				25.4 ^c	21.7
NLC 7. Appleby	Rural	N	N/A	94.3	Y	20.6	19.3	18.2	21.2	17.5
NLC 8. Killingholme	Urban Industrial	N	N/A	77.3	Y	20.1	19.8	19.4	21	19.3

- In bold, exceedence of the PM₁₀ annual mean AQS objective of 40 $\mu\text{g}/\text{m}^3$
- ^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
- ^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
- ^c Means were “annualised” [as in Box 3.2 of TG\(09\)](http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38) (<http://laqm.defra.gov.uk/technical-guidance/index.html?d=page=38>), if valid data capture is less than 75%

The figure 2.19 below shows the 2012 annual mean results for all PM₁₀ sites. There are no annual means that exceeded the 40 µg/m³ objective within the North Lincolnshire Council network. Low Santon monitoring unit was subject to an annual mean exceedence in 2007 and was the trigger for the 2008 Low Santon AQMA. Subsequent years have measured compliant concentrations due in part to changes in correction to VCM, changes in measurement with the FDMS and the focused efforts of operators on the Integrated Steelworks site in reducing PM₁₀ concentrations within the area. The Low Santon site still operates a TEOM as well as an FDMS. The TEOM will remain in place for data continuity and as a useful tool in source identification.

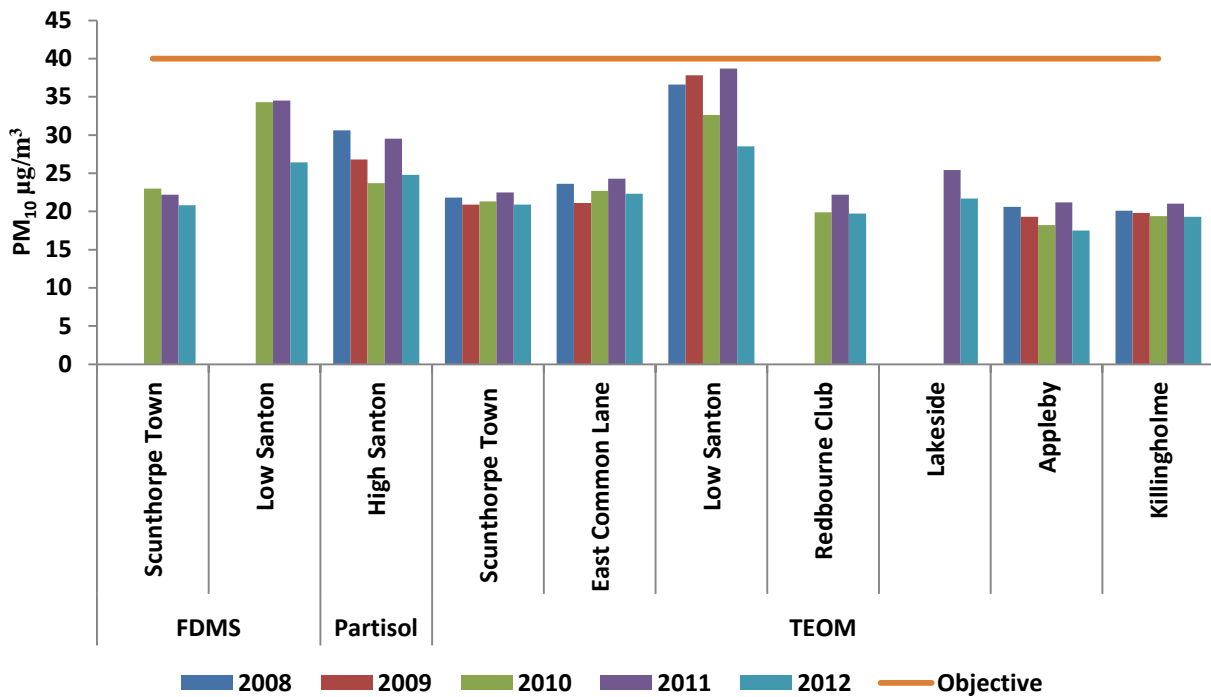


Figure 2-20: Trends in Annual Mean PM₁₀ Concentrations

Table 2.8 below shows the number of daily mean exceedences recorded during 2012 calendar year.

Table 2.8: Results of Automatic Monitoring for PM₁₀: Comparison with 24-hour Mean Objective

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % ^a	Valid Data Capture 2012 % ^b	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m ³				
						2008* ^c	2009* ^c	2010* ^c	2011* ^c	2012 ^c
NLC 1. Scunthorpe Town (FDMS)	Urban Industrial	Y	N/A	86.6	Y			13 (39.7)	20	10 (38.12)
NLC 1. Scunthorpe Town (TEOM)	Urban Industrial	Y	N/A	94	Y	20 (45.5)	9	6 (36.9)	24	16
NLC 2. East Common Lane	Urban Industrial	Y	N/A	99.2	Y	35	17	11	29	19
NLC 3. Low Santon (FDMS)	Industrial	Y	N/A	94	Y			33 (57.5)	55	16
NLC 3. Low Santon (TEOM)	Industrial	Y	N/A	92.6	Y	66 (64)	77	58	73 (63.8)	21
NLC 4. High Santon	Industrial	Y	N/A	90.7	Y	34 (50.7)	27	13 (38.1)	34	10
NLC 5. Redbourne Club	Urban	Y	N/A	96.2	Y			5 (31.1)	22	10

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % ^a	Valid Data Capture 2012 % ^b	Confirm Gravimetric Equivalent (Y or N/A)	Number of Daily Means > 50µg/m ³				
						2008* ^c	2009* ^c	2010* ^c	2011* ^c	2012 ^c
NLC 6. Lakeside	Urban Industrial	N	N/A	79.8	Y				15 (39.5)	12 (39.2)
NLC 7. Appleby	Rural	N	N/A	94.3	Y	5	3	1 (27.1)	7	1
NLC 8. Killingholme	Urban Industrial	N	N/A	77.3	Y	9	5	2	9	4 (34.1)

- In bold, exceedence of the PM₁₀ daily mean AQS objective (50µg/m³ – not to be exceeded more than 35 times per year)
- ^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
- ^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
- ^c if data capture for full calendar year is less than 90%, the 90.4th percentile of 24-hour means in brackets are include

Figure 2.20 below shows the number of exceedences across the sites between the year 2008-2012. It can be seen that most of the sites had been compliant previously except the Low Santon site. The figure shows for the first time since 2008 Low Santon site has been compliant with the PM₁₀ daily mean AQS objective of 50µg/m³ which is not to be exceeded more than 35 times per year. Figure 2.19 and 2.20 both suggests during 2012 most sites within the network demonstrated a reduction in the annual mean and daily exceedence objective compared to previous years. However, during 2012 a rather longer period of rainfall was observed throughout the year as indicated in figure 2.21. The 2013 data so far have highlighted that we have breached a considerable number of days at out monitors situated west of the site (Scunthorpe Town and East Common Lane) and therefore

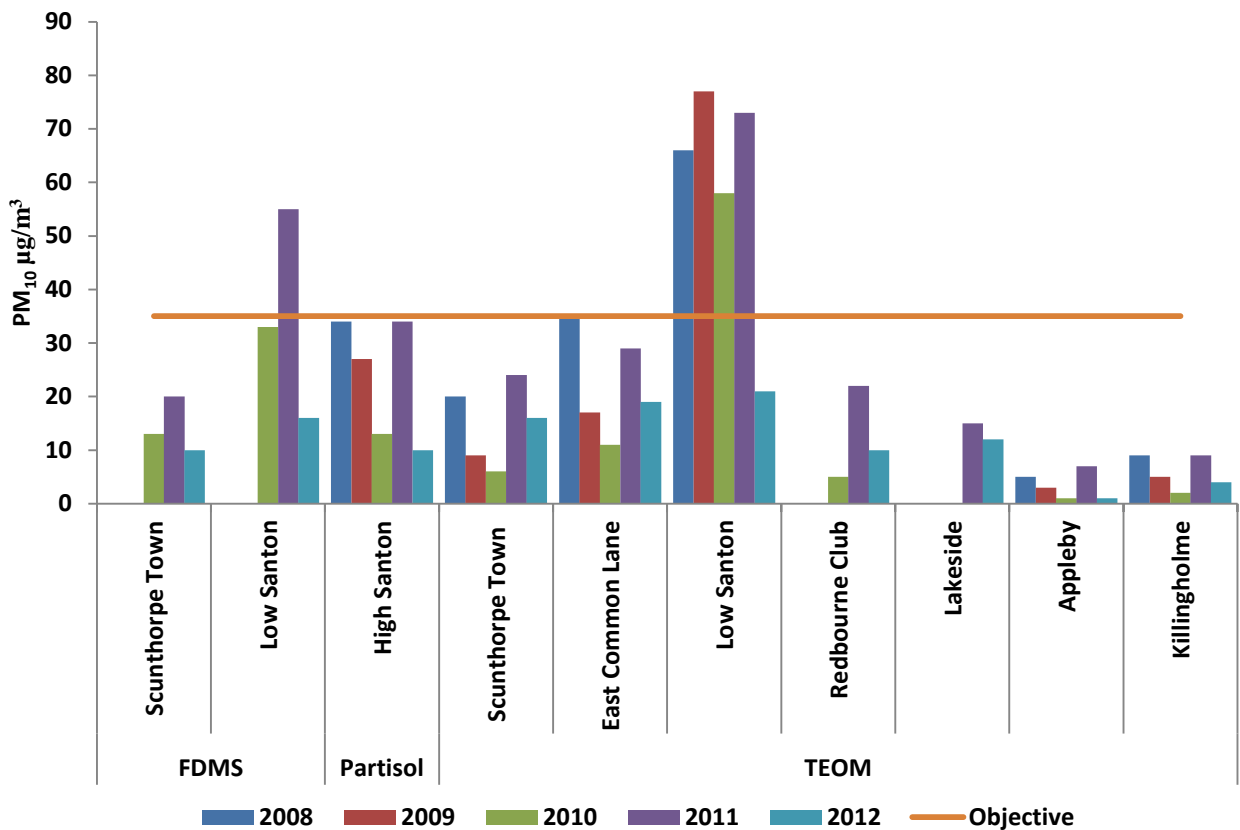


Figure 2-21: Trends Daily Mean Exceedences for PM₁₀ Concentrations

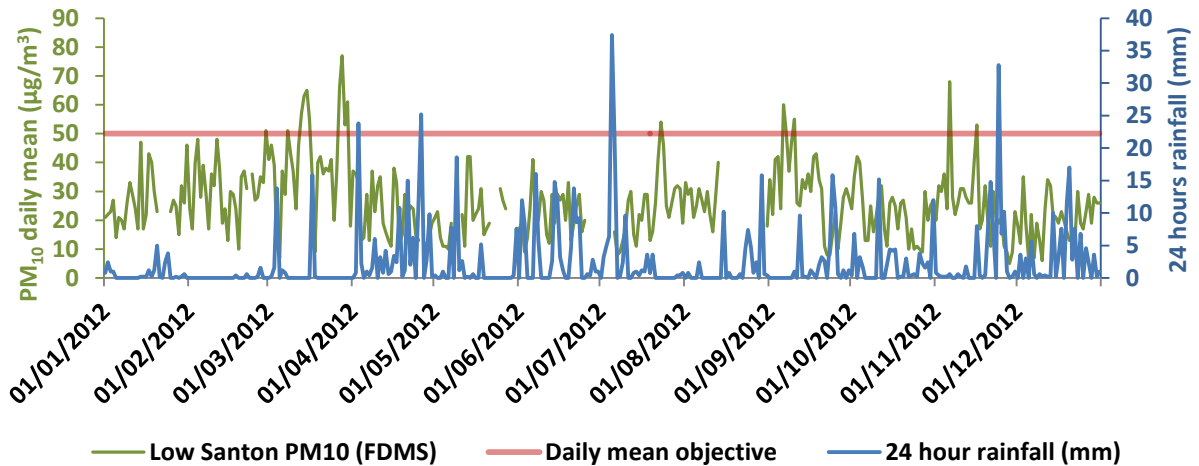


Figure 2-22: Timeseries plot showing PM₁₀ and Rainfall in different axis

Figure 2.21 shows most of the exceedence days are during days where no rain or very low rainfall was recorded. The long period of rain during 2012 summer could have just complemented the additional measures operators on the Integrated Steelworks have taken to reduce the PM₁₀ daily exceedences. Although the data from 2012 has shown an overall improvement at the Low Santon site, any improvement should be met with caution because of the changing meteorological conditions. Low Santon is still the subject of a daily mean exceedence for PM₁₀ and has been the focus of previous air quality reports. An Action Plan currently is in place to manage the Air quality management area designated due to PM₁₀ breaches. Part of the action plan is designed to engage all interested stakeholders in reducing the number of daily exceedences within the area.

2.2.3 Sulphur Dioxide (SO₂)

North Lincolnshire Council continues to operate three automatic Sulphur Dioxide monitoring units located at Low Santon, Scunthorpe Town (AURN) and Killingholme. The results for the year 2012 can be seen in the table 2.9. There are no exceedences recorded during 2012 due to any breach of Sulphur Dioxide objectives within North Lincolnshire monitoring network. All Sulphur Dioxide sites have historically demonstrated compliance even though they are all sited adjacent to major industrial activities. We do not anticipate any changes but will continue to monitor SO₂ at these locations.

Table 2.9: Results of Automatic Monitoring for SO₂: Comparison with Objectives

Site ID	Site Type	Within AQMA?	Valid Data Capture for Monitoring Period % ^a	Valid Data Capture 2012 % ^b	Number of Exceedence (percentile in bracket µg/m ³): ^c		
					15-minute Means > 266µg/m ³	1-hour Means > 350µg/m ³	24-hour Means > 125µg/m ³
NLC 1. Scunthorpe Town	Urban Industrial	Y	NA	92.6	0	0	0
NLC 3. Low Santon	Industrial	Y	NA	96.9	0	0	0
NLC 8. Killingholme	Urban Industrial	N	NA	95.8	0	0	0

- In bold, exceedence of the relevant AQS objective (15-min mean = 35 allowed/year; 1-hour mean = 24 allowed/year; 24-hour mean = 3 allowed/year)
- ^a i.e. data capture for the monitoring period, in cases where monitoring was only carried out for part of the year
- ^b i.e. data capture for the full calendar year (e.g. if monitoring was carried out for six months the maximum data capture for the full calendar year would be 50%)
- ^c if data capture for full calendar year is less than 90%, include the relevant percentile in bracket (in µg/m³): 15-min mean = 99.9th ; 1-hour mean = 99.7th ; 24-hour mean = 99.2th percentile

2.2.4 Benzene

North Lincolnshire Council ceased the measurement of Benzene at Killingholme Primary School in 2009 after 18 months of compliant monitoring. There are no plans at this time to carry out further benzene monitoring.

2.2.5 Other Pollutants Monitored

The 2008 ambient air quality directive (2008/50/EC) replaces all the previous EU legislation and sets targets for main air pollutants. The 2008 Directive along with the 4th Daughter directive (2004/07/EC) was made law in the England Air Quality (Standards) Regulations 2010. The Fourth Daughter Directive sets a target values for B[a]P, arsenic, cadmium and nickel and measurement requirements for mercury.

In addition to the pollutants presented below North Lincolnshire Council also operate two heavy metals monitors and two PAH monitors at Scunthorpe Town and Low Santon. These are operated for NPL on behalf of DEFRA. The latest results are as follows:

Table 2.10: Heavy metal monitoring results for 2012 calendar year

Heavy Metal	Scunthorpe Town 2012 ng/m ³	Low Santon 2012 ng/m ³	Target value (calendar year)
Arsenic (As)	0.65	0.751	6 ng/m ³
Cadmium (Cd)	0.13	0.168	5 ng/m ³
Chromium (Cr)	4.3	5.3	
Copper (Cu)	4.96	4.69	
Iron (Fe)	621.1	1605.7	
Manganese (Mn)	23.95	70.11	
Nickel (Ni)	1.2	1.29	20 ng/m ³
Lead (Pb)	12.58	17.54	0.5 µg/m ³
Platinum (Pt)	0.002	0.004	
Vanadium (V)	1.37	4.2	

Zinc (Zn)	22.73	29.4	
Mercury (Hg)	0.008	0.01	
Selenium	0.77	0.91	
Cobalt	0.13	0.18	

Table 2.11: PAH monitoring results for 2012 calendar year

PAH Compound	2012 Low Santon ng/m ³	2012 Scunthorpe Town ng/m ³	Target (calendar year)
Benzo(a)pyrene	2.9	1.3	1 ng/m ³

North Lincolnshire records some of the highest specific heavy metal compounds and PAHs in the UK. These have previously been highlighted in all our previous review and assessment reports. PAH concentrations are influenced by coke processing on the Integrated Works, the Environment Agency are working with Tata Steel to reduce PAHs in the Scunthorpe area. Table 2.11 shows, Low Santon recorded the highest concentrations out of all the UK PAH monitoring sites and previous reports state that Low Santon site did not achieve compliance in any of the previous years since the monitoring station was installed.

2.2.6 Summary of Compliance with AQS Objectives

No new areas of concern have been highlighted by new monitoring data within the North Lincolnshire monitoring regime, however previously highlighted issues still remain a concern and therefore need continuous effort by all concerned stockholders to reduce the number of air quality breaches. The 2012 results highlighted that the PM₁₀ objective was achieved across all monitoring sites, however the year observed a high level of rainfall which could have helped with the reduction of the daily mean exceedences. The early indication for 2013 results show considerable numbers of daily mean exceedences, therefore all possible measures need to remain in place to reduce the level of particulates from the Integrated Steelworks and maintain the improvement for the following years.

The only other outstanding issue is the elevated concentrations of NO₂ in Killingholme on the A160 and the elevated concentrations of PAH within the AQMA.

NO₂ diffusion tubes are currently in place at South Killingholme and a new automatic NO₂ analyser is soon to be installed as part of the Detailed Assessment proposed in the 2011 Progress Report. The Environment Agency is working with Tata Steel to reduce PAHs in the Scunthorpe area.

North Lincolnshire Council has examined the results from monitoring within and outside the AQMA boundary. Results highlighted that concentrations within the AQMA still have the potential to exceed the daily exceedence objective for PM₁₀ and the AQMA should remain. Concentrations outside of the AQMA are all below the objectives at relevant locations, therefore there is no need to proceed to a Detailed Assessment.

3 New Local Developments

North Lincolnshire Council has considered all new local developments for 2012 calendar year and confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area. North Lincolnshire Council confirms that all the following have been considered:

- **Road traffic sources**
- **Other transport sources**
- **Industrial Sources**
- **New developments with fugitive or uncontrolled sources.**
- **Commercial and Domestic Sources**

4 Local / Regional Air Quality Strategy

North Lincolnshire Council does not have a formally adopted Air Quality Strategy. LAQM TG(09) suggests that councils who have declared AQMA's need not develop an Air Quality Strategy on the basis that the process of developing an AQMA is similar to the process of producing an Air Quality Strategy. North Lincolnshire Council has two AQMA's in place at present. The 2005 Scunthorpe AQMA for breaches of the daily objective and the 2008 Low Santon AQMA for the breach of the annual mean objective. North Lincolnshire Council has implemented and directed a number of initiatives designed to tackle air quality concerns within the area. These initiatives form the basis of an Air Quality Strategy;

Local Industry Forum

Designed to bring all interested parties around the table and share monitoring results and the councils views on the likely origins of the problems. It is an opportunity for local industry to share best practice and report on ongoing site improvements with other local operators.

AQMA Meetings

Strategic meetings involving Council Service Directors and Officers, Environment Agency, Health Protection Agency and the Director of Public Health. Its purpose is to discuss monitoring results, review progress and set priorities across the stakeholder organisations.

Low Santon AQ Technical Working Group

A technical meeting to discuss monitoring results around the Low Santon Area attended by AEAT, National Physical Laboratory, Environment Agency, North Lincolnshire Council, Tata, DEFRA, Lancaster and Leeds University. As a result of these meetings a number of initiatives have been put in place in order to reduce the impacts of the Integrated Steelworks.

5 Air Quality Planning Policies

During 2012 North Lincolnshire Council has produced one action plan for Low Santon and updated the existing plan for Scunthorpe:

- Action Plan for Low Santon – 2012
- Action Plan for the Scunthorpe PM₁₀ AQMA – 2012

Both the reports can be found within the North Lincolnshire Council dedicated air quality website (www.nlincsair.info) through the following link:

http://www.nlincsair.info/reports.php?n_action=report&t=2

The 2010 Progress Report initially presented guidance for the North Lincolnshire Council Planning Department designed to aid decision making on residential developments. This piece of work zoned the 2005 AQMA in to areas where residential development should be avoided. The latest update of the air quality zones were presented in the updated 2012 Scunthorpe PM₁₀ action plan.

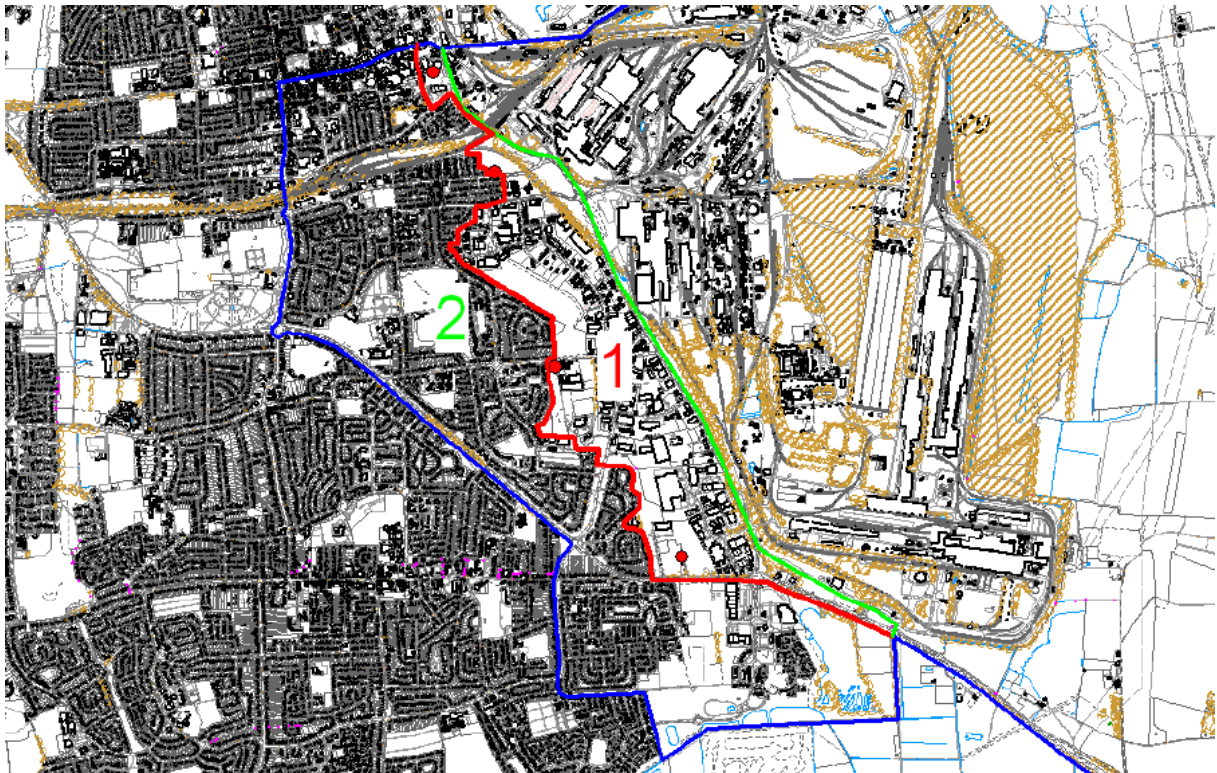


Figure 5-1: 2010 AQMA Zone Map

Following the 2010 original AQMA zoning boundaries, a number of indicative monitoring stations were deployed in order to further investigate areas of suspected exceedence. These sites have indicated areas which have PM₁₀ issues and areas within the AQMA that do not. The monitoring data has confirmed that specific areas

of the zones lie within areas of exceedence whereas others have demonstrated compliance. As a result of this the zones have been redrawn to reflect this data and presented in the 2012 Scunthorpe Action Plan for PM₁₀ (figure 5.1). This work is currently being used to prepare a Supplementary Planning Document (SPD) to determine the authority's approach to the relationship between planning and air quality.

6 Local Transport Plans and Strategies

A Local Transport Plan (LTP) sets out how strategic transport improvements will be delivered in a local area over a specified time period. Whilst the Local Transport Act 2008 retained the statutory requirement to produce and review a LTP, however local authorities were given greater flexibility over particular aspects in developing their third Local Transport Plans (LTP3).

North Lincolnshire's LTP3 consists of a Transport Strategy, which outlines the strategic approach to transport in North Lincolnshire over the next 15 years and an Implementation Plan, which provides specific details on how the Transport Strategy is to be delivered. The geographical area covered by LTP3 extends to North Lincolnshire's local authority boundaries.

The long term vision for transport in North Lincolnshire is:

"a well maintained transport system that supports sustainable communities within a safe and prosperous environment and which contributes to the wider environmental, economic and social well-being of the people who live and work in North Lincolnshire".

Five Local Transport Goals have been identified for North Lincolnshire to deliver the vision. These are:

1. Facilitate **economic growth** by targeting transport improvements in key development areas and along key strategic network corridors
2. Reduce transport related carbon dioxide emissions and protect and enhance the natural and built **environment** through **sustainable** transport solutions
3. Improve transport **safety and security** relating to death or injury from transport, in order to contribute towards safer and stronger communities
4. Provide **equal opportunities** through improvements in accessibility to key local hubs and services by sustainable modes of transport
5. Enhance people's **health and wellbeing** through the promotion of healthy modes of travel and provision of a high quality integrated transport system that contributes towards long term sustainable regeneration

The Transport Strategy identifies a number of transport options that could be implemented during the lifetime of LTP3, which are organised into the following themes:

1. Pedestrian improvements
2. Cycling improvements
3. Public transport improvements
4. Safer routes to school
5. Local safety schemes
6. Demand management
7. Maintaining the existing infrastructure

The Implementation Plan provides more detail on how the schemes will be delivered over three years and is updated every three years.

The Transport Strategy and Implementation Plan can be viewed on:
<http://www.northlincs.gov.uk/transport-and-streets/roads-highways-and-pavements/highway-documents/local-transport-plan/>

7 Climate Change Strategies

Currently energy from all North Lincolnshire Council sectors (including schools) amounts to £5.2 million and this is set to increase to £8.7 million over the next 5 years if the current volatility in energy prices continues.

The Carbon Management Plan sets a target for reducing our carbon footprint by 33% over the next 5 years. The effect of achieving this target is that our energy costs reduce to £4.7 million in the next 5 years. This could equate to £11.5-million in savings over those five years (based on Ofgen energy cost predictions).

Over the five-year period the council will be carrying out intensive work in key council buildings and making changes to improve the energy performance of those buildings. We'll also be working with staff to improve energy management.

The first of these changes took place on 1 October 2010 when the council's heating systems were switched on. Buildings were heated to a target temperature of 19 degrees to prevent buildings from overheating and make a significant reduction in fuel consumption.

North Lincolnshire Council have also trained a number of staff who have volunteered to become energy wardens. These wardens will encourage and educate their fellow staff members in reducing the amount of energy used in offices.

Details on North Lincolnshire Councils Carbon Management Plan and Climate Change Strategy can be found at:

<http://www.northlincs.gov.uk/environment/conservation/energy/carbonmanagementplan/?locale=en>

8 Implementation of Action Plans

Table 8.1: Action Plan Progress

Action	Action Detail	Lead Role	Timescale	Progress
A1	Maintain network of ten PM ₁₀ analysers at nine locations. Four locations are within the AQMA and five outside.	NLC	Ongoing	Ongoing
A2	Boundary monitoring of PM ₁₀ , PM _{2.5} , PM ₁ and Total Suspended Particles at Part A2 and 5 PPC Sites within the AQMA. Including a PM _{2.5} (TEOM) monitor at Low Santon.	NLC / EA	2008	Ongoing
A3	Traffic count and visual observations at Santon to assess likely contribution from re-suspended road dust.	NLC	2008	Complete
A4	PPC Permit Improvement Programme IP 9, 15, 17 & 22 Tata UK Ltd shall undertake a further investigation to monitor and quantify point source and fugitive particulate matter including PM ₁₀ and PM 2.5 emissions from the BOS Plant, Sinter Plant, Blast Furnaces, Appleby/ Dawes Lane Coke Ovens point source emissions and associated activities. The investigation should aim to confirm and establish typical release rates/ emission characteristics from significant sources and include localised ambient air quality monitoring. The proposed scope and method to be adopted, with timescales, should be submitted in advance of any study and agreed with the Environment Agency. A report of the investigation shall be sent to the Environment Agency	EA / Tata	2008	Complete
A5	Study into a local TEOM to Partisol correction factor. Consideration of alternative measurements techniques or correction factors as developed.	NLC	2008	Complete

Action	Action Detail	Lead Role	Timescale	Progress
A6	PPC Permit Improvement Programme IP 33 Tata UK Ltd shall assess the monitoring data recorded by the air quality monitoring stations and the local NETCEN station (including triangulation between stations) to identify process areas/outside influences making significant contribution (short and/or long term) to the pollutant levels measured. The operator shall submit quarterly reports of interpreted monitoring to the Environment Agency. (format to be proposed with the first submission).	EA / Tata	2008	Complete
A7	PPC Permit Improvement Programme IP 37 Tata UK Ltd shall review annually the emissions to air impact assessment and amend as necessary following progressive completion of relevant improvement programme requirements contained within this permit or the identification of any other relevant information or data concerning emissions, dispersion or environmental impact. An annual review report shall be submitted to the Environment Agency	EA / Tata	2008	Complete
A8	PPC Permit Improvement Programme IP 38 Tata UK Ltd shall formulate an air quality management plan for the installation aimed at reducing the impact of pollutants emitted from the installation and ensuring it does not significantly contribute to breaches of the national Air Quality Strategy standards/objectives or EU Directive Limits. Initially, the plan should be based on current emissions and impact assessment knowledge and developed further from the conclusions drawn from the responses made to relevant improvement programme requirements contained within this Permit. The plan should take account of any Local Authority air quality management plans. The operator shall review the air quality management plan annually and include actions to ensure the aim of the plan is delivered. The initial plan and annual reviews shall be submitted to the Environment Agency.	EA / Tata	2008	Complete
B1	Launch and maintain North Lincolnshire air quality website with: <ul style="list-style-type: none"> • Access to real time & historical data, 	NLC	2008	Complete Ongoing

Action	Action Detail	Lead Role	Timescale	Progress
	<ul style="list-style-type: none"> • Production of graphs and pollution roses • Access to air quality reports and latest news updates • General information 			
B2	Review existing methods of communication of real time data to the public and consider alternatives to internet access. Implement one further method.	NLC	2009	Complete
B3	Investigate the potential for air pollution forecasting in Scunthorpe	NLC	2009	Complete Ongoing
B4	Provide information to the public through publicity campaigns about how they can improve air quality from domestic situation e.g. bonfires and heating fuels	NLC	2008	Ongoing
C1	Raise profile & encourage attendance at organised community bonfire celebrations rather than individual bonfires.	NLC	2008	Complete
C2	Conduct a publicity campaign advising commercial organisations about their legal obligations in relation to their waste arisings with particular reference to burning of trade waste. To be conducted in co-operation with the Environment Agency.	NLC	2008	Complete
C3	Complaints in respect of dust and smoke from commercial premises (not regulated under IPPC regime) will be investigated as a priority and enforcement action taken in accordance with the enforcement property.	NLC	Ongoing	Ongoing
C4	Identify current road sweeping schedules within the Scunthorpe AQMA a realign schedules as appropriate to minimise resuspended dust emissions from areas such as Brigg Road	NLC	2009	Complete

Action	Action Detail	Lead Role	Timescale	Progress
C5	Conduct a publicity campaign advising local residents the implications of living in a domestic smoke control area and encourage people to complain if they are affected by smoke from domestic chimneys.	NLC	Ongoing	Ongoing
C6	Complaints in respect of domestic smoke control will be investigated as a priority and enforcement action taken in accordance with the enforcement policy.	NLC	Ongoing	Ongoing
D1	The Council will organise strategic air quality management meeting with other relevant organisations with an interest in air quality issues, including the Health Protection Agency, Primary Care Trust and the Environment Agency. The purpose of the group will be to identify key air quality issues and agree measures for reduction. Meetings to be scheduled approximately quarterly.	NLC EA PCT Tata HPA	2009	Complete Ongoing
D2	Set up a Local Industry Forum involving the Environment Agency, North Lincolnshire Council and Local Industry representatives with the potential to emit PM ₁₀ . The purpose of the group is to identify key issues, agree measures for reduction of PM ₁₀ and formulate a memorandum of understanding between all industrial operators particularly in respect of issues falling outside the scope of permitting. Meetings to be scheduled approximately every six months. This group may include representatives from other steelwork area sites (Council, EA and Tata)	NLC	2009	Complete Ongoing
D3	Formulate an industry overview for the integrated steelworks site. Identifying process areas, haul routes, vehicle flows and operating hours to consider in conjunction with monitoring data. Identify areas of responsibility within general areas of the steelworks site, areas outside the permit regime and regulatory responsibility for the same.	NLC	Ongoing	Complete Ongoing
D4	Continue to lobby central government in relation to permitting of mobile plant and look to identify	NLC	2008	Complete

Action	Action Detail	Lead Role	Timescale	Progress
	improved mechanisms of regulation and enforcement.			
D5	Ensure that the requirements of the PPC permitting regime are appropriately enforced with inspections prioritised on a risk basis taking account of PM ₁₀ emissions. Regulators will work closely with process operators to minimise PM ₁₀ emissions and seek long term solutions to address dusty operations.	NLC	Ongoing	Ongoing
D6	Ensure permits issued under LA-IPPC are reviewed in accordance with guidance, with particular attention to processes within the AQMA with the potential to emit PM ₁₀ .	NLC	Ongoing	Ongoing
D7	Work with local industry and EA towards the development of relevant measurable indicators of changes in significant emissions of PM ₁₀	NLC	2009	Ongoing
D8	Work with local industry and EA to develop targets for the reduction of the area covered by the AQMA so that the number of properties affected will be reduced.	NLC	2010	Ongoing
E1	The impact of development within the Air Quality Management Area shall be considered in relation to air quality. Exposure of new receptors or the introduction of significant new sources of PM ₁₀ will need to be appropriately until such time as action E2 has been completed.	NLC	Short Term	Complete Ongoing
E2	Develop a Supplementary Planning Document (SPD), which identifies the constraints and mitigation to development within the Air Quality Management Area	NLC	2009	Complete Ongoing

Action	Action Detail	Lead Role	Timescale	Progress
F1	Review new and existing development sites, to monitor the impact of road, rail, air and water traffic and their emission levels.	NLC	Short Term	Complete Ongoing
F2	Implementing bus priority measures as appropriate at new residential developments to help ensure that public transport is a quicker and more direct transport than the car	NLC	Ongoing	Complete Ongoing
F3	The main measures to implement are improving facilities for pedestrians and cyclists, school and workplace travel planning, promotional work such as travelwise, implementation of school safety zones, bus and infrastructure enhancements and simplification of the network, ticketing in Scunthorpe and the main rural routes and managing our car parks and tariff structure.	NLC	Ongoing	Ongoing
F4	The implementation of an urban traffic control system will assist the traffic manager in delivering a smoother flow of traffic in the urban area of Scunthorpe and reduce levels of congestion. This has been programmed for delivery during the period of this and the next Local Transport Plan	NLC	Ongoing	Ongoing
F5	Reducing incidents of dangerous driving and enforcing compliance with speed limits will also help maintain a smooth flow of traffic and minimise sudden braking acceleration	NLC	Ongoing	Ongoing
F6	Through the North Lincolnshire Road Safety and Safety Camera Partnerships we will deliver continued enforcement of speed limits and driving standards	NLC	Ongoing	Ongoing
F7	Through the quality bus partnership we will work with the operators to encourage the replacement of vehicles to the latest European emission standards wherever possible	NLC	Ongoing	Ongoing
F8	A fleet of vehicles that are powered by LPG already operates (predominantly in waste management), we	NLC	Ongoing	Stopped

Action	Action Detail	Lead Role	Timescale	Progress
	will continue to update and operate our fleet vehicles to use more environmentally friendly forms of fuel. Particulate traps on our vehicles are also used and we will continue to promote their use to reduce particulate matter			
F9	<p>The council will aim to:</p> <ul style="list-style-type: none"> • Reduce traffic flows through promotion of sustainable travel and demand management measures • Reduce transport related emissions by reducing traffic flows and making more efficient use of the network • Deliver environmental improvements • Improve the street scene • Make communities places where people want to live 	NLC	Ongoing	Ongoing

9 Conclusion

9.1 Conclusions from New Monitoring Data

North Lincolnshire Council has continued to operate an extensive air quality monitoring network. The data captured from this network has not identified any new areas of exceedance and has continued to identify known areas of poor air quality. These areas include the area immediately around the Scunthorpe Integrated Steelworks including Low Santon for PM₁₀ and the A160 (Humber Road) in Killingholme for NO₂ which is to be the subject of a Detailed Assessment.

9.2 Conclusions relating to New Local Developments

North Lincolnshire Council has considered all new local development during 2012 calendar year and confirms that there are no new or newly identified local developments which may have an impact on air quality within the Local Authority area. A large number of sources were considered in the 2012 USA and have not been reconsidered due to a continuation of inputs/outputs from the individual sources.

9.3 Proposed Actions

There are no new actions that need adding with the existing action plans as a result of new monitoring data or the assessment of sources. However, there are ongoing actions as stated in the 2012 Action Plans that will need to continue as planned to tackle the issues behind the declaration of AQMA's for breaching the PM₁₀ air quality objective. For the possible issue regarding NO₂ breaches at South Killingholme, North Lincolnshire Council will produce a Detailed Assessment for NO₂ once 12 months continuous data is available. Further actions for the air quality network will include the ongoing monitoring and analysis of the existing AQMA's and also the upgrading of air quality monitoring stations as and when required.

10 References

Carslaw, D.C. and K. Ropkins, (2012). openair — an R package for air quality data analysis. *Environmental Modelling & Software*. Volume 27-28, 52-61.

Carslaw, D.C. (2013). The openair manual — open-source tools for analysing air pollution data. Manual for version 0.8-0, King's College London.

(Carslaw and Ropkins 2012)

Local Air Quality Management Technical Guidance LAQM.TG(09). February 2009. Published by Defra in partnership with the Scottish Government, Welsh Assembly Government and Department of the Environment Northern Ireland

Defra. "Policy- Protecting and Enhancing Our Urban and Natural Environment to Improve Public Health and Wellbeing." *GOV.UK*. Department of Environment, Food and Rural Affairs, 9 Apr. 2013. Web. 06 June 2013.

11 Appendix 1: QA:QC Data

Diffusion Tube Bias Adjustment Factors

North Lincolnshire Council currently uses ESG for both supply and analysis of its Nitrogen Dioxide Diffusion Tubes. The Bias Adjustment factor for ESG in 2012 was 0.67.

Factor from Local Co-location Studies

North Lincolnshire Council had only 1 ongoing co location study at Scunthorpe Town site, the results are as below:

Table 11.1: Factors from local co-location studies

Site	Analyser Annual Mean	Tube Annual Means	Bias Adjustment Factor
Scunthorpe Town	20	30	0.67

Discussion of Choice of Factor to Use

The decision to use a Bias Adjustment Factor generated from our own co location study was reached due to the complexity of the issues within North Lincolnshire. As the AQMA's declared within North Lincolnshire are predominantly industry related it was felt that using an average of other authority figures would be unsuitable.

Our NO₂ analysers suffered major faults in 2009 falling in to 2010. The Gallagher Retail Park & Kingsway House analysers suffered major reductions in data capture, consequently neither site could be used for the bias adjustment. This left Rowland Road.

Although the tube network is spread over a wide area of North Lincolnshire the tubes are situated in relatively similar situations, all at the same height and if the tubes are not co located most are held on roadside lampposts. This study has been ongoing since 2006 and has presented different adjustment factors each year. We have confidence within our AURN continuous monitor at this location due to its strict calibration programme and ratification procedures carried out by AEA.

PM Monitoring Adjustment

Particulate matter within North Lincolnshire is currently measured using TEOM. The sites at Santon and Scunthorpe Town have co located Partisols as discussed in the monitoring data section of this report. Numbers reported with results from a TEOM

have had a factor of 1.3 applied and then corrected using the Volatile Correction Model as recommended by the Technical Guidance 2009.

QA/QC of automatic monitoring

AEA Technology currently carry out the QA/QC amendments to our data via their Calibration Club service. Each of the gas analysers is calibrated every 2 weeks with the TEOMs calibrated fortnightly and filter changed every 4 weeks.

Diffusion Tube Bias adjustment

North Lincolnshire Council has carried out own diffusion tube co-location study. Department of Environment Food and Rural Affairs (Defra) developed a spreadsheet to assist in calculating the precision and accuracy of the diffusion tube results by their results from co-location studies by comparing with automatic analysers. The result provide a bias adjustment factor with a 95% confidence interval as an estimate of the uncertainty on the bias adjustment. The bias adjustment factor was then applied to the annual mean results from other NO₂ diffusion tube sites according to the LAQM.TG (09) guidance (Table 11.2).

Table 11.2: Checking the diffusion tube precision and accuracy from co-location study

Checking Precision and Accuracy of Triplicate Tubes

Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 $\mu\text{g m}^{-3}$	Tube 2 $\mu\text{g m}^{-3}$	Tube 3 $\mu\text{g m}^{-3}$	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	06/01/2012	03/02/2012	44.0	36.0	40.0	40	4.0	10	9.9
2	03/02/2012	01/03/2012		42.0	38.0	40	2.8	7	25.4
3	01/03/2012	30/03/2012	66.0	35.0	36.0	46	17.6	39	43.8
4	30/03/2012	27/04/2012	26.0	25.0	23.0	25	1.5	6	3.8
5	27/04/2012	01/06/2012	20.0	20.0	18.0	19	1.2	6	2.9
6	01/06/2012	29/06/2012	18.0	24.0	18.0	20	3.5	17	8.6
7	29/06/2012	03/08/2012	19.0	22.0	17.0	19	2.5	13	6.3
8	03/08/2012	31/08/2012	19.0	21.0	19.0	20	1.2	6	2.9
9	31/08/2012	28/09/2012	25.0	32.0	33.0	30	4.4	15	10.8
10	28/09/2012	02/11/2012	34.0	28.0	27.0	30	3.8	13	9.4
11	02/11/2012	30/11/2012	37.0	39.0	36.0	37	1.5	4	3.8
12	30/11/2012	04/01/2013	39.0	33.0	35.0	36	3.1	9	7.6
13									

It is necessary to have results for at least two tubes in order to calculate the precision of the measurements

AEA Energy & Environment
From the AEA group

Automatic Method		Data Quality Check	
Period Mean	Data Capture (% DC)	Tubes Precision Check	Automatic Monitor Data
39.8	99.7	Good	Good
34.7	99.7	Good	Good
29.2	99.0	Poor Precision	Good
17.5	99.7	Good	Good
13.5	90.0	Good	Good
10.0	34.4	Good	or Data Capture
6.7	96.5	Good	Good
10.8	94.0	Good	Good
11.4	99.4	Good	Good
16.4	97.6	Good	Good
21.7	78.3	Good	Good
24.5	96.3	Good	Good

Overall survey -->

Good precision	Good Overall DC
----------------	-----------------

(Check average CV & DC from Accuracy calculations)

Site Name/ID: Rowland Road

Accuracy (with 95% confidence interval)	without periods with CV larger than 20%
Bias calculated using 10 periods of data	
Bias factor A	0.67 (0.62 - 0.94)
Bias B	50% (7% - 94%)
Diffusion Tubes Mean:	30 $\mu\text{g m}^{-3}$
Mean CV (Precision):	9
Automatic Mean:	20 $\mu\text{g m}^{-3}$
Data Capture for periods used:	95%
Adjusted Tubes Mean:	20 (15 - 28) $\mu\text{g m}^{-3}$

Precision 11 out of 12 periods have a CV smaller than 20%

Accuracy (with 95% confidence interval)	WITH ALL DATA
Bias calculated using 11 periods of data	
Bias factor A	0.66 (0.53 - 0.89)
Bias B	51% (12% - 90%)
Diffusion Tubes Mean:	31 $\mu\text{g m}^{-3}$
Mean CV (Precision):	12 caution
Automatic Mean:	21 $\mu\text{g m}^{-3}$
Data Capture for periods used:	95%
Adjusted Tubes Mean:	20 (16 - 28) $\mu\text{g m}^{-3}$

Jaume Targa, for AEA
Version 04 - February 2011