



2011 Air Quality Progress Report for North Lincolnshire Council (Draft)

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

July 2011

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Executive Summary

The 2011 Progress Report has highlighted a potential new exceedance of the air quality objectives applicable to LAQM **in England** as set out in the Air Quality (England) Regulations 2000 (SI 928), 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 2009 Updating & Screening Assessment and 2010 Progress Report.

Continuing problems have been highlighted within the local area relating to PM₁₀ which 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.

Data from 2010 has shown an overall improvement at the affected sites but any improvement should be met with caution because of changing meteorological conditions. Early indications from 2011 have shown that monitoring sites around the Integrated Steelworks have already or are close to exceeding PM₁₀ objectives.

A potential new exceedance of the air quality objective for NO₂ has been identified at South Killingholme. High levels of traffic have previously been identified on the affected stretch of road but a new diffusion tube study has alerted North Lincolnshire Council to the risk of an exceedance.

All other sources assessed have not met the criteria required to proceed to a detailed assessment. These will be assessed again in the 2012 Updating and Screening Assessment to ensure that they do not have a detrimental effect on the air quality of North Lincolnshire.

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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. Almost half of North Lincolnshire's population, approximately 73,250 people, live in Scunthorpe and the adjacent town of Bottesford. Overall, 71 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

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 Local Air Quality Management (LAQM) **in England** are set out in the Air Quality (England) Regulations 2000 (SI 928), and the Air Quality (England) (Amendment) Regulations 2002 (SI 3043). They are shown in Table 1.1. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (for carbon monoxide the units used are milligrammes per cubic metre, mg/m^3). Table 1.1. includes the number of permitted exceedences in any given year (where applicable).

Table 1.1 Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England.

Pollutant	Concentration	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	10.0 mg/m^3	Maximum daily running 8-hour mean	31.12.2003
Lead	0.5 $\mu\text{g}/\text{m}^3$	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
Particles (PM₁₀) (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 exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 $\mu\text{g}/\text{m}^3$, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

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;

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

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.

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 5µg/m³ 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.

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} .

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

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 $40\mu\text{g}/\text{m}^3$.

Further Assessment of PM_{10} 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.

Progress Report 2008

The progress report concluded that NO_2 concentrations within Killingholme had decreased and there had been no significant changes to road traffic flows or other transportation.

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.

Progress Report 2010

The 2010 Progress Report did not highlight any new exceedances 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.

Further Assessment of PM₁₀ at Low Santon

This Further Assessment was undertaken because of continued exceedances 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

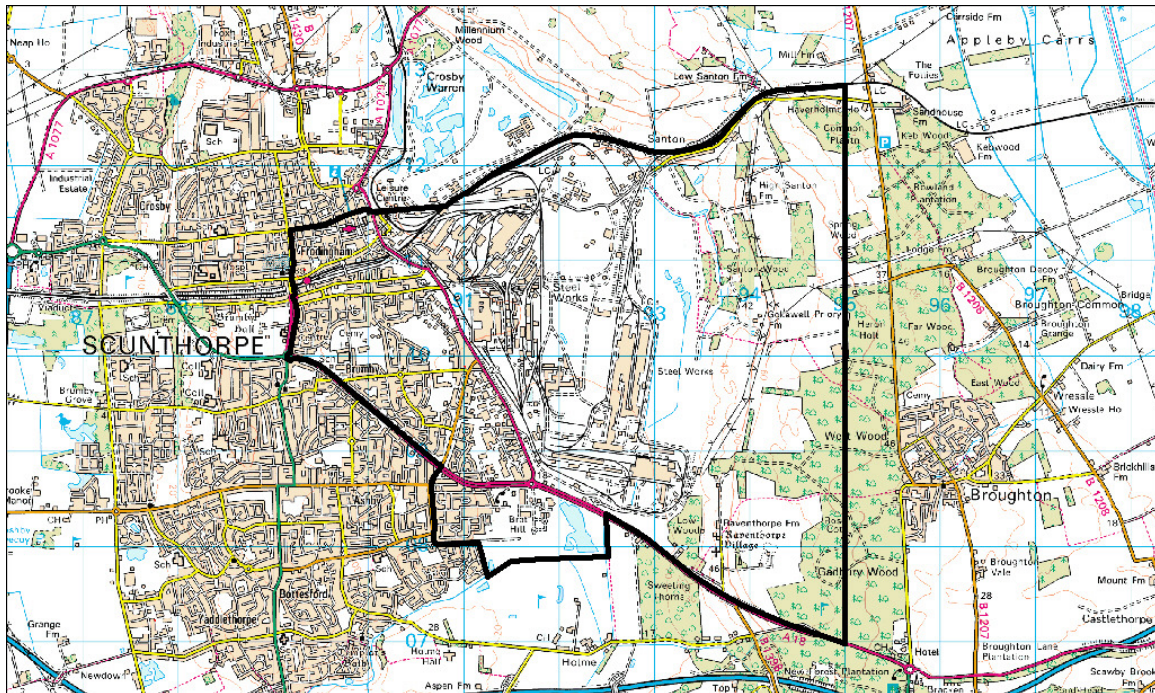


Figure 1.1 2005 Scunthorpe Town AQMA Boundary

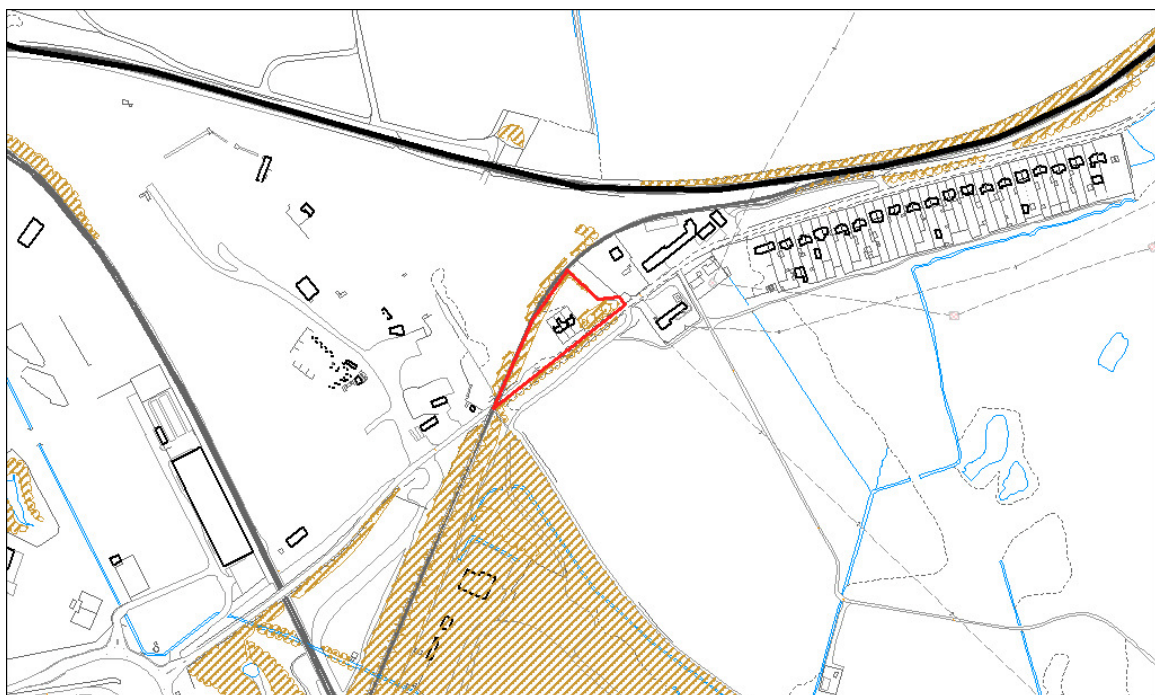


Figure 1.2 2008 Low Santon AQMA Boundary

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

North Lincolnshire has managed an extensive network of automatic monitoring stations in recent years. This network is constantly being reviewed and as a result of this was reduced in size as the 2010 Progress Report was being written. Further changes have now taken place resulting in a number of stations being removed and replaced at more relevant locations.

X Gallagher Retail Park [Monitoring Suspended from 31/03/2010](#)

This monitor has ceased recording and will not be brought back in to service. Data from the first 3 months of 2010 are detailed in this report.

X Allanby Street [Monitoring Suspended from 31/03/2010](#)

This monitoring station has been removed and replaced within a local sports and social club. Data from the first few months of 2010 at Allanby Street are detailed in this report

X Kingsway House [Monitoring Suspended from 31/03/2010](#)

This monitor has ceased recording and will not be brought back in to service. Data from the first 3 months of 2010 at Kingsway House are detailed in this report

X Lincoln Gardens [Monitoring Suspended from 03/04/2011](#)

This monitoring station has ceased recording but remains in place. It is the intention of North Lincolnshire Council to move this monitor to a more relevant location yet to be determined.

X Broughton [Monitoring Suspended from 31/03/2010](#)

This monitoring station has been removed and replaced within a newly built housing development close to the boundary of the local Integrated Steelworks. Data from the first few months of 2010 recorded at Broughton are detailed in this report

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 Physics Laboratory funded Heavy Metals sampler and a Digitel 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.

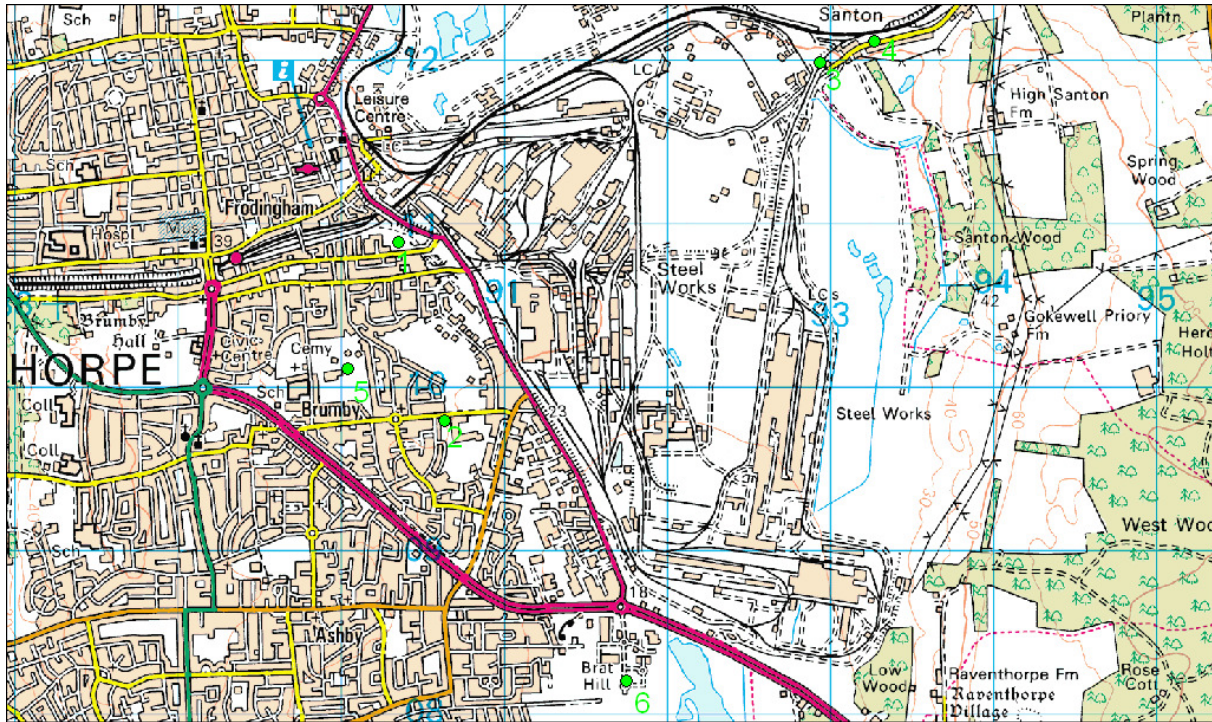


Figure 1.3 Location of Monitoring Sites in Scunthorpe

5. Redbourn Club [Monitoring Commenced 18/08/2010](#)

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 [Monitoring Commenced 01/03/2011](#)

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.



Figure 1.4 Location of Appleby Site

8. Killingholme

The site is located within the grounds of South Killingholme Primary School and is approximately 200 m north of the dual-carriage A160; see figure 1.6. 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.

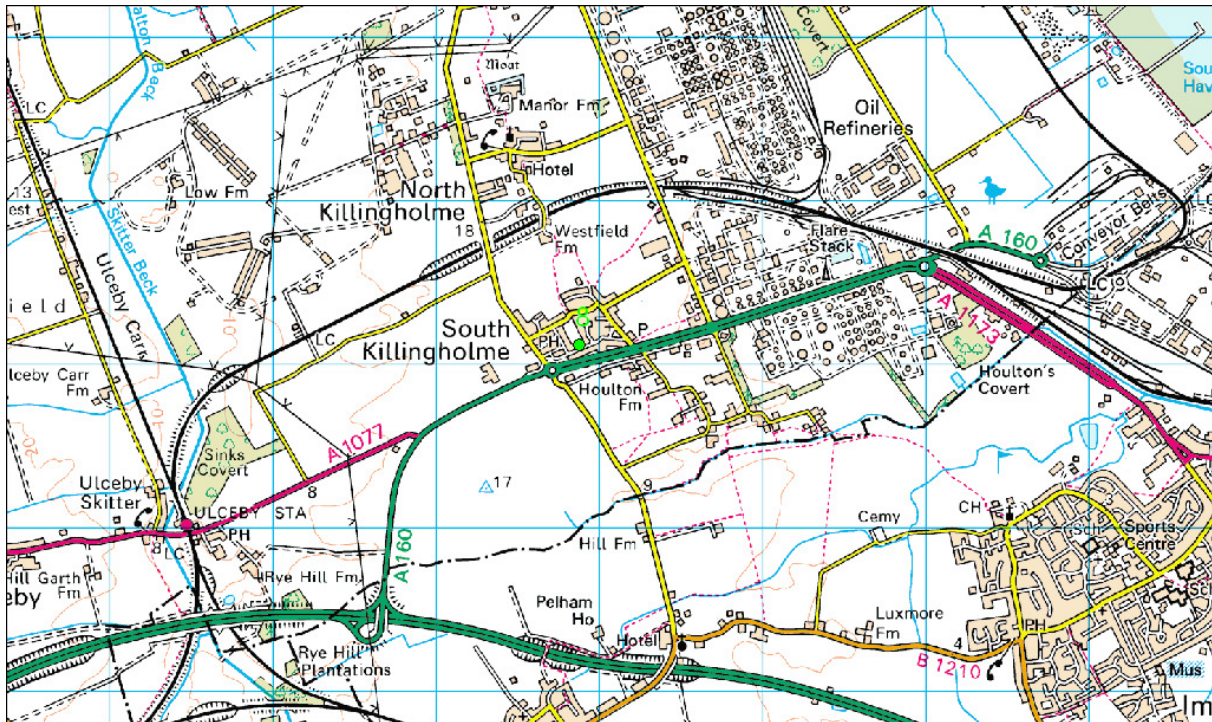


Figure 1.5 Location of Killingholme Monitoring Site

Table 2.1 Details of Active Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA?	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?
1. Scunthorpe Town (AURN)	Urban Industrial	490320	410831	PM10, SO2, NO2	FDMS, TEOM, Gas	Yes	Y (21m)	7m	N
2. East Common Lane	Urban Industrial	490663	409789	PM10	TEOM	Yes	Y (3m)	28m	N
3. Low Santon	Industrial	492945	411931	PM10, SO2, NO2	FDMS, TEOM, Gas	Yes	Y (41m)	5m	N
4. High Santon	Industrial	492945	411931	PM10	Partisol	Yes	Y (8m)	5m	N
5. Redbourn Club	Urban	490002	410069	PM10	TEOM	Yes	Y (15m)	N/A	N
6. Lakeside	Urban Industrial	491750	408127	PM10	TEOM	No	Y (4m)	8m	N
7. Appleby	Rural	495075	414767	PM10	TEOM	No	Y (17m)	N/A	N
8. Killingholme	Urban Industrial	514880	416133	PM10, SO2, NO2	TEOM, Gas	No	Y (9m)	N/A	N

Table 2.2 Details of Redundant Monitoring Sites

Site Name	Site Type	OS Grid Ref		Pollutants Monitored	Monitoring Technique	In AQMA?	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?
X Gallagher Retail Park	Urban	486696	411105	NO2	Airpointer	N	Y (39m)	10m	N
X Allanby Street	Urban	489228	411447	PM10	TEOM	N	Y (15m)	3m	N
X Kingsway House	Urban	489145	409889	NO2	Airpointer	N	Y (5m)	2m	N
X Lincoln Gardens	Urban	489464	408939	PM10	TEOM	N	Y (18m)	N/a	N
X Broughton	Rural	496046	409410	PM10	TEOM	N	Y (9m)	7m	N

2.1.2 Non-Automatic Monitoring Sites

North Lincolnshire Council had a nitrogen dioxide diffusion tube network consisting of 39 sites in 2010. The number of tubes has been reduced in 2011. The diffusion tubes are supplied and analysed by South Yorkshire Air Quality Samplers, the chemical absorbent used consists of 50% Acetone and 50% Triethanolamine. North Lincolnshire Council has followed the guidance in relation to applying a bias adjustment calculation. Only one collocation study was in progress within North Lincolnshire for the whole of 2010. Three studies were active in 2009 and for a period in 2010 although problems were encountered at the NO_x Airpointer sites, Kingsway House and Gallagher Retail Park due to the availability of replacement parts. These sites have now been removed.

The 2010 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 South Yorkshire Air Quality Samplers operate 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.

Table 2.3 Details of Non- Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location ?
Tube 1	Urban Kerbside	X489099 Y411723	NO ₂	N	3m	1m	N
Tube 2	Urban Roadside	X489394 Y411927	NO ₂	N	18m	1m	N
Tube 3	Rural Roadside	X486618 Y412252	NO ₂	N	N/a	12m	N
Tube 4	Suburban Kerbside	X478038 Y403957	NO ₂	N	1m	1m	N
Tube 5	Suburban Roadside	X483642 Y410643	NO ₂	N	20m	2m	N
Tube 6	Suburban Roadside	X486690 Y411112	NO ₂	N	42m	16m	N
Tube 7	Suburban Roadside	X486690 Y411112	NO ₂	N	42m	16m	N
Tube 8	Suburban Roadside	X486690 Y411112	NO ₂	N	42m	16m	N
Tube 9	Suburban Roadside	X486928 Y411156	NO ₂	N	12m	3m	N
Tube 10	Suburban Kerbside	X487239 Y411259	NO ₂	N	9m	2m	N
Tube 11	Urban Roadside	X488547 Y411249	NO ₂	N	30m	2m	N
Tube 12	Urban Roadside	X489190 Y411285	NO ₂	N	4m	2m	N
Tube 13	Urban Kerbside	X489209 Y411118	NO ₂	N	4m	3m	N
Tube 14	Urban Kerbside	X489247 Y410355	NO ₂	N	20m	3m	N
Tube 15	Urban Kerbside	X489777 Y409702	NO ₂	N	20m	5m	N
Tube 16	Urban Kerbside	X488490 Y409963	NO ₂	N	8m	1m	N
Tube 17	Urban Roadside	X489145 Y409889	NO ₂	N	2m	5m	N
Tube 18	Urban Roadside	X489145 Y409889	NO ₂	N	2m	5m	N
Tube 19	Urban Roadside	X489145 Y409889	NO ₂	N	2m	5m	N
Tube 20	Urban Kerbside	X489172 Y409926	NO ₂	N	20m	2m	N
Tube 21	Urban Kerbside	X489112 Y409463	NO ₂	N	15m	1m	N
Tube 22	Urban Kerbside	X489242 Y408695	NO ₂	N	3m	1m	N
Tube 23	Suburban Kerbside	X489735 Y407880	NO ₂	N	9m	4m	N
Tube 24	Suburban Kerbside	X409638 Y408632	NO ₂	N	9m	4m	N
Tube 25	Urban Roadside	X491628 Y408658	NO ₂	N	N/a	2m	N
Tube 26	Suburban Roadside	X491737 Y408378	NO ₂	N	N/a	2m	N

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	In AQMA ?	Relevant Exposure? (Y/N with distance (m) to relevant exposure)	Distance to kerb of nearest road (N/A if not applicable)	Worst-case Location ?
Tube 27	Industrial Roadside	X491838 Y408641	NO ₂	N	N/a	9m	N
Tube 28	Industrial Roadside	X491859 Y408645	NO ₂	N	N/a	9m	N
Tube 29	Urban Kerbside	X499975 Y407421	NO ₂	N	60m	3m	N
Tube 30	Suburban Kerbside	X500430 Y407270	NO ₂	N	10m	2m	N
Tube 31	Industrial Roadside	X515363 Y416085	NO ₂	N	20m	5m	N
Tube 32	Industrial Kerbside	X515280 Y416085	NO ₂	N	10m	2m	N
Tube 33	Industrial Roadside	X514645 Y417363	NO ₂	N	5m	3m	N
Tube 34	Suburban Kerbside	X503048 Y421907	NO ₂	N	15m	1m	N
Tube 35	Suburban Kerbside	X497833 Y421043	NO ₂	N	7m	1m	N
Tube 36	Industrial Roadside	X490316 Y410837	NO ₂	N	32m	6m	N
Tube 37	Industrial Roadside	X490316 Y410837	NO ₂	N	32m	6m	N
Tube 38	Industrial Roadside	X490316 Y410837	NO ₂	N	32m	6m	N
Tube 39	Industrial Roadside	X490080 Y411258	NO ₂	N	36m	2m	N

Further tubes were installed at Killingholme in 2010 following a consultation exercise undertaken by the Highways Agency. The Killingholme area will see a vast increase in economic activity over the next few years because of port related growth. This will result in increasing AADT of which HGV's will be a large sector. Because of concerns over any increase in NO₂ in the area, an additional six tube study was installed. These results will be reviewed later in this report.

It is the intention of North Lincolnshire Council to further reduce the number of tubes within the network over the coming years. A number of tubes have remained compliant throughout their monitoring campaigns. These tubes will be discussed later in this report with recommendations on the value of their continuation

2.2 Comparison of Monitoring Results with Air Quality Objectives

North Lincolnshire Council has made a number of changes to the monitoring network as discussed previously in this report. This section will outline the ratified monitoring results from 2010. Should any site have been discontinued in 2010 the date it ceased will be highlighted. Due to the impact on data capture any relevant corrections will be applied.

In addition to the removal of sites in 2010 a number of new sites were installed. Again, the start date is highlighted along with the relevant corrections to ensure consistency when comparing sites against the relevant air quality objectives.

North Lincolnshire Council continue to facilitate a number of external networks within its boundary such as the PAH network and Heavy Metals network. The most recent results available will be presented within this section.

A number of Osiris particulate monitors are now in operation within North Lincolnshire and are being used as a screening tool in order to assess the relative concentrations at critical locations in Scunthorpe. The use of Osiris monitors allows a higher spatial resolution and allows the collection of monitoring data at sites with no previous data. Although these sites are not permanent they are valuable tools in assessing the scale of exceedances and in the identification of pollution sources. Data from these sites will also be presented within this section of the report. It is important to remember that these sites are not equivalent methods and direct comparison to relevant air quality objectives is not appropriate.

2.2.1 Nitrogen Dioxide

Automatic Monitoring Data

Table 2.3a Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with Annual Mean Objective

Site ID	Location	Relevant public exposure? Y/N	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2010 ^b %	Annual mean concentrations ($\mu\text{g}/\text{m}^3$)		
					2008 ^{c, d}	2009 ^{c, d}	2010 ^c
1	Scunthorpe Town	Y		96.7%	18.7	17.9	19.8
3	Low Santon	Y		91.5%	20.3	18.6	18.9
8	Killingholme	Y		99.6%	21.9	18.7	21.0
x	Kingsway House	Y	79.7%	22.4%	32.0	30.1	40.1

^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 should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.

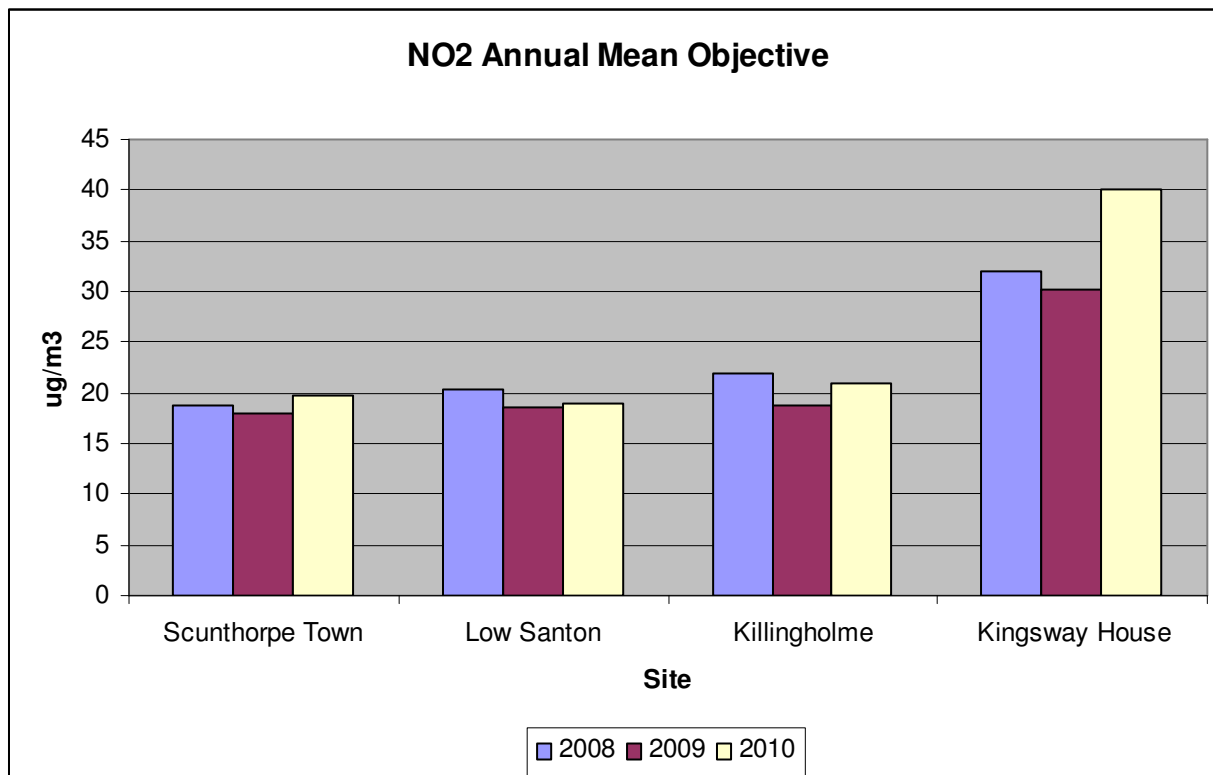
^d Annual mean concentrations for previous years are optional.

Automatic NO_x analysers have demonstrated compliance within North Lincolnshire over recent years. Scunthorpe Town, Low Santon and Killingholme have demonstrated consistent levels throughout their monitoring campaign. Although demonstrating compliance these will remain in place. Scunthorpe Town because of its AURN affiliation, Low Santon due to its value in source identification on a complex industrial site and Killingholme because of its location close to two large oil refinery complex sites.

The further two automatic NO_x analysers were situated at roadside sites identified as being likely to exceed the relevant objectives during previous rounds of review and assessment. Due to instrument failure and availability of replacement parts these sites have now been mothballed with only Kingsway House recording data in 2010. Kingsway House exceeded the objective for the period in which it was recording data. Using box 3.2 in TG (09) the annualised mean for Kingsway House corrected with readings from the remaining automatic monitoring stations is 37.2 $\mu\text{g}/\text{m}^3$ demonstrating overall compliance. This calculation can be viewed in appendix 4 of this document. Data recorded for the same period in 2009 shows similar elevated levels at Kingsway House yet the annual mean for 2009 highlights the likelihood that had Kingsway House recorded for the full 12 months, it would have demonstrated compliance. The residential development known as Kingsway House has now been demolished.

No automatic monitoring sites within North Lincolnshire have exceeded the annual mean concentration for NO₂.

Figure 2.1 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Automatic Monitoring Sites.



The above graph demonstrates compliance at automatic monitoring sites with the Nitrogen Dioxide annual mean objective of 40ug/m³. Kingsway House recorded a marginal exceedance with poor data capture however when annualised this site demonstrates compliance.

Table 2.3b Results of Automatic Monitoring for Nitrogen Dioxide: Comparison with 1-hour Mean Objective

Site ID	Location	Within AQMA?	Relevant public exposure? Y/N	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2010 ^b %	Number of Exceedences of hourly mean (200 µg/m ³) If the period of valid data is less than 90% of a full year, include the 99.8 th percentile of hourly means in brackets.		
						2008 ^c	2009 ^c	2010
1	Scunthorpe Town	N	Y		96.7%	0	0	0
3	Low Santon	N	Y		91.5%	0	0	0
8	Killingholme	N	Y		99.6%	0	0	0
x	Kingsway House	N	Y	79.7%	22.4%	8	0	0 (145.2)

^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 Numbers of exceedences for previous years are optional.

No automatic monitoring sites within North Lincolnshire measured an exceedance of the hourly mean objective for Nitrogen Dioxide in 2010. Previous years have also produce no exceedences of this objective.

The 99.8th percentile figure for Kingsway House is presented in brackets within Table 2.3b. Although this indicates a high level of hourly NO₂ it should be noted that it does not exceed the objective and an annualised calculation for this site has demonstrated compliance with the annual mean objective.

No automatic sites within North Lincolnshire have exceeded the permitted number of exceedences above the Nitrogen Dioxide hourly mean objective.

Diffusion Tube Monitoring Data

The diffusion tube network has remained unchanged during 2010 and is the same as that reported in 2009.

Many of the tubes within the network have demonstrated compliance for a number of years and it is proposed to conduct a review of tubes for exposure in 2012, a number of tubes are likely to be removed.

Table 2.4 Results of Nitrogen Dioxide Diffusion Tubes

Site ID	Location	Within AQMA ?	Relevant public exposure ? Y/N	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2010 ^b %	Annual mean concentrations ($\mu\text{g}/\text{m}^3$)		
						2008 ^{c, d}	2009 ^{c, d}	2010 ^c
Tube 1	Frodingham Road	N	Y		100	27	22	24
Tube 2	Normanby Road	N	Y		83	25	19	21
Tube 3	A1077 Orbital Road	N	Y		100	24	18	17
Tube 4	Epworth/Belton	N	Y		100	31	25	25
Tube 5	Keadby Bridge	N	Y		92	30	22	23
Tube 6	Gallagher Retail Park	N	Y	100		24	20	19
Tube 7	Gallagher Retail Park	N	Y	100		25	19	20
Tube 8	Gallagher Retail Park	N	Y	100		25	20	19
Tube 9	Doncaster Rd (Hilton)	N	Y		92	29	23	22
Tube 10	Scotter Road	N	Y		25	34	33	34
Tube 11	Doncaster Rd (Royal)	N	Y		100	27	19	24
Tube 12	Brittania Corner	N	Y		92	34	27	30
Tube 13	Oswald Road	N	Y		100	32	24	27
Tube 14	Ashby Road	N	Y		100	24	21	24
Tube 15	Old Brumby	N	Y		100	31	23	25
Tube 16	Lloyds Avenue	N	Y		83	27	20	24
Tube 17	Kingsway House	N	Y	100		34	29	31
Tube 18	Kingsway House	N	Y	100		28	21	23

Tube 19	Kingsway House	N	Y	100		30	22	24
Tube 20	Ashby Rd (A18)	N	Y		92	31	24	26
Tube 21	Ashby Rd (Brumby)	N	Y		83	34	27	29
Tube 22	Ashby Rd (Burringham)	N	Y		100	31	20	28
Tube 23	Chancel Rd	N	Y		42	28	21	33
Tube 24	Ashby High Street	N	Y		83	29	22	25
Tube 25	Dudley Road	N	Y		100	28	20	23
Tube 26	Lakeside Parkway	N	Y		92	25	19	23
Tube 27	Brigg Rd/ A18	N	Y		100	47	36	42
Tube 28	Ashby Lodge Pub	N	Y		100	27	24	22
Tube 29	Barnard Avenue	N	Y		83	30	26	26
Tube 30	Wrawby	N	Y		92	28	22	28
Tube 31	Humber Rd, Chip Shop	N	Y		100	30	24	23
Tube 32	Humber Rd, LP695	N	Y		92	27	29	30
Tube 33	St Crispins Close	N	Y		100	18	14	15
Tube 34	Holydyke	N	Y		100	29	21	25
Tube 35	South Ferriby Main Rd	N	Y		100	20	15	14
Tube 36	Rowland Road	N	Y		100	23	18	20
Tube 37	Rowland Road	N	Y		100	23	17	20
Tube 38	Rowland Road	N	Y		100	26	19	20
Tube 39	Station Road (Netto)	N	Y		100	29	22	24

^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 should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.

^d Annual mean concentrations for previous years are optional.

North Lincolnshire Council elected to use its own bias adjustment for the 2010 Nitrogen Dioxide diffusion tube study as it has done in previous years. This decision is explained fully in the appendix of this document.

Brigg Road/ A18 junction is the only site that has exceeded the annual mean objective within the diffusion tube network. This has been the case over a number of years and resulted in a further tube being placed closer to the relevant receptor. This was highlighted within the 2009 Updating and Screening Assessment:

“The 2008-diffusion tube study has highlighted only one exceedance of the permitted Annual Mean Objective set at 40µg/m³. Tube 27 (Brigg Road/A18 Junction) was measured at 47µg/m³ after the bias calculation. Tube 27 is at an industrial background site close to a busy road junction.

The nearest relevant receptors include a newly developed residential estate located 300m to the South. Using the Nitrogen Dioxide fall off with distance documented in TG (09) the predicted levels of Nitrogen Dioxide 50m away from the exceedance is 27.6µg/m³ well within the permitted Air Quality Objective of 40µg/m³ and the necessary levels to proceed to a detailed assessment. North Lincolnshire Council does not need to proceed to a Detailed Assessment for Nitrogen Dioxide.

Tube 27 also sits adjacent to a pub, which is also a residential property with the owners living upstairs. As this pub has been identified in previous rounds of review and assessment a tube (28) has been placed on the wall of the pub. This tube is measured at 27 µg/m³ and rules out the need to progress to a Detailed Assessment for Nitrogen Dioxide.”

The new tube 28 falls well within the compliance thresholds removing the need for any further investigation at this location.

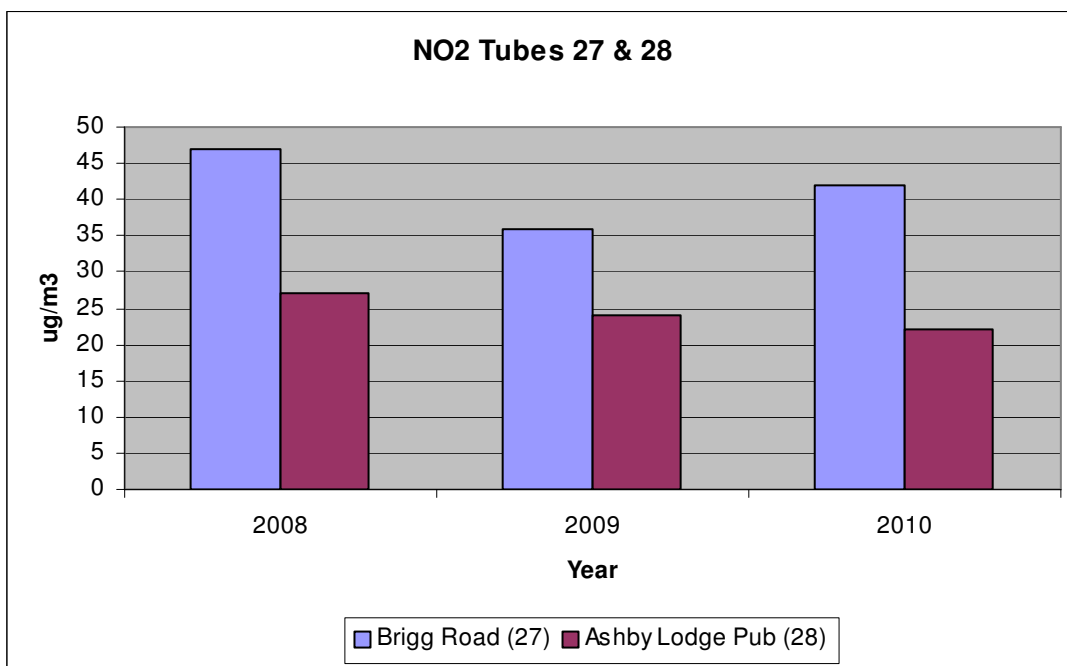


Figure 2.2 Trends in Annual Mean Nitrogen Dioxide Concentration Measured at Diffusion Tube Monitoring Sites.

North Lincolnshire Council in conjunction with the Highways Agency conducted further monitoring of Nitrogen Dioxide in 2010 using diffusion tubes. The A160 is a road that links the M180 and the local port of Immingham, which is to be the subject of major growth in the future. The Highways Agency proposed a number of schemes to improve the road network in this area, resulting in a preferred scheme being identified.

Although the new road scheme was modelled a lack of monitoring data within the area restricted model verification, consequently six additional tubes were installed in order to verify the results. The data is reported in Table 2.5.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes Additional Study at Killingholme

Tube	Location	Month (Objective <40µg/m ³)												Average
		May-10	Jun-10	Jul-10	Aug-10	Sep-10	Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	
Killingholme 1	Humber Road	44	44	34	47		42							42
Killingholme 2	Humber Road	37	40	38	42		35							38
Killingholme 3	Humber Road	35	34	28	28	38	35							33
Killingholme 4	Humber Road	56	58	64	50	68	59	70	63	88	77	71		66
Killingholme 5	Humber Road	52	51	45	38	52	53	65	64	67	73	47		55
Killingholme 6	Town Street				24	29	34		47	71	68	36		44

Data for tubes 4 and 5 identifies recorded levels significantly above the NO₂ Annual Mean Air Quality Objective . The location of tubes 4 and 5 can be seen on the map below. 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 and has confirmed that tube 4 will remain non compliant requiring further investigations to be undertaken. The properties close to tube 5 site are located far enough away from the exceedance to maintain a level of compliance.



Figure 2.3 Locations of non-compliant NO₂ tubes within South Killingholme



Figure 2.4 Focused location of non-compliant NO₂ tubes within South Killingholme

2.2.2 PM₁₀

North Lincolnshire Council has declared two AQMA's for breaches of both PM₁₀ Objectives. Many of the issues are focused around the Integrated Steelworks and have been covered in the 2010 Further Assessment of PM₁₀ within Low Santon.

Industrial operators around Low Santon have focussed on the elevated levels of PM₁₀ at Santon during the last year. The high number of exceedances at Low Santon have led to a number of operational initiatives being put in place in order to reduce the likelihood of exceedances.

Table 2.5a Results of PM₁₀ Automatic Monitoring: Comparison with Annual Mean Objective

Site ID	Location	Within AQMA ?	Data Capture for monitoring period ^a %	Data Capture for full calendar year 2010 ^b %	Annual mean concentrations (µg/m ³)		
					2008 ^{c, d}	2009 ^{c, d}	2010 ^c
1.	Scunthorpe Town TEOM	Y		95.2	21	21	22
1.	Scunthorpe Town FDMS			83.2			23
2.	East Common Lane	Y		96.4	25	22	23
3.	Low Santon TEOM	Y		92.5	38	39	33
3.	Low Santon FDMS		82.2	47.1			28
4.	High Santon	Y		81.1	31	27	23
5.	Redbourn Club	Y	97.8	36.5			20
7.	Appleby	Y		77.6	22	20	19
8.	Killingholme	N		94.3	21	22	21
x	Lincoln Gardens	Y		81.8	21	19	19
x	Broughton	N	81.5	45.4	20	19	20
x	Allanby Street	N	99.6	26.3	22	20	22

^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 should be "annualised" as in Box 3.2 of TG(09), if monitoring was not carried out for the full year.

^d Annual mean concentrations for previous years are optional.

The data for 2010 in Table 2.5a has been subject to the Volatile Correction Model (VCM) where appropriate. The equivalent methods of FDMS and Partisol are presented as raw data. Following a review of the North Lincolnshire Council monitoring network a number of sites were removed, where these have not met the necessary data capture, data has been annualised as per Box 3.2 of TG (09) and presented in appendix 3 of this report.

Most sites within the network remained static or demonstrated a reduction in their annual means. The introduction of the VCM in 2008 has seen a reduction in overall levels throughout the network. Previously North Lincolnshire Council has exercised caution when analysing VCM results due to the FDMS correction sites being a considerable distance from the TEOMs. Although 2010 saw the installation of two FDMS stations in Scunthorpe and Santon data for the year 2010 still used the distant FDMS corrections due to commissioning problems with the new FDMS sites.

The table documents data from the newly installed FDMS in 2010. The commissioning problems have now been resolved and it is anticipated that 2011 data can be corrected using the local units. This has been discussed in depth within the *"2011 Further Assessment of PM₁₀ at Low Santon"*. Previous monitoring data has been corrected to gravimetric *1.3, data from the FDMS in 2011 appear to show a more 1:1 correlation meaning the reductions calculated by the VCM in previous years may not be accurate.

Table 2.5b Results of PM₁₀ Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture for monitoring period ^a %	Data Capture 2010 ^b %	Number of Exceedences of daily mean objective (50 µg/m ³) If data capture < 90%, include the 90 th percentile of daily means in brackets.		
					2008 ^c	2009 ^c	2010 ^c
1.	Scunthorpe Town TEOM	Y		95.2	22	11	16
1.	Scunthorpe Town FDMS			83.2			14 (42)
2.	East Common Lane	Y		96.4	40	17	11
3.	Low Santon TEOM	Y		92.5	73	78	52 (62)
3.	Low Santon FDMS		82.2	47.1			12
4.	High Santon	Y		81.1	34	27	8 (38)
5.	Redbourn Club	Y	97.8	36.5			6
7.	Appleby	Y		77.6	5	5	2 (33)
8.	Killingholme	N		94.3	11	4	3
x	Lincoln Gardens	Y		81.8	21	7	3 (35)
x	Broughton	N	81.5	45.4	6	2	1 (35)
x	Allanby Street	N	99.6	26.3	20	5	0

^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%.)

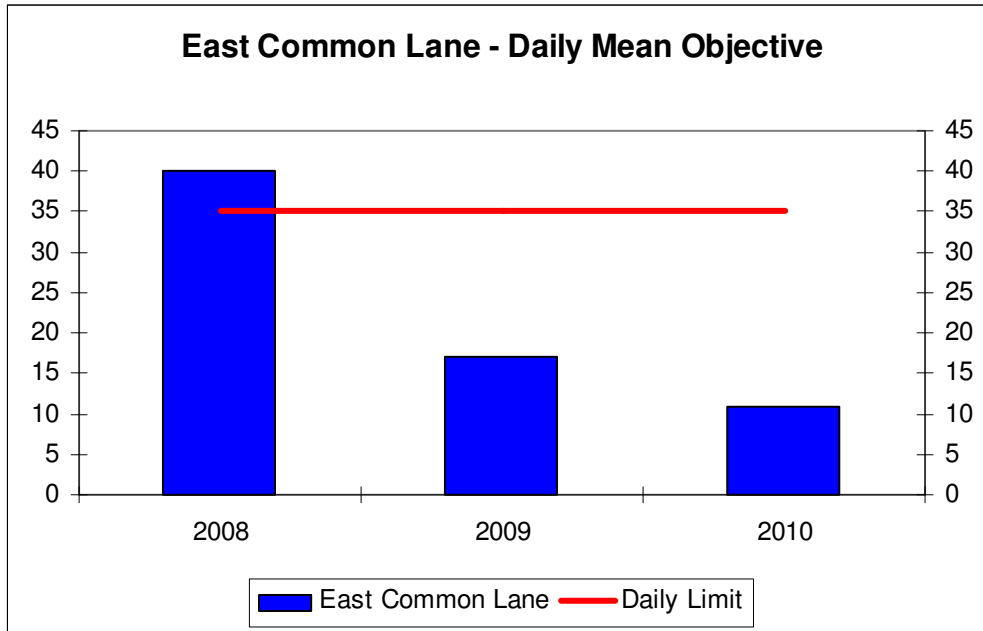
^c Numbers of exceedences for previous years are optional.

Data in Table 2.5a has been subject to the Volatile Correction Model (VCM) where appropriate. The equivalent methods of FDMS and Partisol are presented as raw data. Following a review of the North Lincolnshire Council monitoring network a number of sites were removed. Where these have not met the necessary data capture a 90th percentile has been calculated. Of these percentiles, only the new FDMS at Low Santon exceeded the daily mean objective. An AQMA is already in place at this location yet recent monitoring has indicated improvements at this location. This higher result should be met with caution due to the discussed commissioning problems. 2011 will be a more accurate reflection of the equivalent data being captured at these sites.

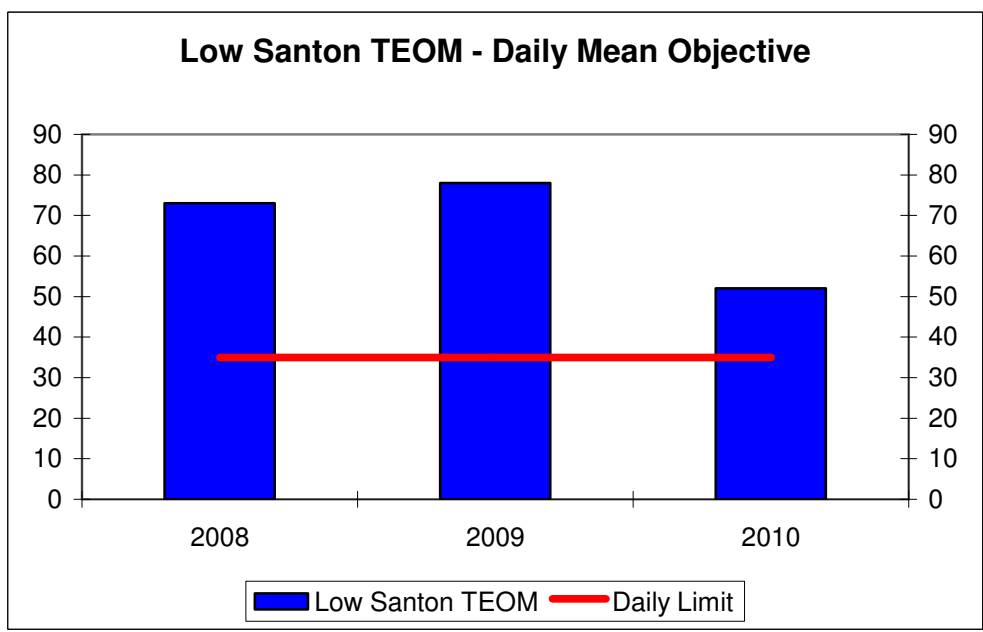
Low Santon remains the area of concern and is still above the daily mean objective even though it has demonstrated a reduction year on year since monitoring began. The Low Santon FDMS was operational in 2010 although the data has been rejected due to inadequate data capture. It is anticipated that quality data will be captured in 2011, early indications have already shown total exceedences in excess of 35 days.

East Common Lane, the only other site to exceed in the past 3 years, again demonstrated a marked reduction in 2010. This site is very dependent on wind direction and is already close to the 35 daily limit for 2011.

Figure 2.5 Trends in Annual Mean PM₁₀.



East Common Lane has demonstrated a marked decrease in exceedances since 2008. All data in these years from this site has been subject to the VCM.



Low Santon has again demonstrated a reduction in exceedances for 2010 yet remains substantially above the daily mean objective. This step change may be due to improvements being made on the Integrated Steelworks Site but is more likely due to unusual meteorological conditions with a higher frequency of Easterly winds.

2.2.3 Sulphur Dioxide

North Lincolnshire Council continues to operate three automatic Sulphur Dioxide monitoring units based at Low Santon, Scunthorpe Town (AURN) and Killingholme. These sites have historically demonstrated compliance even though they are all sited adjacent to major industrial activities.

Table 2.6 Results of SO₂ Automatic Monitoring: Comparison with Objectives

Site ID	Location	Within AQMA?	Data Capture 2010 %	Number of Exceedences of: (µg/m ³)		
				15-minute Objective (266 µg/m ³)	1-hour Objective (350 µg/m ³)	24-hour Objective (125 µg/m ³)
5	Scunthorpe Town AURN	N	85.2	0	0	0
7a	Low Santon	N	90.1	0	0	0
10	Killingholme	N	88.7	0	0	0

There continues to be no exceedences of the Sulphur Dioxide objectives within North Lincolnshire. We do not anticipate any changes but will continue to monitor SO₂ at these locations.

2.2.4 Other pollutants monitored

North Lincolnshire Council currently monitors PAH's (poly-aromatic hydrocarbons) and Heavy Metals at two locations within the county, Low Santon and the Scunthorpe Town (ST) site. Results for PAH's are as follows:

Table 2.7 Results of PAH Monitoring

PAH Compound	2009 Santon ng/m ³	2009 ST ng/m ³	2010 Santon ng/m ³	2010 ST ng/m ³
Benzo(c)phenanthrene	0.02	0.05	0.01	0.03
Benzo(a)anthracene	2.09	1.73	1.27	1.2
Chrysene	2.98	2.39	2.09	1.96
Cyclopenta(c,d)pyrene	0.33	0.32	0.25	0.17
Benzo(b)naph(2,1d)thiophene	0.07	0.07	0.24	0.20
5MethylChrysene	<0.01	<0.01	<0.01	<0.01
Benzo(b+j)fluoranthene	3.65	2.67	2.64	1.99
Benzo(k)fluoranthene	1.93	1.03	0.97	0.70
Benzo(e)pyrene	2.35	1.58	1.35	1.12
Benzo(a)pyrene	2.38	1.77	1.61	1.21
Perylene	0.88	0.42	0.40	0.29
Indeno(1,2,3cd)pyrene	1.99	1.40	1.17	0.82
Dibenzo(ah.ac)anthracene	0.35	0.25	0.29	0.22
Benzo(ghi)perylene	1.96	1.34	1.31	0.99
Anthanthrene	0.59	0.23	0.17	0.07
Dibenzo(al)pyrene	0.01	0.01	0.01	0.01
Dibenzo(ae)pyrene	0.04	<0.01	0.11	0.03
Dibenzo(ai)pyrene	0.18	0.09	0.14	0.09
Dibenzo(ah)pyrene	0.05	0.01	0.01	<0.01
Coronene	0.47	0.32	0.34	0.26
Cholanthrene	0.03	0.01	<0.01	<0.01

The UK has set standards and objectives for a number of pollutants in ambient air. In 1999, the UK Expert Panel on Air Quality Standards (EPAQS, 1999) issued a report recommending a maximum annual average concentration for BaP in air of 0.25 ng/m³. Exposure to PAH's at this concentration would minimise the risk to human health. This value was adopted as an annual mean air quality objective to be met by 2010 in England.

In December 2004, the Member States of the European Union published the 4th Air Quality Daughter Directive (4DD) relating to five pollutants including PAH's. The Directive set a target value of 1 ng/m³ for PAH's in terms of benzo[a]pyrene collected in the PM₁₀ fraction of ambient air (PM₁₀ is particulate matter with an aerodynamic diameter less than 10m)

PAH's remain an issue at Scunthorpe Town and Low Santon. There has been a marked reduction in Benzo(a)pyrene in 2010 yet the levels still exceed the European Air Quality Standard and the UK Target Value. Over the coming months PAH will become a strong focus of North Lincolnshire Council because of its combined impacts with PM₁₀ at Low Santon. A review of PAH's and PM₁₀ can be found within the recently submitted "*Further Assessment of PM₁₀ at Low Santon*".

North Lincolnshire Council also operates two Heavy Metals monitoring stations in partnership with the National Physics Laboratory. Results from both stations are as follows:

Table 2.8 Results of Heavy Metals Monitoring

Heavy Metals	Santon ng/m ³	Scunthorpe Town ng/m ³
Arsenic (As)	0.82	0.80
Cadmium (Cd)	0.16	0.19
Chromium (Cr)	3.24	3.05
Copper (Cu)	4.6	5.7
Iron (Fe)	1487	683
Manganese (Mn)	80.8	24.7
Nickel (Ni)	0.98	0.78
Lead (Pb)	29.2	17.1
Platinum (Pt)	0.001	0.001
Vanadium (V)	3.86	1.55
Zinc (Zn)	24.9	23.2
Mercury (Hg)	0.022	0.019

Measured pollutants are far higher at Low Santon than at Scunthorpe Town. Many of the pollutants measured are present in releases from the Integrated Steelworks leading to higher concentrations at Low Santon due to its proximity.

A review of Heavy Metals and PM₁₀ can be found within the recently submitted "*Further Assessment of PM₁₀ at Low Santon*".

Summary of Compliance with AQS Objectives

North Lincolnshire Council has measured concentrations of Nitrogen Dioxide above the annual mean objective at relevant locations, and **will need to proceed to a Detailed Assessment** at South Killingholme.

3 New Local Developments

3.1 Road Traffic Sources

North Lincolnshire Council previously identified the A160 as a potential new road development. The A160 runs for approximately 4.5 km in a west to east direction from its junction with the A180 linking to the Port of Immingham and the surrounding South Humber Bank area. The A180 provides access to the motorway network via the M180 and M18. The A160 consists of single carriageway for approximately 2 km from its junction with the A180 then 2.5 km of dual carriageway and finally on 0.7 km of single carriageway beneath the railway, non-trunk road Humber Road to the dock gate entrance to the Port of Immingham.

Freight traffic, which constitutes approximately 40% of the flow on the A160, causes congestion on the single carriageway section from Brocklesby junction to Top Road roundabout and at the Manby Road roundabout at the eastern end of the scheme. With the planned expansion of the port and the land available for development, there is forecast to be considerable traffic growth in the next ten to fifteen years.

Due to a number of planning applications already received highlighting the growth in the area North Lincolnshire Council and the Highways Agency commissioned a 6 month study to assess the likely impact this road development will have on air quality. The results of this study have been discussed within section 2.2.1 of this report and has highlighted exceedances of NO₂ on the A160. The proposed road development would have reduced overall concentrations relative to a 'do nothing' option as it was likely to speed up the flow of traffic reducing idling vehicles at critical locations.

This scheme has been suspended due to cuts in Government spending.

North Lincolnshire Council has not identified any new sources of the following since the last round of review and assessment;

- Narrow congested streets with residential properties close to the kerb.
- Busy streets where people may spend one hour or more close to traffic.
- Roads with a high flow of buses and/or HGVs.
- Junctions.
- New roads constructed or proposed since the last Updating and Screening Assessment.
- Roads with significantly changed traffic flows.
- Bus or coach stations.

3.2 Other Transport Sources

North Lincolnshire Council has not identified any new sources of the following since the last round of review and assessment;

- Airports.
- Locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.
- Locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.
- Ports for shipping (other than increases to existing operations at Killingholme, increases in the numbers of ship movements will be assessed in the 2012 USA).

3.3 Industrial Sources

North Lincolnshire Council considered two major developments in 2010. Waste Recycling Group (WRG) have applied to develop a Waste Treatment and Recycling facility. The proposed facility would be designed to process up to 69,000 tonnes per annum (tpa) of residual mixed Municipal Solid Waste (MSW) collected from a combination of households and Household Waste Recycling Centres (HWRCs). Whilst the primary intention of the facility is to manage residual municipal waste arising from within North Lincolnshire, it has been sized to meet the future residual municipal waste management needs of the authority. Thus, in the early years of the facilities operation, contract municipal waste tonnages would be lower than 69,000tpa and third-party waste will be required to make up the shortfall.

The main facility building would contain five distinct mechanical and biological waste processing areas which can be summarised as:

- Enclosed waste reception and pre-treatment;
- Mechanical waste sorting;
- Bio-drying tunnels;
- Solid Recovered Fuel (SRF) refining and shredding; and
- Biofilters (for the treatment of air extracted from the bio-drying tunnels).

Investigations in to the impact of increased traffic because of deliveries at this site have shown that any increase will be negligible and would not significantly increase levels of nitrogen dioxide leading to an exceedance. Pollutant releases from the recycling process focused on bioaerosols of which a further risk assessment was requested in order to ensure limited exposure to bioaerosols at a nearby warehousing site.

Following on from the reporting of the Able Development in the 2010 Progress Report:

“Able UK is another major development on the South Humber Bank. Able UK have applied for outline permission to develop a vast area of land for a number of uses not yet decided. North Lincolnshire Council commented on these proposals in September 2009. At present we do not know what the development will consist of and individual cases will be dealt with on a case by case basis. The primary concern is number of vehicles likely to be using the A160 and it’s potential effects on the residents of South Killingholme.

The measures North Lincolnshire Council and the developers need to put in place will become clearer as the results of the extended NO₂ study are captured”

Some of the intended land use has now been finalised. The submission of an Environmental Statement for a Marine Energy Park raised some concerns. The Marine Energy Park (327 Hectares with Deep Water frontage) is being developed for the manufacturing, commissioning, installation and recycling of offshore wind turbines and also to produce renewable energy from biomass products.

The construction and operation of the AMEP has the potential to result in impacts on air quality. These impacts may be to sensitive human receptors or sensitive ecological receptors and arise from a number of sources. The key issues of interest are the construction phase:

- road traffic;
- shipping;
- and construction dust.

And the operational phase:

- road traffic;
- shipping;
- emissions from paint spraying of product;
- and supply chain manufacturing activities.

Further clarification has been requested for a number of these issues including detailed traffic, rail and ship movements. North Lincolnshire Council anticipates that this development will have a major impact on the area and is focussed on ensuring that NO₂ concentrations remain compliant.

Existing industrial sources within North Lincolnshire have not reported any increases in output. The dominant source within North Lincolnshire, the Integrated Steelworks, has been running at a reduced capacity for the last couple of years with no sign of an increase. A check of the Environment Agency's Pollution Inventories has shown no substantial increases according to the thresholds supplied within TG (09).

There have been no additional fuel storage depots storing petrol, petrol stations or poultry farms introduced to the area.

3.4 Commercial and Domestic Sources

North Lincolnshire Council has only received one application for the introduction of a biomass boiler to a refurbished supermarket chain shop. The shop sits within a small market town centre but is close to residential properties to the North.

The applicant stated that the proposed gas fuelled combined heat and power plant will have a fuel input of 474kW. Due to the capacity of this CHP plant, it has been necessary for the applicant to apply to the Local Authority for approval of the CHP plant chimney height, under the provisions of the Clean Air Act 1993. Prior to the commencement of use of the CHP plant, the applicant will need to gain approval for the chimney height and comply with any conditions attached to the chimney height approval.

With the construction of a suitable chimney of appropriate height no air quality impacts are likely. The area has no existing air quality issues and has not been identified in any previous rounds of review and assessment.

3.5 New Developments with Fugitive or Uncontrolled Sources

North Lincolnshire Council has not identified any potential sources of fugitive or uncontrolled particulate matter, which are new since the last Updating and Screening Assessment:

- Landfill sites.
- Quarries.
- Unmade haulage roads on industrial sites.
- Waste transfer stations etc.

Other potential sources of fugitive particulate emissions have been identified. A major housing development being built to the South of Scunthorpe known as Lakeside has been under development in stages over recent years. The latest area to be developed involves a large area being prepared for the building of further houses and a school.

This area of unmade land was the subject of a number of complaints from local residents. The contractors were advised how to control dust and this area is now damped with a number of bowsers with restriction on operation in high winds.

North Lincolnshire Council has identified the following new or previously unidentified local developments which may impact on air quality in the Local Authority area.

Lakeside Housing Development, Scunthorpe
WRG Waste Treatment Plant, Scunthorpe
Tesco Biomass Boiler, Brigg
Able UK Marine Energy Park, South Humber Bank

These will be taken into consideration in the next Updating and Screening Assessment, scheduled for 2012.

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 Technical Working Group

A technical meeting to discuss monitoring results around the Low Santon Area attended by AEAT, National Physics 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. North Lincolnshire Council currently offer an alert service to operators in the Integrated Steelworks and a weather prediction tool designed to forecast exceedances before the event.

5 Air Quality Planning Policies

The 2010 Progress Report presented guidance submitted to 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. Below are the original zones, following this exercise a number of indicative monitoring stations were deployed in order to further investigate areas of suspected exceedance. These sites have indicated areas which have PM₁₀ issues and areas within the AQMA that do not.

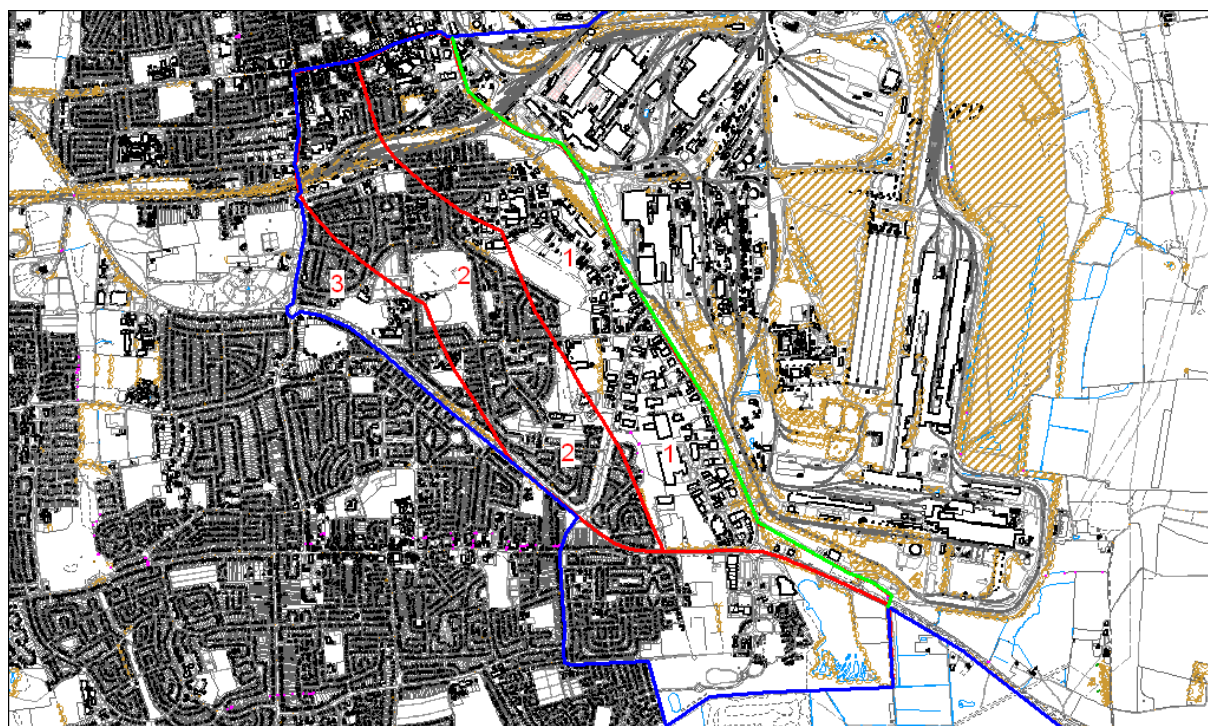


Figure 2.6 2010 AQMA Zone Map

This work is currently being reviewed with an update to be submitted to North Lincolnshire Council Planning Department. Further updates to this work will be presented in the 2012 Updating and Screening Assessment.

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 given period of time. Each local authority in England (outside of London) has been required to produce an LTP every five years, since the passing of the Transport Act 2000. The first and second Local Transport Plans covered the periods from 2001 to 2006 and 2006 to 2011 respectively.

Whilst the Local Transport Act 2008 retained the statutory requirement to produce and review a LTP, 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 and an Implementation Plan. The Transport Strategy outlines the strategic approach to transport in North Lincolnshire over the next 15 years, the Implementation Plan provides specific details on how the Transport Strategy is to be delivered and will be updated every three years during the life of LTP3. This approach is different from the previous Local Transport Plans, which were single documents and covering a five year period. In terms of coverage LTP3 is the same as the previous documents, in that it extends to North Lincolnshire's local authority boundaries. Where there are clear cross boundary links with neighbouring areas, these have been considered.

The 15 year Transport Strategy for North Lincolnshire is based on the following long term vision for 2026:

"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".

In order to realise this vision, the Transport Strategy has identified five Local Transport Goals that will be targeted during LTP3, which are:

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

Having outlined the problems and challenges to delivering these goals, the Transport Strategy generated and appraised a number of possible transport options, based on existing evidence and an extensive consultation process with both stakeholders and members of the community.

These options were then appraised and reduced down to a selected number of preferred options, before being prioritized and packaged into seven theme headings:

- Pedestrian Improvements
- Cycling Improvements
- Public Transport Improvements
- Safer Routes to School
- Local Safety Schemes
- Demand Management
- Maintaining the Existing Infrastructure

The next stage in the process is to set out the prioritized options that will be delivered within these theme headings and Part 2 of LTP3 will provide a three year Implementation Plan for the Transport Strategy.

Further information on North Lincolnshire Councils LTP3 can be found at:

<http://www.northlincs.gov.uk/NorthLincs/Transportandstreets/transportplanning/LocalTransportPlan20112026.htm>

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 continue.

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.

The council has signed up to the carbon management plan which has set us a target of reducing our carbon footprint by 33 per cent over the next five 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/NorthLincs/Environment/conservation/energy/CarbonManagementPlan.htm>

8 Conclusions and Proposed Actions

8.1 Conclusions from New Monitoring Data

North Lincolnshire Council has identified a new area of exceedance of NO₂ within Killingholme. This exceedance was identified using NO₂ diffusion tubes and has been screened using provisional data. This report recommends that North Lincolnshire Council proceed to a detailed assessment for Nitrogen Dioxide at this location.

PM₁₀ continues to cause concern at Low Santon. A further assessment for this breach has recently been submitted to DEFRA. Every effort is being focused in to achieving compliance at this location.

All other pollutants are compliant with the relevant objectives.

8.2 Conclusions relating to New Local Developments

No new developments are causing major concern. Of the sites highlighted, development on the South Humber Bank is being carefully considered with regard to its air quality impacts. The potential development of the South Humber Bank is the basis for the Detailed Assessment at Killingholme, the air quality assessment produced for the road improvements was based only on committed development and not the large growth predicted over the next few years, this concern has been communicated to the Highways Agency.

Other development sites have been subject to consideration by the Environmental Protection Team with conditions and mitigation put in place to ensure ground level ambient air compliance.

8.3 Other Conclusions

North Lincolnshire will continue to review and assess its AQMA's to ensure the boundaries remain accurate. Ongoing improvements at the Integrated Steelworks means the scale of the exceedances are decreasing all the time. This information will be used to inform planning decisions.

8.4 Proposed Actions

The major action to be identified within this progress report is the need for a Detailed Assessment for NO₂ at Killingholme.

Monitoring data has demonstrated that a location close to residential boundaries has exceeded the annual mean air quality objective for Nitrogen Dioxide. North Lincolnshire Council has applied for air quality grant funding to install a continuous NO₂ monitor at this location in order to better understand the levels currently being experienced. Data from this analyser will inform the Detailed Assessment and ensure confidence if the declaration of an AQMA is deemed appropriate.

Following the installation of this monitoring station, data will be interpreted and used to inform not only the detailed assessment but the potential further assessment and action plan.

Appendices

- Appendix 1 QA/QC Data
- Appendix 2 Bias Adjustment Calculation
- Appendix 3 PM₁₀ Short-term to Long-term Data adjustment
- Appendix 4 NO₂ Short-term to Long-term Data adjustment

Appendix A: QA:QC Data

Diffusion Tube Bias Adjustment Factors

North Lincolnshire Council currently uses South Yorkshire Laboratories for both supply and analysis of its Nitrogen Dioxide Diffusion Tubes. The Bias Adjustment factor from all Local Authorities for 2010 is 0.96.

Factor from Local Co-location Studies (if available)

North Lincolnshire Council had only 1 ongoing co location study as discussed in the monitoring data section of this report in 2010, Scunthorpe Town an urban industrial site:

Site	Analyser Annual Mean	Tube Annual Means	Bias Adjustment Factor
Scunthorpe Town	19.6	27	0.71

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 lamppost roadside sites. 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.

QA/QC of diffusion tube monitoring

Laboratory	Performance on basis of RPI, OLD CRITERIA, best 4 out of the 5 rounds 105-109	Performance on basis of RPI, NEW CRITERIA, best 4 out of the 5 rounds 105-109
Aberdeen Public Analysts	Good	Good
Bristol City Council	Good	Good
Cardiff Scientific Services	Good	Good
Edinburgh City Council	Good	Good
Environmental Services Group (formerly Bureau Veritas)	Good	Good
Exova (formerly Clyde Analytical)	Good	Acceptable
Glasgow Scientific Services	Good	Good
Gradko International	Good	Good
Harwell Scientifics	Good	Good
Kent Scientific Services	Good	Good
Kirklees MBC	Good	Acceptable
Lambeth Scientific Services	Good	Acceptable
Lancashire County Analysts	Good	Acceptable
Milton Keynes Council	Good	Acceptable
Northampton Borough Council	Good	Good
South Yorkshire Air Quality Samplers	Good	Acceptable
Staffordshire County Council	Good	Good
Tayside (formerly Dundee CC)	Good	Good
Walsall MBC	Participated in less than 4 of last 5 rounds.	
West Yorks Analytical Services	Good	Acceptable

North Lincolnshire Council moved NO₂ tube suppliers at the end of 2010. For the purposes of this report, 2010 diffusion tube QA/QC was supplied by South Yorkshire Air Quality Samplers which received a good rating in the above tests.

Appendix B: Bias Adjustment Calculation

Checking Precision and Accuracy of Triplicate Tubes



Diffusion Tubes Measurements									
Period	Start Date dd/mm/yyyy	End Date dd/mm/yyyy	Tube 1 µgm ⁻³	Tube 2 µgm ⁻³	Tube 3 µgm ⁻³	Triplicate Mean	Standard Deviation	Coefficient of Variation (CV)	95% CI of mean
1	06/01/2010	03/02/2010	44	40	38	40	2.9	7	7.3
2	03/02/2010	03/03/2010	31	32	31	31	0.7	2	1.6
3	03/03/2010	31/03/2010	27	30	36	31	4.3	14	10.7
4	31/03/2010	28/04/2010	23	18	23	21	2.8	13	6.9
5	28/04/2010	02/06/2010	20	18	16	18	2.0	11	5.0
6	02/06/2010	30/06/2010	17	17	15	16	1.3	8	3.3
7	30/06/2010	04/08/2010	17		16	16	0.6	4	5.5
8	04/08/2010	01/09/2010	20		20	20	0.3	2	3.1
9	01/09/2010	29/09/2010	28	24	23	25	2.7	11	6.8
10	29/09/2010	03/11/2010	25	27	26	26	1.2	5	3.1
11	03/11/2010	01/12/2010	42	39	44	42	2.5	6	6.3
12	01/12/2010	05/01/2011	43	38	47	43	4.5	11	11.2
13									

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

Automatic Method		Data Quality Check	
Period	Mean	Tubes Precision Check	Automatic Monitor Data
25	99.3	Good	Good
23	96.2	Good	Good
20	99.7	Good	Good
15	99.9	Good	Good
14	83.9	Good	Good
11	93.2	Good	Good
12	94.9	Good	Good
12	98.9	Good	Good
16	98.9	Good	Good
20	98.3	Good	Good
22	99.8	Good	Good
45	88.3	Good	Good

Overall survey -->

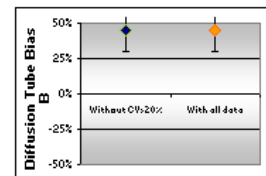
Good precision **Good Overall DC**
(Check average CV & DC from Accuracy calculations)

Site Name/ ID: **Rowland Road**

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

Accuracy (with 95% confidence interval)	
without periods with CV larger than 20%	
Bias calculated using 12 periods of data	
Bias factor A	0.71 (0.64 - 0.8)
Bias B	40% (25% - 55%)
Diffusion Tubes Mean:	27 µgm ⁻³
Mean CV (Precision):	8
Automatic Mean:	20 µgm ⁻³
Data Capture for periods used:	96%
Adjusted Tubes Mean:	19 (18 - 22) µgm ⁻³

Accuracy (with 95% confidence interval)	
WITH ALL DATA	
Bias calculated using 12 periods of data	
Bias factor A	0.71 (0.64 - 0.8)
Bias B	40% (25% - 55%)
Diffusion Tubes Mean:	27 µgm ⁻³
Mean CV (Precision):	8
Automatic Mean:	20 µgm ⁻³
Data Capture for periods used:	96%
Adjusted Tubes Mean:	19 (18 - 22) µgm ⁻³



Jaume Targa, for AEA
Version 04 - February 2011

Scunthorpe Town – Bias Adjustment

Appendix 3: PM₁₀ Short-term to Long-term Data adjustment

Low Santon FDMS 7th June 2010 to 31st December 2010

Site	Site Type	Annual Mean	Period Mean	Ratio
Appleby	TEOM	19µg/m ³	21µg/m ³	0.90
Scunthorpe Town	FDMS	23µg/m ³	20µg/m ³	1.15
Killingholme	TEOM	21µg/m ³	21µg/m ³	1.00
			Average	1.02

Low Santon FDMS annual mean adjustment = 28µg/m³ * 1.02 = **28.6µg/m³**

Redbourn Club TEOM 18th August 2010 to 31st December 2010

Site	Site Type	Annual Mean	Period Mean	Ratio
Appleby	TEOM	19µg/m ³	21µg/m ³	0.90
Scunthorpe Town	FDMS	23µg/m ³	19µg/m ³	1.21
Killingholme	TEOM	21µg/m ³	20µg/m ³	1.05
			Average	1.05

Redbourn Club TEOM annual mean adjustment = 20µg/m³ * 1.05 = **21.0µg/m³**

Broughton TEOM 1st January 2010 to 22nd July 2010

Site	Site Type	Annual Mean	Period Mean	Ratio
Appleby	TEOM	19µg/m ³	18µg/m ³	1.05
Scunthorpe Town	FDMS	23µg/m ³	21µg/m ³	1.09
Killingholme	TEOM	21µg/m ³	25µg/m ³	0.84
			Average	0.99

Broughton TEOM annual mean adjustment = 20µg/m³ * 0.99 = **19.8µg/m³**

Allanby Street 1st January 2010 to 6th April 2010

Site	Site Type	Annual Mean	Period Mean	Ratio
Appleby	TEOM	19µg/m ³	16µg/m ³	1.19
Scunthorpe Town	FDMS	23µg/m ³	21µg/m ³	1.00
Killingholme	TEOM	21µg/m ³	23µg/m ³	1.09
			Average	1.09

Allanby Street TEOM annual mean adjustment = 22µg/m³ * 1.09 = **23.9µg/m³**

Appendix 4: NO₂ Short-term to Long-term Data adjustment

Kingsway House Airpointer 1st January 2010 to 13th April 2010

Site	Site Type	Annual Mean	Period Mean	Ratio
Scunthorpe Town	Monitor Labs	20µg/m ³	22µg/m ³	0.90
Low Santon	Ambirak	19µg/m ³	19µg/m ³	1.00
Killingholme	Monitor Labs	21µg/m ³	24µg/m ³	0.88
			Average	0.93

Low Santon FDMS annual mean adjustment = $40\mu\text{g}/\text{m}^3 * 0.93 = 37.2\mu\text{g}/\text{m}^3$