



Local Air Quality Management Environment Act 1995

AIR QUALITY FURTHER ASSESSMENT



North Devon Council
Environmental Health and Housing Services
Prepared April 2012



Air Quality Management Area # 1

Further Assessment

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

Apr 2012

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Executive Summary

This report concludes that :

- the findings of the Detailed Assessment undertaken in 2009 were correct.
- the declaration of AQMA #1 was correct.
- 91 % of total NO_x present at the worst case site in the AQMA (site 12) is attributable to road sources – i.e. traffic.
- an estimated 22 % reduction in Road NO_x is required to achieve the AQ Objective for N02.

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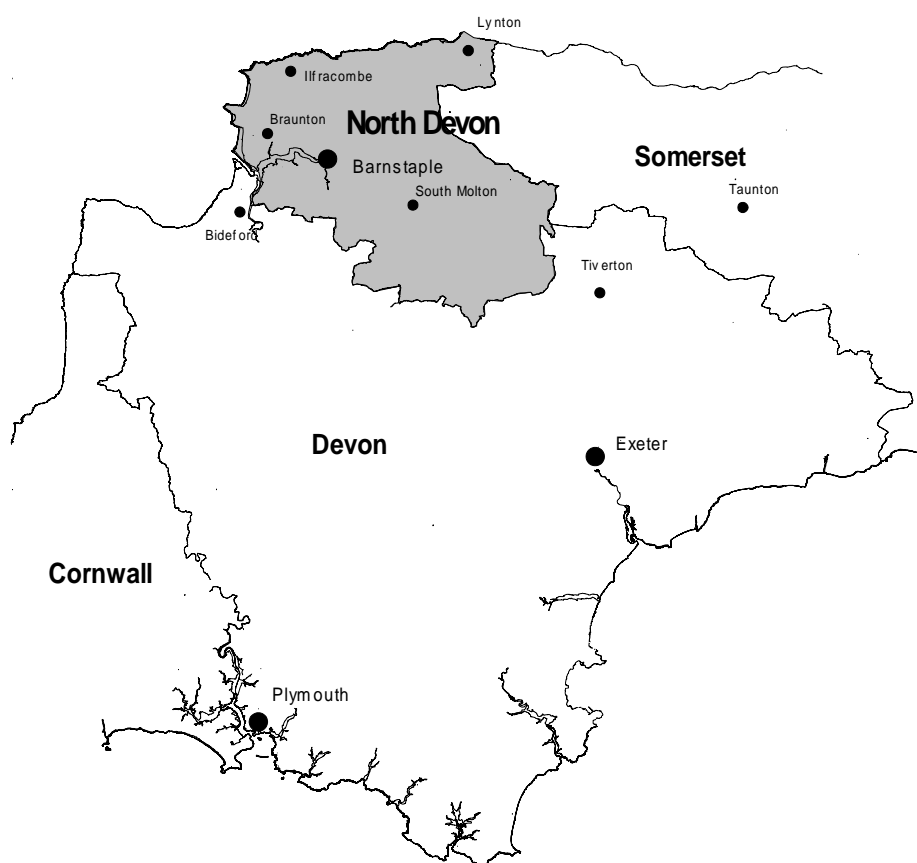
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1.0 INTRODUCTION

1.1 Description of Local Authority Area

The North Devon district occupies the northern most part of the county of Devon and borders the western borders of Somerset and the Bristol Channel, covering an area approximately 1,085 square kilometres (419sq miles). The area is characterised by a rugged northern Bristol Channel coast, the sandy beaches of the West Coast, the estuarine and valley landscapes of the River Taw and the open moorland and farmland of the Exmoor fringes. The district includes approximately one-third of the area of Exmoor National Park. The character of the North Devon district is inextricably linked to its natural landscape, which is its most prized asset. The landscape is highly valued by residents and tourists alike and incorporates numerous Sites of Special Scientific Interest, Areas of Outstanding Natural Beauty and Heritage Coastline.



The population of the area in 2000 was approximately 91,800 with approximately half the residents living in the four main settlements of Ilfracombe, Braunton, South Molton and Barnstaple, which is also the regional centre for northern Devon. The remainder of the population lives in the open countryside or in one of the numerous villages and hamlets of the area.

The area has an extensive rural road network and is connected to the rest of the region by the A39, A361 and A377 roads. There is also a regional rail connection between Barnstaple and Exeter, which runs along the valley of the River Taw.

Employment in the district is concentrated in the main settlements. There is a strong dependence on the service industry, especially tourism related in the summer and also in the public administration, health and finance sectors, reflecting Barnstaple's role as a regional centre. There is also a healthy industrial base in the area and this is reflected in the 48 prescribed processes regulated under the Pollution Prevention and Control Regulations 2000, which are currently in operation within the administrative area of North Devon Council.

1.2 Purpose of 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 exceedances 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.

An AQMA, referred to as "North Devon Council Air Quality Management Area No1" (AQMA#1) was declared by North Devon Council on 11th July 2011. A copy of the official Order including a map is attached as Appendix A to this report.

The purpose of this Further Assessment is to :

- confirm the findings of the Detailed Assessment which was undertaken in 2009
- confirm the declaration of AQMA #1
- present the results of a source apportionment exercise undertaken to apportion sources of N02
- estimate the level of reduction required to achieve the N02 objective at the relevant sites
- inform the forthcoming AQAP

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. This table shows the objectives in units of microgrammes per cubic metre $\mu\text{g}/\text{m}^3$ (milligrammes per cubic meter, mg/m^3 for Carbon Monoxide) with the number of exceedances in each year that are permitted (where applicable).

Table 1: Air Quality Objectives included in Regulations for the purpose of Local Air Quality Management in England

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	5.00 $\mu\text{g}/\text{m}^3$	Running 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	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 (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 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

In relation specifically to Nitrogen Dioxide, it is important to acknowledge the findings of the previous reviews and assessments which have been undertaken as part of the LAQM Process.

These findings are summarised below:-

- The Updating and Screening Assessment (USA) produced in 2002/03 concluded that monitoring results for Nitrogen Dioxide identified potential exceedances of the annual mean objective at several locations in Barnstaple.

However, these locations were likely to see significant reductions in road traffic numbers, should the proposed "Western Bypass and Downstream Bridge" be constructed.

As this was scheduled for completion by early 2006, it was considered that a detailed assessment for Nitrogen Dioxide was not necessary at that time.

- The Progress Report (produced in 2005) confirmed that construction of the "Western Bypass and Downstream Bridge" had commenced.

The predicted reductions in road traffic in central Barnstaple were still expected to be achieved, however compliance with the annual mean objective for Nitrogen Dioxide at Rolle Street was expected to be approximately 12 months later than stated in the 2003 USA.

- The USA (produced in 2006) concluded that monitoring results for Nitrogen Dioxide identified potential exceedances of the annual mean objective at several locations in Barnstaple.

However, these locations were likely to see significant reductions in road traffic numbers on completion of the "Western Bypass and Downstream Bridge".

As this was scheduled for completion by May 2007, it was considered that a detailed assessment for Nitrogen Dioxide was not necessary at that time.

- The Progress Report (produced in 2007) concluded that 2 of the 16 sites monitored in 2006 were equal to the threshold limit for Nitrogen Dioxide and one site exceeded the limit.

The "Western Bypass and Downstream Bridge" project was completed in May 2007 and had been forecast to have a significant effect on traffic flows in and around Barnstaple.

It was, therefore, stated that the effects of the completion of this project on the Nitrogen Dioxide levels at these sites would be able to be fully assessed during the following year's LAQM Progress Report.

- The Progress Report (produced in 2008) concluded that 3 of the 16 sites monitored in 2007 exceeded the threshold limit for Nitrogen Dioxide. It was therefore determined that a detailed assessment of Nitrogen Dioxide should be undertaken at the following sites:-

Rolle Street 2, Barnstaple
The Square, Braunton
The London Inn, Braunton

- The USA (produced in 2009) concluded that the measured bias adjusted annual mean concentration of Nitrogen Dioxide for 2008 was greater than the threshold of $40 \mu\text{g}/\text{m}^3$ at sites 12 and 13.

The results of previous monitoring undertaken had resulted in a detailed assessment being commenced at these sites in March 2009, the results of which were to be reported in April 2010.

- The Progress Report (produced in 2010) concluded that the measured bias adjusted annual mean concentration of Nitrogen Dioxide for 2009 was below the threshold limit value, except for sites 12 and 13.

The results of the detailed assessment were to be discussed separately in the report entitled, "Detailed Assessment of Nitrogen Dioxide in Rolle Street, Barnstaple and Braunton", which was to be submitted to DEFRA by the end of June 2010.

For completeness however, the report confirmed that as a result of the detailed assessment having been undertaken, North Devon Council did not intend to declare an AQMA for Rolle Street (sites 2 and 3), but did intend to declare an AQMA for Braunton (site 13)

- The Detailed Assessment (produced in 2010) concluded that the measured bias adjusted annual mean concentration of Nitrogen Dioxide for 2009 was below the threshold limit for Rolle Street, Barnstaple, and that there was a borderline exceedance in Braunton.

North Devon Council therefore did not intend to declare an AQMA for Rolle Street, Barnstaple, but announced their intention to declare an AQMA for Braunton.

- The Progress Report (produced in 2011) concluded that the measured bias adjusted annual mean concentration of Nitrogen Dioxide for 2010 was below the threshold limit value, except for site 12.

NDC were in the process of declaring an AQMA in Braunton (site 12). The diffusion tube monitoring network in Braunton had recently been expanded, the results being scheduled to be reported in 2012.

These results shall inform this Further Assessment.

2.0 NITROGEN DIOXIDE MONITORING

2.1 Summary of Monitoring Undertaken

Nitrogen Dioxide is routinely measured by diffusion tube at 16 locations in the North Devon District and the current monitoring programme has been in place since 2000.

This monitoring programme was expanded for the purposes of undertaking the detailed assessment by installing additional monitoring sites in and around the areas concerned, in order to help identify the potential boundaries of an AQMA, should one have to be declared.

The monitoring network in Braunton was expanded further in January 2011 to help inform this Further Assessment – and is continuing.

Identification of these additional monitoring sites was undertaken in accordance with the relevant technical guidance and in consultation with DEFRA, via the air quality helpdesk.

The diffusion tube monitoring network in Braunton presently includes a total of 13 sites. The sites identified as “12” and “13” form part of the routine District wide network, with the additional sites, now totalling 11, being identifiable as the sites numbered from B1 to B11.

Details of all of the monitoring sites presently located in Braunton are included in Table 2.

The exact locations of all the diffusion tubes are more easily understood by viewing the map attached as Appendix F to this report.

Table 2: Details of Non-Automatic Monitoring Sites

Site Name	Site Type	OS Grid Ref	Pollutants Monitored	Relevant Exposure? (Y/N with approximate distance (m) to relevant exposure)	Distance to Kerb of Nearest Road (N/A if not applicable)
B1 (formerly DA1)	Kerbside	SS 49052 BNG 35885	NO ₂	Y (10m)	1.0m
B2	Kerbside	SS 48970 BNG 36071	NO ₂	Y (5m)	2.0m
B3 (formerly DA2)	Kerbside	SS 48916 BNG 36188	NO ₂	Y (5m)	1.0m
B4	Kerbside	SS 48886 BNG 36320	NO ₂	Y (5m)	2.0m
B5	Kerbside	SS 488859 BNG 36407	NO ₂	Y (5m)	0.5m
B6 (formerly DA3)	Kerbside	SS 48712 BNG 36059	NO ₂	Y (5m)	1.0m
B7	Kerbside	SS 48788 BNG 36495	NO ₂	Y (1m)	1.0m
B8	Kerbside	SS 48781 BNG 36656	NO ₂	Y (15m)	1.0m
B9	Kerbside	SS 48619 BNG 36628	NO ₂	Y (1m)	3.0m
B10	Kerbside	SS 48429 BNG 36598	NO ₂	Y (2m)	1.0m
B11	Kerbside	SS 48335 BNG 36648	NO ₂	Y (6m)	1.0m
12	Kerbside	SS 48896 BNG 36714	NO ₂	Y (4m)	1.0m
13	Kerbside	SS 48731 BNG 36642	NO ₂	Y (1m)	1.0m

2.2 Comparison of Monitoring Results with AQ Objectives

The results of all of the diffusion tube monitoring undertaken in Braunton for 2011 are shown in Table 3. It is important to acknowledge the slight discrepancies in the final 2 columns of Table 2 with data previously submitted. These sites have been revisited to make a more accurate assessment of these distances for the purpose of this further assessment.

The bias adjustment factor applied to the annual mean concentration was 0.89, as calculated from the spreadsheet available at <https://laqm.defra.gov.uk/>, inputting "Gradko" as the analysing laboratory, "20% TEA in water" for the preparation and 2011 for the year.

In accordance with advice issued by the air quality helpdesk, all sites with a collection efficiency of >75% have been bias adjusted only. Sites with a collection efficiency of <75% have had a short-term adjustment factor applied prior to the bias adjustment factor, as have all sites with a collection efficiency of <100% and an annual mean concentration of >36 $\mu\text{g}/\text{m}^3$. The calculations associated with determining the appropriate short-term correction factor are included as Appendix C to this report.

As can be seen in Table 3, exceedances of the AQ objective for N02 exist at locations 12 and 13.

The results of monitoring for location B5 suggest that the N02 concentration is also close to the objective. As this site has not been monitored before, it is not known whether or not this is representative of this location, or may indeed be spurious.

NDC do not intend therefore to redefine the boundary of the AQMA at this moment in time. However, if the annual mean concentrations of future monitoring confirm that additional exceedances exist, the Council will then consider redefining the boundary of the AQMA.

Table 3: Results of Nitrogen Dioxide Diffusion Tubes 2011

Site ID	Location	Data Capture 2011 %	Annual Mean Concentrations
			2011 ($\mu\text{g}/\text{m}^3$) Adjusted for Bias
B1	Exeter Road, Braunton – “Vellator”	100	15.63
B2	Exeter Road 2, Braunton – “Wingate”	67	19.47
B3	Exeter Road 3, Braunton – “Parklyn”	83	24.65
B4	Exeter Road 4, Braunton – “Kaya”	92	17.34
B5	Exeter Road 5, Braunton – “Paint A Pot”	67	39.14
B6	South Street 1, Braunton – “Barton Lane”	83	15.28
B7	South Street 2, Braunton – “village end”	75	15.98
B8	Chaloners Road, Braunton – “Parish Hall”	100	25.34
B9	Caen Gardens, Braunton - “J Benning”	100	15.66
B10	Saunton Road 1, Braunton – “Field Lane”	75	21.73
B11	Saunton Road 2, Braunton – “Sharlands”	92	20.36
12	The Square, Braunton	100	42.91
13	The London Inn, Braunton	83	40.31

3.0 SOURCE APPORTIONMENT

Source apportionment has been undertaken, in accordance with the approach recommended in TG09.

This confirms that the 90.52 % of total NO_x present at the worst case site in the AQMA (site 12) is attributable to road sources.

As this is such a high %, it has been determined, (following discussion with the helpdesk), that it will not be necessary to apportion this further - into types of vehicles etc etc.

The calculations associated with this source apportionment are included as Appendix D to this report.

4.0 AIR QUALITY REDUCTIONS

The results of the source apportionment have been used to calculate the air quality reductions which are required to ensure the air quality objective of 40 ug/m³ is met.

The result of this exercise confirms that a 22.30% reduction in Road NO_x is required to achieve this objective.

The calculations associated with determining this figure are included as Appendix E to this report.

5.0 CONCLUSIONS AND PROPOSED ACTIONS

5.1 Conclusions

This report concludes that :

- the findings of the Detailed Assessment undertaken in 2009 were correct
- the declaration of AQMA #1 was correct
- 91 % of total NO_x present at the worst case site in the AQMA (site 12) is attributable to road sources – i.e. traffic
- an estimated 22% reduction in Road NO_x is required to achieve the AQ Objective for NO₂

5.2 Proposed Actions

The data presented in this Report, once accepted, shall be used to inform this Local Air Quality Action Plan (LAQP) - which is currently in the process of being written.

The monitoring identified in Section 2.1 of this Further Assessment shall continue.

References

“Local Air Quality Management – Technical Guidance LAQM.TG(09)”,
Department for Environment, Food and Rural Affairs, London, 2009.

Appendices

- Appendix A AQMA Order and Map
- Appendix B QA/QC Data
- Appendix C Short Term Adjustment Factor Calculations
- Appendix D Source Apportionment Calculations
- Appendix E Air Quality Reduction Calculations
- Appendix F Map Showing Approximate Diffusion Tube Locations

Appendix A
AQMA Order and Map



Air Quality Management Area Order

**Environment Act 1995 Part IV Section 83(1)
North Devon Council
AQMA Order**

North Devon Council, in exercise of the powers conferred upon it by Section 83(1) of the Environment Act 1995, hereby makes the following Order:

This Order may be cited/referred to as the North Devon Council Air Quality Management Area No.1 and shall come into effect on 11th July 2011.

The area shown on the attached map in red is to be designated as an air quality management area (the designated area).

The designated area incorporates the area encompassing the B3231 in Braunton, in between the junction known as "The Square" in the middle of the village, and the Village Green.

The map may also be viewed at the Council Offices.

This Area is designated in relation to a likely breach of the nitrogen dioxide (annual mean) objective as specified in the Air Quality Regulations 2000.

This Order shall remain in force until it is varied or revoked by a subsequent order.

The Common Seal of North Devon Council was hereto affixed on 11th July 2011 and signed by:

A handwritten signature in black ink, appearing to read "J. Mann".

Jeremy Mann
Head of Environmental Health and Housing Services
North Devon Council.



Map Showing Boundary of North Devon Council Air Quality Management Area No.1 - in Braunton, North Devon

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Appendix B

QA/QC Data

Diffusion Tubes are supplied and analysed by Gradko Laboratories, using a 20% TEA in water preparation.

The bias adjustment factor applied to the annual mean concentration was 0.89, as calculated from the spreadsheet available at <https://uk-air.defra.gov.uk/>, inputting "Gradko" as the analysing laboratory, "20% TEA in water" for the preparation and 2011 for the year.

The spreadsheet was accessed on Tuesday 17th April 2012.

Calculation of the short-term adjustment factors is included separately as Appendix C to this report.

QA/QC of diffusion tube monitoring

Gradko Laboratories' internal analysis procedures are assessed annually by UKAS to confirm compliance with ISO 17025.

Furthermore, Gradko's NO₂ diffusion tube procedures have been amended to follow the guidelines of the DEFRA Harmonisation document related to the preparation, extraction, analysis and calculation procedures for NO₂ passive diffusion tubes.

Appendix C

Calculation of Short Term Adjustment Factors

Site B5																
Monthly Mean NO ₂ 2011																
Site Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Units	Annual Average	Period Mean	Correction Factor
Bournemouth	21.47	20.13	27.04	20.28	8.85	8.82	9.76	10.41	9.04	14.28	16.92	14.25	µgm ⁻³	15.10	15.12	1.00
Bristol St Paul's	38.58	34.21	37.98	28.66	15.70	16.01	21.83	19.35	23.49	27.00	36.00	26.32	µgm ⁻³	27.09	27.27	0.99
Average correction factor																1.00

Site 13																
Monthly Mean NO ₂ 2011																
Site Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Units	Annual Average	Period Mean	Correction Factor
Bournemouth	21.47	20.13	27.04	20.28	8.85	8.82	9.76	10.41	9.04	14.28	16.92	14.25	µgm ⁻³	15.10	15.81	0.96
Bristol St Paul's	38.58	34.21	37.98	28.66	15.70	16.01	21.83	19.35	23.49	27.00	36.00	26.32	µgm ⁻³	27.09	28.21	0.96
Average correction factor																0.96

Appendix D

Source Apportionment Calculations

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Source Apportionment		
		Notes:
Site ID	12	worst case scenario site
SS	48896	
BNG	36714	site location - in bearings. http://gridreferencefinder.com/gmap.php# used to identify closest 1 km grid square in x/y coordinates format - to enable appropriate data to be identified from background data maps downloaded from Defra website. Both these websites accessed 26/04/2012
x	248500	
y	136500	
Background N02 (ug/m3) - 2011	6.85	from row 394 of background data spreadsheet - downloaded from defra website on 27/04/2012 - inputting N02, North Devon, 2011
Total Background NOx (ug/m3) - 2011	8.45	from row 394 of background data spreadsheet - downloaded from defra website on 27/04/2012 - inputting NOx, North Devon, 2011
Regional Background NOx (ug/m3) - 2011	5.03	from row 394 of background data spreadsheet - downloaded from defra website on 27/04/2012 - inputting NOx, North Devon, 2011 - advice received from helpdesk on 26/04/2012 confirms "rural" represents regional background
Local Background NOx (ug/m3)	3.42	advice received from helpdesk on 26/04/2012 confirms this is "total - regional"
Road NOx (ug/m3) (from N02 to NOx calculator)	80.73	from N02 to NOx calculator on defra website accessed on 27/04/2012 - inputting North Devon, 2011, all nonurban UK traffic on general tab, site ID 12 42.91, background NOx of 8.45 into diff tube tab
Total NOx	89.18	advice received from helpdesk on 26/04/2012 confirms this is Road Nox + Total Background Nox
% Total NOx which is attributable to road sources	90.52	Road NOx as a % of Total Nox
<p>Interpretation of this data shows that the total NOX present at this site is 89.18 ug/m3 - 80.73 of which is attributable to road sources - i.e. traffic. This equates to approximately 90.52 %</p>		

advice received from helpdesk on 26/04/2012 confirms "rural" represents regional background - this is not available for 2010 map based data - advice received from helpdesk on 27/04/2012 identified that as the Total Background NOx for 2010 based on 2010 mapping is so close to Total Background NOx for 2011 based on 2008 mapping, it is acceptable to submit data based on the 2011 data set for this further assessment

Appendix E
Air Quality Reduction Calculations

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Air Quality Reduction		
		Notes:
Target N02 to be achieved (ug/m3)	36.00	10 % below the 40ug/m3 threshold
Target Road NOx to be achieved (ug/m3)	62.73	from N02 to NOx calculator on defra website accessed on 27/04/2012 - inputting North Devon, 2011, all nonurban UK traffic on general tab, 36 into N02 column, background NOx of 8.45 into diff tube tab
Existing Road NOx (ug/m3)	80.73	Road NOx calculated during source apportionment exercise
Required Reduction in Road NOx (ug/m3)	18.00	difference between Target Road NOx and existing Road NOx
NOx reduction required (%)	22.30	difference between Target Road NOx and existing Road NOx as a %
Interpretation of this data shows that to achieve a NO2 level of 36 ug/m3 at this location, the reduction required of Road NOx is 22.30 %		

Appendix F

Map Showing Approximate Diffusion Tube Locations

Diffusion Tube Monitoring Locations – Branton

