



# 2009 Air Quality Updating and Screening Assessment for *The Highland Council*

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

NOVEMBER 2009

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<b>Report Reference number</b>	THCLAQMUSA2009
<b>Date</b>	17 <sup>TH</sup> November 2009

## **Executive Summary**

This document is a report of the findings of the 2009 Updating and Screening Assessment, undertaken by The Highland Council as required by the Local Air Quality Management process.

The assessment has considered new monitoring data, new transport, commercial, industrial and domestic sources of air pollution.

Air quality in the Highlands is generally good.

This report has considered for the first time the impact of biomass combustion on the local air quality environment.

The Highland Council has identified biomass installations and initial screening suggests that one installation may be causing a failure to meet the air quality objectives for Particles (PM10) and Nitrogen dioxide. The Highland council will progress to detailed assessment for these pollutants at this location.

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### **Appendices**

Appendix 1 [QA/QC](#)

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# **1 Introduction**

## **1.1 Description of Local Authority Area**

The area of the Highland Council covers approximately 26,500 square kilometres, excluding inland water, around one third of the Scottish mainland. The area includes Skye and other Inner Hebridean islands. The central and western regions of the area are a combination of high mountain and moorland and deep glens bordered by a coastline of sea lochs. In the north east lies the "flow" country of Caithness. Further south on the east coast lie three estuarine systems, the Dornoch, the Cromarty and the Moray firths, which are flanked by extensive arable land. The Great Glen Fault runs approximately east – west from coast to coast between Inverness and Fort William. To the south of the Great Glen fault, lie the massive upland areas of the Monadhliath and Cairngorm mountains, including the recently formed Cairngorm National Park. To the south west the area extends to the Ardnamurchan peninsula. 15% of the land area is afforested. Over 20% of the Highlands is designated as National Scenic Area.

Inverness is the capital city of the Highlands and had an estimated population of 57,228 in 2007. The next largest settlements in the Highlands at that time were Nairn (population 10,831) and Fort William (9,752).

In 2007 the total population of the Highlands was over 217,000. The population growth rate was 4.2% in the previous 10 years although growth in Inverness, was much higher at over 10% during the same period. The majority of the population live in the eastern coastal areas of the Highlands, in the rapidly growing city of Inverness and in the numerous smaller towns along the A9 and A96 transport corridors.

Industrial development is also concentrated in south and east, although there are some other significant industrial developments elsewhere such as the "Alcan" facility at Fort William.

In 2007 the largest employers of the Highland Population were the Public Administration, Education and Health Sector and the catering and hospitality industry, employing over 50% of the workforce.

Over most of the Highlands the transport network is sparse and for a large proportion of the network the usage is very light. 85% of the road network is classified as rural.

Appendix A contains a map of the Highland Council Area.

## **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 exceedences are considered likely, the local authority must then declare an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) setting out the measures it intends to put in place in pursuit of the objectives.

## **1.3 Air Quality Objectives**

The air quality objectives applicable to LAQM in Scotland are set out in the Air Quality (Scotland) Regulations 2000 (Scottish SI 2000 No 97), the Air Quality (Scotland) (Amendment) Regulations 2002 (Scottish SI 2002 No 297), and are shown in Table 1.1. This table shows the objectives in units of

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microgrammes per cubic metre  $\mu\text{g}/\text{m}^3$  (milligrammes per cubic metre,  $\text{mg}/\text{m}^3$  for carbon monoxide) with the number of exceedences in each year that are permitted (where applicable).

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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
<b>Benzene</b>	16.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
	3.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2010
<b>1,3-Butadiene</b>	2.25 $\mu\text{g}/\text{m}^3$	Running annual mean	31.12.2003
<b>Carbon monoxide</b>	10.0 $\text{mg}/\text{m}^3$	Running 8-hour mean	31.12.2003
<b>Lead</b>	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
<b>Nitrogen dioxide</b>	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
<b>Particles (PM<sub>10</sub>) (gravimetric)</b>	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
	50 $\mu\text{g}/\text{m}^3$ , not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 $\mu\text{g}/\text{m}^3$	Annual mean	31.12.2010
<b>Sulphur dioxide</b>	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**

The first Review and Assessment of Air Quality in Highland was completed in 1998. The table below outlines the previous reports which have been published by the Highland Council as part of the Review and Assessment process.

The Local Air Quality Updating and Screening Assessment Report, 2003, identified that a Detailed Assessment would have to be carried out.

### **Detailed assessment was carried out for the following pollutants**

**Benzene.** The screening assessment indicated that the running annual mean air quality objective for Benzene may be exceeded

- (a) in the vicinity of petrol terminals at Inverness harbour, and
- (b) near the Talisman Energy UK Ltd, Nigg Oil Terminal petroleum refining process at Nigg.

**Sulphur Dioxide.** The screening assessment indicated that:-

- (a) there was a risk that the 15 minute mean air quality objective for SO<sub>2</sub> could be exceeded in Castletown in Caithness as a result of the density of dwellings which burn solid fuel, and
- (b) a Detailed Assessment would need to be carried out in respect of the ALCAN Aluminium Smelter in Fort William as the number of stacks which emit SO<sub>2</sub> at that site, did not lend themselves to simple screening techniques.

**Nitrogen dioxide.** Both the Scottish Executive and the Scottish Environment Protection Agency voiced concern over levels of NO<sub>2</sub> in Inverness City Centre as measured by passive diffusion tube and so a Detailed Assessment was also undertaken for Nitrogen dioxide.

The Detailed Assessment Report, published in 2005, concluded that there was little likelihood of a failure to meet the objectives for these pollutants.

The 2008 Progress Report identified that the monitoring data generated by the Automatic Monitoring station at Telford Street, Inverness suggested a likely exceedence of the PM<sub>10</sub> annual mean objective at this location. It was concluded that a detailed assessment for PM<sub>10</sub> would be required although later amendments to the monitoring dataset suggest that this is no longer necessary.



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**Table 1.2 Summary of Previous Rounds of Review and Assessment**

Report	Date	Outcome
Air Quality in The Highlands – First stage Review and Assessment	1998	No requirement to proceed to second stage review and assessment
Addendum to Air Quality in The Highlands	2001	
Updating and Screening Assessment	June 2003	Proceed to detailed assessment with respect to: Benzene in the vicinity of the fuel storage facilities at Nigg and Inverness; Sulphur dioxide in respect of areas with a high density of domestic solid fuel burning. Sulphur dioxide in the vicinity of the Alcan Site, Fort William. Nitrogen dioxide in Inverness City centre.
Progress Report	2005	Detailed Assessment not required.
Detailed Assessment	2005	Concluded: that there was no likelihood of the objective for benzene not to be met in the Highland Council Area; that the air quality objective for Sulphur dioxide is being met in the Highland Council area; that the air quality objectives for Nitrogen dioxide are being met in the Highland Council area; and that there is no requirement to declare a Local Air Quality Management Area in the Highland Council Area.
Updating and Screening Assessment	2006	Detailed Assessment not required.
Progress Report	2007	Detailed Assessment not required.
Progress Report	2008	Likely exceedence identified at Telford Street, Inverness for PM10. Detailed assessment required.

## 2 New Monitoring Data

### 2.1 Summary of Monitoring Undertaken

#### 2.1.1 Automatic Monitoring Sites

There are three automatic monitoring sites in the Highlands, part of the Automatic Urban and Rural Network. Details of the sites are included in Table 2.1 below. The sites are operated and maintained by contractors to DEFRA and a fully ratified dataset for each site is available for download from the internet. Two of the sites are in urban areas, namely Inverness and Fort William. The remaining site, Strath Viach, is a rural site located in a remote highland glen 5km from the nearest road, and monitors Ozone. The results recorded at the Strath Viach site are not reported here.

Since the last round of review and assessment DEFRA have initiated monitoring for PM2.5 at the Telford Street Site in Inverness. Oxides of Nitrogen and PM10 (daily gravimetric) continue to be monitored at this site.

The Highland Council has been notified of a correction that has been applied to the PM10 dataset for the Telford Street site as a result of a detected error in the assessment of field blanks. In this round of review and assessment The Highland Council is reporting measured PM10 concentrations and predicted PM10 concentrations based upon the corrected dataset. It should therefore be noted that the results reported here for years to 2007 will differ from what has been reported in previous rounds of review and assessment.

**Table 2.1 Details of 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 ?
Telford Street	Roadside	265709 845670	NO <sub>2</sub> , PM10, PM2.5	N	Y(2.5m)	4m	N
Strathviach	Rural	234831 875029	Ozone	N	N/A	N/A	N/A
Fort William	Suburban	210857 774431	NO <sub>2</sub> , Ozone	N	N(N/A)	N/A	N/A

#### 2.1.2 Non-Automatic Monitoring

The Highland Council continues to monitor Nitrogen dioxide by diffusion tube at 9 sites in Inverness and Dingwall. One of the sites (Telford Street) is a co-location study at the automatic monitoring location.

A detailed assessment for NO<sub>2</sub> was completed in 2005 which indicated that air quality objectives were unlikely to be exceeded. However the Highland Council has continued to monitor NO<sub>2</sub> at four roadside sites in the "Old Town" area of Inverness on Academy Street, Union Street and Queensgate. Works to improve the shopping environment in the Old Town were largely completed through 2007/08 and there has been a noticeable reduction in general traffic use on Queensgate and Union Street although the streets continue to be used by buses. It was reported in the last round that an indicated breach of the Nitrogen dioxide annual mean objective at the site Queensgate A may have been due to the ongoing streetworks and that the 2008 dataset would clarify this position.

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Inspection of the 2008 dataset for Academy Street, Union Street and both Queensgate sites has shown the concentrations recorded to be unrealistically low. Results were typically found to be less than  $5 \mu\text{g}/\text{m}^3$ . An investigation into the cause of this has revealed that an error in the exposure procedure has resulted in underexposure of tubes at these sites. This error has now been rectified, however there is no ratified data available for 2008 and early 2009. By the end of 2009 the Highland council will be able to report the measured concentrations of Nitrogen dioxide at these three sites under the changed traffic conditions. Tubes exposed at the Telford Street Site were unaffected by this error and have been reported here.

Monitoring data was not available for the four Dingwall sites from March 2008.

**Table 2.2 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?
Telford Street, Inverness	Roadside (collocation study)	265710 845672	NO2	N	Annual Mean only (2.5)	4	N
Union Street, Inverness	Roadside	266675 845339	NO2	N	1-hour only (0.5m)	3	N
Academy Street, Inverness	Roadside	266577 845538	NO2	N	Y (5m)(0.5m for 1-hour)	5	N
Queensgate A, Inverness	Roadside	266599 845416	NO2	N	1-hour only (0.5m)	3	N
Queensgate B, Inverness	Roadside	266642 845424	NO2	N	1-hour only (0.5m)	3	N
Wyvis Terrace, Dingwall	Roadside	254430 858968	NO2	N	Y(2.5)	1m	Y
Station Road, Dingwall	Roadside	255200 858185	NO2	N	Y(1m)	1m	Y
Kintail Place, Dingwall	Urban Background	255112 859866	NO2	N	Y	N/A	N/A
Burns Crescent, Dingwall	Urban Background	254420 859288	NO2	N	Y	N/A	N/A

QA/QC information for diffusion tube monitoring is contained in appendix A.

## 2.2 Comparison of Monitoring Results with AQ Objectives

### 2.2.1 Nitrogen Dioxide

The annual mean concentration did not exceed 40ug/m<sup>3</sup> at any site in 2008. None of the sites recorded more than 18 1-hour means above 200 ug/m<sup>3</sup>, or where appropriate the 99.8%ile of hourly means did not exceed 200 ug/m<sup>3</sup>. However it should be noted that there was insufficient data available to determine the annual mean concentration at sites IV1, IV2, IV3a and IV3b.

#### Automatic Monitoring Data

Nitrogen dioxide levels monitored at the Telford Street Site, were slightly lower than in the previous two years, at 20.6 ug/m<sup>3</sup> Annual Mean Concentration. There were no exceedences of the 200 ug/m<sup>3</sup> 1-hour mean objective. Data capture for the site was very good at 99%.

The Telford Street AUN site is 4 metres from the carriageway of the A82 (Telford Street). The majority of houses along the street are at around 6 metres from the carriageway. There are, however, several houses which are only 2.5 metres from the kerb. The AUN site is therefore not representative of the closest relevant receptors on the street in terms of the Annual Mean objective. There is no relevant exposure at this location in terms of the 1-hour Objective.

The procedure described in TG(09) has been followed to calculate an estimate of the Nitrogen dioxide annual mean concentration at the closest receptors to Telford Street. Distance corrected results are displayed in brackets alongside the actual measured results in Table 2.3a

Table 2.3a compares annual mean data with the annual mean objective. Table 2.3b compares the hourly mean dataset with the hourly mean objective.

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

Site ID	Location	Within AQMA?	Proportion of year with valid data 2008 %	Annual mean concentrations (corrected for distance)(µg/m <sup>3</sup> )		
				2006 *	2007 *	2008
IV3	Telford Street	N	99	22 (23.7)	22.3 (24.1)	20.6 (22.3)
	Fortwilliam	N	88	10.5 <sup>1</sup>	9.32 <sup>2</sup>	10.5 <sup>3</sup>

- <sup>1</sup>Only 42.6% data was captured from the Fort William site in 2006.
- <sup>2</sup>Only 84.8% data was captured for Fort William in 2007.
- <sup>3</sup>Only 88% data was captured for Fort William in 2008.

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

Site ID	Location	Within AQMA?	Data Capture 2008 %	Number of Exceedences of hourly mean (200 µg/m <sup>3</sup> )		
				2006 *	2007 *	2008 *
IV3	Telford Street, Invern	N	98.9	0	0	0
	Fort William	N	88	0 (52)	0 (53)	0 (59)

*If the period of valid data is less than 90% of a full year, include the 99.8<sup>th</sup> %ile of hourly means in brackets.*

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### Diffusion Tube Monitoring Data

Results of the Nitrogen dioxide diffusion tube monitoring at sites within Highland for 2008 are contained in table 2.4a below.

Site IV4, Telford Street, is 4 metres from the kerb. The nearest relevant exposure to this street is 2.5 metres from the kerb. This site is a co-location study with the AUN site and results are bias adjusted with a locally obtained bias adjustment factor derived using the tool "Checking Precision and Accuracy of Triplicate Tubes" provided by AEA Energy and Environment. The procedure described in TG(09) has been followed to calculate an estimate of the Nitrogen dioxide levels at the closest receptors to Telford Street.

The annual mean concentration at site RC1, Wyvis Terrace, Dingwall and site RC2, Station Road, Dingwall have been determined from a short term measurement. The ratio applied to determine the annual mean was obtained by the method which is described in Appendix A of this report. These results are bias adjusted using a combined bias adjustment factor (see appendix A). A correction for distance was not required for results at these locations.

It has not been possible to determine the annual mean Nitrogen dioxide concentration at other locations.

**Table 2.4a Results of Nitrogen Dioxide Diffusion Tubes**

Site ID	Location	Within AQMA?	Data Capture 2008 %	Annual mean concentrations
				2008 ( $\mu\text{g}/\text{m}^3$ ) Adjusted for bias (corrected for distance)
IV4	Telford Street	N	100	20 (22)
IV1	Union Street	N	0	n/a
IV2	Academy Street	N	0	n/a
IV3a	Queensgate	N	0	n/a
IV3b	Queensgate	N	0	n/a
RC1	Wyvis Terrace	N	16	18.9
RC2	Station Road	N	16	27
RC3	Kintail Place	N	16	n/a
RC4	Burns Crescent	N	16	n/a

### 2.2.2 PM<sub>10</sub>

PM<sub>10</sub> Annual Mean concentrations at Telford Street are significantly below the 2010 objective and have been the subject of a reducing trend over the past 3 years.

There have been no breaches of the 24 hour mean PM<sub>10</sub> objective at Telford Street.

**Table 2.5a Results of PM<sub>10</sub> Automatic Monitoring: Comparison with Annual Mean Objective**

Site ID	Location	Within AQMA?	Data Capture 2008 %	Annual mean concentrations ( $\mu\text{g}/\text{m}^3$ )			
				2006	2007	2008	2010 <sup>+</sup>
IV4	Telford Street, Inverness	N	98.9	15.6	13.5	12.5	12.3

+ Predicted from 2008 data using the methodology in Box 2.1 of LAQM.TG(09).

Table 2.5b Results of PM<sub>10</sub> Automatic Monitoring: Comparison with 24-hour Mean Objective

Site ID	Location	Within AQMA?	Data Capture 2008 %	Number of Exceedences of hourly mean (50 µg/m <sup>3</sup> ) <i>If data capture &lt; 90%, include the 90<sup>th</sup> %ile of hourly means in brackets.</i>			
				2006	2007	2008	2010 <sup>+</sup>
IV4	Telford Street, Inverness	N	98.9	4	0 (24)	0	12.3

+ 2010 annual mean estimated from 2008 data using the methodology in LAQM.TG(09).

### 2.2.3 Sulphur Dioxide

There was no monitoring for Sulphur dioxide carried out in the Highland Council Area in 2008.

### 2.2.4 Benzene

There was no monitoring for Benzene carried out in the Highland Council Area in 2008.

## **3 Road Traffic Sources**

### **3.1 Narrow Congested Streets with Residential Properties Close to the Kerb**

The Highland Council confirms that there are no new/newly identified congested streets with a flow above 5,000 vehicles per day and residential properties close to the kerb, that have not been adequately considered in previous rounds of Review and Assessment.

### **3.2 Busy Streets Where People May Spend 1-hour or More Close to Traffic**

The Highland Council confirms that there are no new/newly identified busy streets where people may spend 1 hour or more close to traffic.

### **3.3 Roads with a High Flow of Buses and/or HGVs.**

The Highland Council confirms that there are no new/newly identified roads with high flows of buses/HDVs.

### **3.4 Junctions and Busy Roads**

The Highland Council confirms that there are no new/newly identified busy junctions/busy roads.

### **3.5 New Roads Constructed or Proposed Since the Last Round of Review and Assessment**

The Highland Council confirms that there are no new/proposed roads.

### **3.6 Roads with Significantly Changed Traffic Flows**

The Highland Council confirms that there are no new/newly identified roads with significantly changed traffic flows.

### **3.7 Bus and Coach Stations**

The Highland Council confirms that there are no relevant bus stations in the Local Authority area.



## **4 Other Transport Sources**

### **4.1 Airports**

The Highland Council confirms that there are no airports in the Local Authority area with a total equivalent passenger output of more than 10 million passengers per annum.

### **4.2 Railways (Diesel and Steam Trains)**

#### **4.2.1 Stationary Trains**

The Highland Council confirms that there are no locations where diesel or steam trains are regularly stationary for periods of 15 minutes or more, with potential for relevant exposure within 15m.

#### **4.2.2 Moving Trains**

The Highland Council confirms that there are no locations with a large number of movements of diesel locomotives, and potential long-term relevant exposure within 30m.

### **4.3 Ports (Shipping)**

The Highland Council confirms that there are no ports or shipping that meet the specified criteria within the Local Authority area.

## **5 Industrial Sources**

### **5.1 Industrial Installations**

#### **5.1.1 Alcan, Fort William**

In The Highland Council's 2008 Progress Report it was reported that air dispersion modelling had identified the possibility of breaches of the 15 minute objective for Sulphur dioxide at locations around the Alcan facility, an Aluminium Smelter on the outskirts of Fort William.

The Report "Modelling Alcan Lochaber smelter impacts on air quality – sensitivity studies" was produced by AEA Energy and Environment in July 2007 on behalf of the process operator as an assessment of the sensitivity and uncertainties of modelling the emission from the site. The report was the first part of a phased approach to assessing the environmental impact of the process, at the behest of the regulator. The report concluded that the uncertainty in the model was large and a temporary halt was called on further work.

The air dispersion model ADMS3.3 was used to perform model runs of air dispersion using varying input parameters for terrain and meteorology. The output was in terms of the 99.9<sup>th</sup> percentile of 15 minute mean Sulphur dioxide concentrations. For some of the model runs the output predicted pollutant levels in excess of the objective at Lochaber High which lies approximately 900m north of the Alcan site.

The following points are however significant:

The modelling was carried out on a "worst case" basis using the maximum permitted emission rate of the process. In reality the process emits around fifty percent of the permitted amount of Sulphur dioxide. It is likely that the modelling process has significantly overestimated pollutant levels.

As part of the LAQM process The Highland Council undertook a detailed assessment for Sulphur dioxide at Fort William in 2005. Automatic monitoring equipment was installed at the British Aluminium Club, which lies around 500m north-west of the Alcan site. Monitoring was undertaken throughout the six months from December 2004 to June 2005. The maximum 15 minute mean Sulphur dioxide concentration recorded in this time was 77 ug/m<sup>3</sup>. The 2007 Alcan study predicted 2005 Sulphur dioxide concentrations of between 138 and 202 ug/m<sup>3</sup> (99<sup>th</sup> Percentile of 15 minute means). At this location measured levels were at most 50% of the modelled levels.

The 2005 monitoring was carried out at a time when Arjo Wiggins Paper Mill, which is 4km west of the site was emitting over 800 tons of Sulphur dioxide a year. Arjo Wiggins is now closed.

In a response to the submission of The Highland Council's 2008 LAQM Progress Report SEPA expressed concern that combined emission of Alcan and domestic heating sources might be significant.

The highest concentrations of Sulphur dioxide modelled during the 2007 Alcan Study were predicted at Lochaber High. Lochaber High is not in an area of domestic housing. The nearest areas of concentrated housing to the School are Caol and Inverlochty each approximately 1500m away. It is therefore unlikely that burning of domestic coal is significantly contributing to Sulphur dioxide concentrations at this location.

The Highland Council surveyed domestic fuel as part of the 2003 USA. Three survey areas in Fort William and Corpach were considered and it was discovered that the density of coal burning in all three areas was not significant. The most commonly used fuel for domestic space heating was electricity.

The 2005 Detailed Assessment concluded that there was little likelihood of a failure to meet the objectives for Sulphur dioxide. Taking into account all of the above it seems unlikely that this situation will have changed.

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### **5.1.2 New or Proposed Installations for which an Air Quality Assessment has been Carried Out**

A new CHP plant, operated by BALCAS, was granted planning permission in 2007. The plant is authorised by SEPA. An Assessment of Air Quality was carried out during the planning application process which determined that there would not be a significant impact in terms of local air quality.

The Highland Council has assessed new/proposed industrial installations, and concluded that it will not be necessary to proceed to a Detailed Assessment.

### **5.1.3 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced**

The Highland Council confirms that there are no industrial installations with substantially increased emissions or new relevant exposure in their vicinity within its area or nearby in a neighbouring authority.

### **5.1.4 New or Significantly Changed Installations with No Previous Air Quality Assessment**

The Highland Council confirms that there are no new or proposed industrial installations for which planning approval has been granted within its area or nearby in a neighbouring authority.

## **5.2 Major Fuel (Petrol) Storage Depots**

There are major fuel storage facilities at Inverness and Nigg both of which were the subject of a detailed assessment in 2005 that concluded that there was no likelihood of a breach of objectives as a result of these facilities.

There are major fuel (petrol) storage depots within the Local Authority area, but these have been considered in previous reports.

### **5.3 Petrol Stations**

There are three petrol stations in Highland that are nearby to roads which can be taken to be busy by the terms described in LAQM.TG(09). All three of these stations have stage 2 vapour recovery installed and need not be considered by this review.

The Highland Council confirms that there are no petrol stations meeting the specified criteria.

### **5.4 Poultry Farms**

The Scottish Environment Protection Agency has registered one poultry farm as a process under IPPC. Killara Chickens, Mains of Kilravock, Inverness houses 68,000 birds and therefore does not meet the specified criteria.

The Highland Council confirms that there are no poultry farms meeting the specified criteria.

## **6 Commercial and Domestic Sources**

### **6.1 Biomass Combustion – Individual Installations**

The Highland Council has identified 23 installations burning biomass in 50kW to 20MW units. An assessment of these units has been carried out. A summary of the results of assessment is listed in the tables 6.1a and 6.1b below.

The method of assessment suggested in LAQM.TG(09) compares the background adjusted emission rate for the installation with a threshold emission rate, determined by the effective stack height and diameter of the installation. The LAQM Tools section of the government website [www.airquality.co.uk](http://www.airquality.co.uk) provides a spreadsheet tool, which enables the Local Authority to calculate the threshold emission rate for an installation taking account of the stack dimensions and background pollution levels. Provided that the actual maximum emission rate of the stack does not exceed this threshold there is no need to progress to a detailed assessment. This tool has been used to calculate the threshold emission rate for each of the installations listed in the tables below. Where the actual emission rate of the installation is known this has been used, otherwise the emission rate has been estimated using emission factors from table A2.20 of TG(09) and the known maximum thermal capacity of the appliance.

Geddes Windows, Halkirk operates a waste wood boiler of 1200kWth input capacity. The estimated maximum emission rate from the stack exceeds the threshold emission rate for compliance with the PM10 objective and both of the Nitrogen dioxide objectives.

It will therefore be necessary to proceed to a Detailed Assessment for the 24hour mean objective PM10, for the Annual Mean Objective NO2 and for the 1-hour Mean Objective NO2 at Geddes Windows, Halkirk Caithness

It will not be necessary to proceed to a detailed assessment for any of the other installations.

Table 6.1a Screening Assessment results for Biomass installations 50kW to 2MW (PM10)

Name	Description	Capacity (kW)	Maximum Emission Rate (PM10)	Threshold Emission Rate (PM10)
Albyn Housing, Aviemore	Advanced Automatic Boiler	400	0.0264	0.0367
Scottish Natural Heritage, Aviemore	Advanced Automatic Boiler	80	0.0015	0.0175
Dorback Lodge, Nethybridge	Advanced Automatic Boiler	100	0.0027	0.0392
Mains Care Home, Newtonmore	Advanced Automatic Boiler	200	0.0132	0.0172
Russwood Sawmill, Newtonmore	Advanced Automatic Boiler	120	0.0023	0.0392
Scottish School of Forestry, Balloch	Advanced Automatic Boiler	110	0.0072	0.0182
Culloden Battlefield, Inverness	Advanced Automatic Boiler	220	0.0145	0.0186
North Coast Leisure, Bettyhill	Advanced Automatic Boiler	120	0.0079	0.0182
Averon Leisure, Alness	Advanced Automatic Boiler	150	0.0099	0.0212
Ashley Ann, Wick	Advanced Automatic Boiler	150	0.0099	0.0206
<b>Geddes Windows, Halkirk</b>	<b>Advanced Automatic Boiler</b>	<b>1200</b>	<b>0.0792</b>	<b>0.0214</b>
Localsh and Skye Housing Association, Portree	Advanced Automatic Boiler	500	0.0095	0.0336
Sabhal Mor Ostaig, Sleat	Advanced Automatic Boiler	500	0.0095	0.0368
Highland Birchwoods, Munloch	Advanced Automatic Boiler	60	0.00396	0.0186
Lochalsh Leisure, Kyle of Lochalsh	Advanced Automatic Boiler	100	0.0066	0.017
Novar House, Evanton	Advanced Automatic Boiler	120	0.00792	0.019
Ardtalla, Evanton	Advanced Automatic Boiler	120	0.00792	0.019
Nevis Centre, Fort William	Advanced Automatic Boiler	200	0.0132	0.0131
Lochaber College, Fort William	Advanced Automatic Boiler	110	0.00726	0.0131
Fort William Medical Centre	Advanced Automatic Boiler	150	0.0099	0.0131
Kinlochleven Community and Sports Centre	Advanced Automatic Boiler	120	0.00792	0.0169
Glen Coe Visitors Centre	Advanced Automatic Boiler	120	0.00792	0.0174
Great Glen Cattle Ranch, Spean Bridge	Advanced Automatic Boiler	80	0.00528	0.0175

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Table 6.1b Screening Assessment results for Biomass installations 50kW to 2MW (NO2)

Name	Description	Capacity (kW)	Maximum Emission Rate (NO2)	Threshold Emission Rate (NO2 annual mean objective)	Threshold Emission Rate (NO2 1 Hour objective)
Albyn Housing, Aviemore	Advanced Automatic Boiler	400	0.0675	0.1703	0.2177
Scottish Natural Heritage, Aviemore	Advanced Automatic Boiler	80	0.00632	0.0656	0.0727
Dorback Lodge, Nethybridge	Advanced Automatic Boiler	100	0.0115	0.139	0.1551
Mains Care Home, Newtonmore	Advanced Automatic Boiler	200	0.03	0.061	0.0807
Russwood Sawmill, Newtonmore	Advanced Automatic Boiler	120	0.00948	0.1402	0.1585
Scottish School of Forestry, Balloch	Advanced Automatic Boiler	110	0.0165	0.0658	0.0728
Culloden Battlefield, Inverness	Advanced Automatic Boiler	220	0.033	0.0665	0.0731
North Coast Leisure, Bettyhill	Advanced Automatic Boiler	120	0.018	0.0674	0.0735
Averon Leisure, Alness	Advanced Automatic Boiler	150	0.0225	0.0811	0.1068
Ashley Ann, Wick	Advanced Automatic Boiler	150	0.0225	0.0814	0.107
<b>Geddes Windows, Halkirk</b>	<b>Advanced Automatic Boiler</b>	<b>1200</b>	<b>0.18</b>	<b>0.0823</b>	<b>0.1074</b>
Localsh and Skye Housing Association, Portree	Advanced Automatic Boiler	500	0.084	0.1419	0.1816
Sabhal Mor Ostaig, Sleat	Advanced Automatic Boiler	500	0.084	0.1444	0.1868
Highland Birchwoods, Munlochy	Advanced Automatic Boiler	60	0.009	0.0669	0.0733
Lochalsh Leisure, Kyle of Lochalsh	Advanced Automatic Boiler	100	0.015	0.0689	0.0741
Novar House, Evanton	Advanced Automatic Boiler	120	0.018	0.0679	0.0737

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**Table 6.1b (cont) Screening Assessment results for Biomass installations 50kW to 2MW (NO2)**

<b>Name</b>	<b>Description</b>	<b>Capacity (kW)</b>	<b>Maximum Emission Rate (NO2)</b>	<b>Threshold Emission Rate (NO2 annual mean objective)</b>	<b>Threshold Emission Rate (NO2 1 Hour objective)</b>
Ardtalla, Evanton	Advanced Automatic Boiler	120	0.018	0.0679	0.0737
Nevis Centre, Fort William	Advanced Automatic Boiler	200	0.03	0.0665	0.0731
Lochaber College, Fort William	Advanced Automatic Boiler	110	0.0165	0.0665	0.0731
Fort William Medical Centre	Advanced Automatic Boiler	150	0.0225	0.0665	0.0731
Kinlochleven Community and Sports Centre	Advanced Automatic Boiler	120	0.018	0.068	0.0737
Glen Coe Visitors Centre	Advanced Automatic Boiler	120	0.018	0.0682	0.0738
Great Glen Cattle Ranch, Spean Bridge	Advanced Automatic Boiler	80	0.012	0.0678	0.0736

The Highland Council has assessed biomass combustion plant, and concluded that **it will be necessary to proceed to a Detailed Assessment for PM10 and Nitrogen dioxide.**



## **6.2 Biomass Combustion – Combined Impacts**

There are no concentrations of biomass combustion in The Highland Council Area at a level which would require further assessment in this section.

**The Highland Council has assessed the biomass combustion plant, and concluded that it will not be necessary to proceed to a Detailed Assessment.**

## **6.3 Domestic Solid-Fuel Burning**

A detailed assessment was carried out by this authority, in 2005, with respect to Sulphur dioxide emission from domestic solid fuel combustion. Castletown in Caithness was identified as an area where the highest level of domestic solid fuel combustion occurred and was the subject of the assessment. The conclusion of the assessment was that there was not a likelihood of failure to meet the objectives.

**The Highland Council has assessed areas of significant domestic solid fuel use, and concluded that it will not be necessary to proceed to a Detailed Assessment.**

## **7 Fugitive or Uncontrolled Sources**

The Highland Council confirms that there are no potential sources of fugitive particulate matter emissions in the Local Authority area.

## **8 Conclusions and Proposed Actions**

### **8.1 Conclusions from New Monitoring Data**

New monitoring data has not identified any exceedences of objectives, or a likelihood of exceedences to occur. Adjustment of the existing dataset for PM10 recorded at Telford Strret, Inverness, has resulted in a significant reduction in the level of PM10 reported for this location. It will not now be necessary to progress to a detailed assessment for PM10 at this location.

### **8.2 Conclusions from Assessment of Sources**

The assessment of sources has identified one commercial source in The Highland Council area whose impact may be to cause a breach of the air quality objectives to occur.

There have been no new transport sources, industrial installations, domestic sources or fugitive emissions identified, which are likely to be significant to local air quality.

### **8.3 Proposed Actions**

There is a need for the Highland Council to proceed to Detailed Assessment in relation to stack emissions from a Biomass Installation at Geddes Windows, Halkirk, Caithness, against the following objectives:

- 50 ug/m<sup>3</sup> 24 Hour Mean Objective for PM10 objective;
- 200 ug/m<sup>3</sup> 1 Hour Mean Objective for Nitrogen dioxide;
- 40 ug/m<sup>3</sup> Annual Mean objective for Nitrogen dioxide.

SEPA have informed the Highland Council that the installation is a waste wood burner that was operating without permit. A permit application for the installation has been submitted but has not been issued.

Monitoring should continue as at present. It is especially important that monitoring of the Nitrogen dioxide concentrations at the four Inverness City Centre diffusion tube locations should continue in order that the effect of new traffic management systems can be investigated.

The Highland Council's next course of action will be to submit a progress report in April 2010 and to progress to a detailed assessment of the matters identified above.

## 9 References

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5. The Highland Council, **Air Quality in The Highlands – First Stage Review and Assessment** 1998.
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8. The Highland Council, **Progress Report**, 2005
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14. **Environment Act 1995**
15. **Clean Air Act 1993**
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20. AEA Technology, **QA/QC Data Ratification report for the Automatic Urban and Rural Network, October – December 2008 and Annual Review for 2008**, June 2009.
21. Gradko (International) Ltd, **Passive Diffusion Tube Monitors – Instruction manual for Exposure and Location**.
22. AEA Energy and Environment, **Technical Guidance – Screening Assessment for Biomass Boilers**, 2008
23. Air Quality Consultants, **Nitrogen dioxide Concentrations and Distance from Roads**, 2008
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25. AEA Energy and Environment for DEFRA and the devolved administrations, **Diffusion Tubes for Ambient NO2 Monitoring – Practical Guidance for Laboratories and Users**, 2008
26. AEA Energy and Environment on behalf of DEFRA and the devolved administrations, **WASP - Annual Performance Criteria for NO2 Diffusion Tubes used in Local Air Quality Management (LAQM), 2008 onwards, and Summary of Laboratory Performance in Rounds 100-104**.

# **Appendices**

Appendix A: QA/QC Data

Appendix B: Maps

## **Appendix A: QA:QC Data**

### **Diffusion Tube Bias Adjustment Factors**

Diffusion tubes used by The Highland Council are supplied and analysed by Gradko International Ltd. The preparation method is "20% TEA in Water". The bias adjustment factor recommended by the R&A Helpdesk Database is 0.91. This factor is derived from 19 co-location studies.

### **Factor from Local Co-location Studies (if available)**

A diffusion tube co-location study has taken place at site IV4, a roadside site on Telford Street, Inverness. The tubes are co-located with the Telford Street AUN Station. AEA's DifTPAB spreadsheet tool has been used to determine the precision and accuracy of the diffusion tube co-location study. Precision of the survey was good and the bias adjustment factor calculated was 0.81.

### **Discussion of Choice of Factor to Use**

The local bias adjustment factor has been used to adjust the results of the diffusion tube survey at site IV4, Telford Street, Inverness. The survey location is co-located with the automatic diffusion tube monitor.

Had there been data available from the other sites in Inverness and Dingwall to bias adjust it would have been more appropriate to use the combined bias adjustment factor. The tubes deployed by the Highland Council are exposed over a range of settings, which differ from the co-location site.

### **PM Monitoring Adjustment**

The method used for the measurement of PM10 at Telford Street, Inverness is considered to be equivalent to the reference method. No adjustment of the dataset has been necessary.

### **Short-term to Long-term Data adjustment**

The data set for four diffusion tube sites in Dingwall was incomplete. Only two months (Jan, feb) of data were available in 2008. Two of these sites are urban background sites and there is not an appropriate location available from which to derive a ratio to allow adjustment of the short term data. Two sites are roadside sites and the data from the AUN site at Telford Street may be used for this purpose. The method described in Box 3.2 of TG(09) has been used to derive the ratio of 1.39 which has been applied to the data from the Wyvis Terrace and Station Road sites in Dingwall

<b>Site</b>	<b>Site Type</b>	<b>Annual Mean</b>	<b>Period Mean</b>	<b>Ratio</b>
Telford St. (IV4)	Roadside	20.6	28.8	1.398

### **QA/QC of automatic monitoring**

The AURN sites in Highland are operated for DEFRA by Bureau Veritas with QA/QC provided by AEA.

### **QA/QC of diffusion tube monitoring**

Gradko have supplied the following QA/QC statement:

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### **Supply and Analysis of Nitrogen Dioxide (NO<sub>2</sub>) Diffusion Tubes**

Analysis of the NO<sub>2</sub> diffusion tubes is carried out using ion chromatography techniques in accordance with Gradko International Ltd U.K.A.S. accredited (ISO/IEC 17025) internal laboratory procedure GLM 7, which is a recommended UV spectrophotometric method.

Reporting of the NO<sub>2</sub> analysis results is sent electronically to each authority in PDF format or if requested EXCEL format. The report is issued within 10 working days from receipt of the exposed diffusion tubes to the Gradko Laboratory.

**Tube Delivery:** Once confirmation has been received on the required despatch dates, a calendar database will be set up by the Sales Dept at Gradko International Ltd which will automatically flag up each month's date of despatch. The window period is usually 7 days before the required date. A delivery note containing the details of each month's requirements is raised by the Sales Dept and provided to the Diffusion Tube Preparation Laboratory. This Laboratory holds one week's stock of newly prepared NO<sub>2</sub> diffusion tubes based on our monthly despatches.

**Missing / Lost Deliveries :** If notification of a missing or lost delivery is received from a local authority, a new batch of diffusion tubes will be immediately despatched. If the missing batch is eventually found they should be returned to Gradko International Ltd for disposal. If additional tubes are required over and above the normal monthly quantity, they will be despatched with the main batch of tubes. The point of contact for this service or other sales enquiries is the Sales Co-ordinator, Phone 01962 860331 or e-mail [sales@gradko.co.uk](mailto:sales@gradko.co.uk).

**For technical queries** or complaints relating to service, the point of contact is the Technical / Quality Manager, Phone 01962 860331 or e-mail [diffusion@gradko.co.uk](mailto:diffusion@gradko.co.uk).

For laboratory analysis enquiries the point of contact is the Laboratory Supervisor or the Laboratory Technician responsible for NO<sub>2</sub> analysis, phone 01962 860331 ext 227 or e-mail [LabReports@gradkolab.co.uk](mailto:LabReports@gradkolab.co.uk)

**Quality Assurance:** The laboratory has a fully documented Quality Management System, which has been assessed and accredited by U.K.A. S. (Accreditation No. 2187). A copy of the Quality Manual Contents Index is available on request.

**Quality Control Procedures:** All tube components are maintained in a high state of cleanliness. New absorbent is prepared by the Laboratory and checked for levels of nitrogen dioxide. The diffusion tubes are prepared in a dedicated clean laboratory and stored under refrigerated conditions to maintain stability. A sample of each batch of tubes prepared is checked by the analyst for blank levels. If the tubes are stored for more than one week, a further sample is taken and checked for any increases in blank levels. If the levels reach a pre-determined value, the batch of tubes is discarded.

Analytical Quality Control Procedures are implemented by the use of internal standards checks using certified standards from two different sources, and the use of external proficiency schemes such as WASP Inter-Comparison Project and NETCEN which are administered by the UK Health & Safety Laboratory.

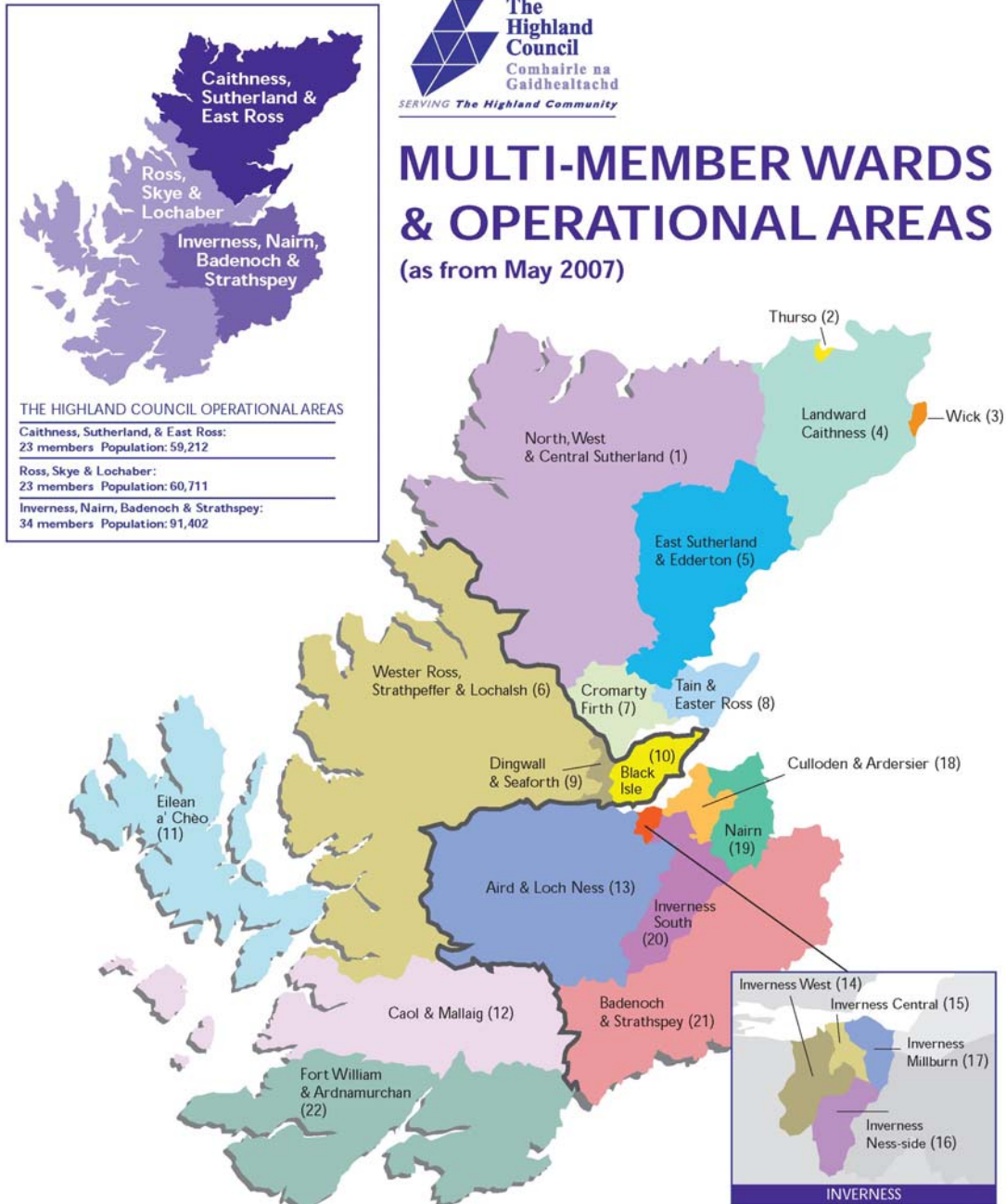
Gradko performance on the WASP Inter-comparison Project was described as "good".

#### **Tube Exposure Procedure**

The Highland Council exposes diffusion tubes according to the method described in "Passive Diffusion Air Monitors – Instruction Manual for Exposure and Location" by Gradko International Ltd. Guidance is also found in "Diffusion Tubes for Ambient NO<sub>2</sub> Monitoring: Practical Guidance" by AEA for DEFRA.

# Appendix B: Maps

## Maps of Locations



CAITHNESS, SUTHERLAND & EASTER ROSS OPERATIONAL AREA		
Ward No./	No. of	2004
Ward Name	Members	Population
1	3	6,055
2	3	7,849
3	3	7,506
4	4	9,809
5	3	7,620
7	4	11,652
8	3	8,721
<b>TOTAL</b>	<b>23</b>	<b>59,212</b>

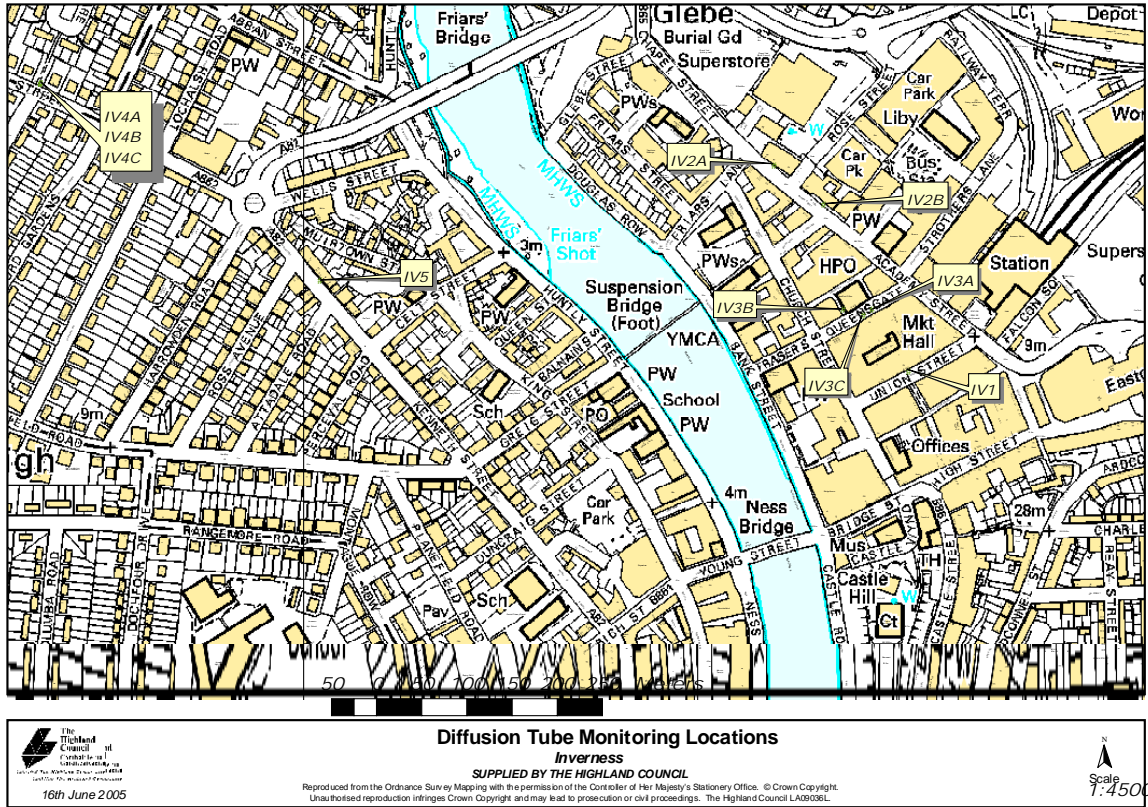
ROSS, SKYE & LOCHALSH OPERATIONAL AREA		
Ward No./	No. of	2004
Ward Name	Members	Population
6	4	11,758
9	4	11,073
10	4	9,468
11	4	9,694
12	3	8,080
22	4	10,638
<b>TOTAL</b>	<b>23</b>	<b>60,711</b>

INVERNESS, NAIRN, BADENOCH & STRATHSPEY OPERATIONAL AREA		
Ward No./	No. of	2004
Ward Name	Members	Population
13	4	10,020
14	3	8,106
15	4	12,672
16	4	10,477
17	3	8,657
18	4	11,523
19	4	10,809
20	4	7,156
21	4	11,983
<b>TOTAL</b>	<b>34</b>	<b>91,402</b>

Map 1 – Highland Council Area

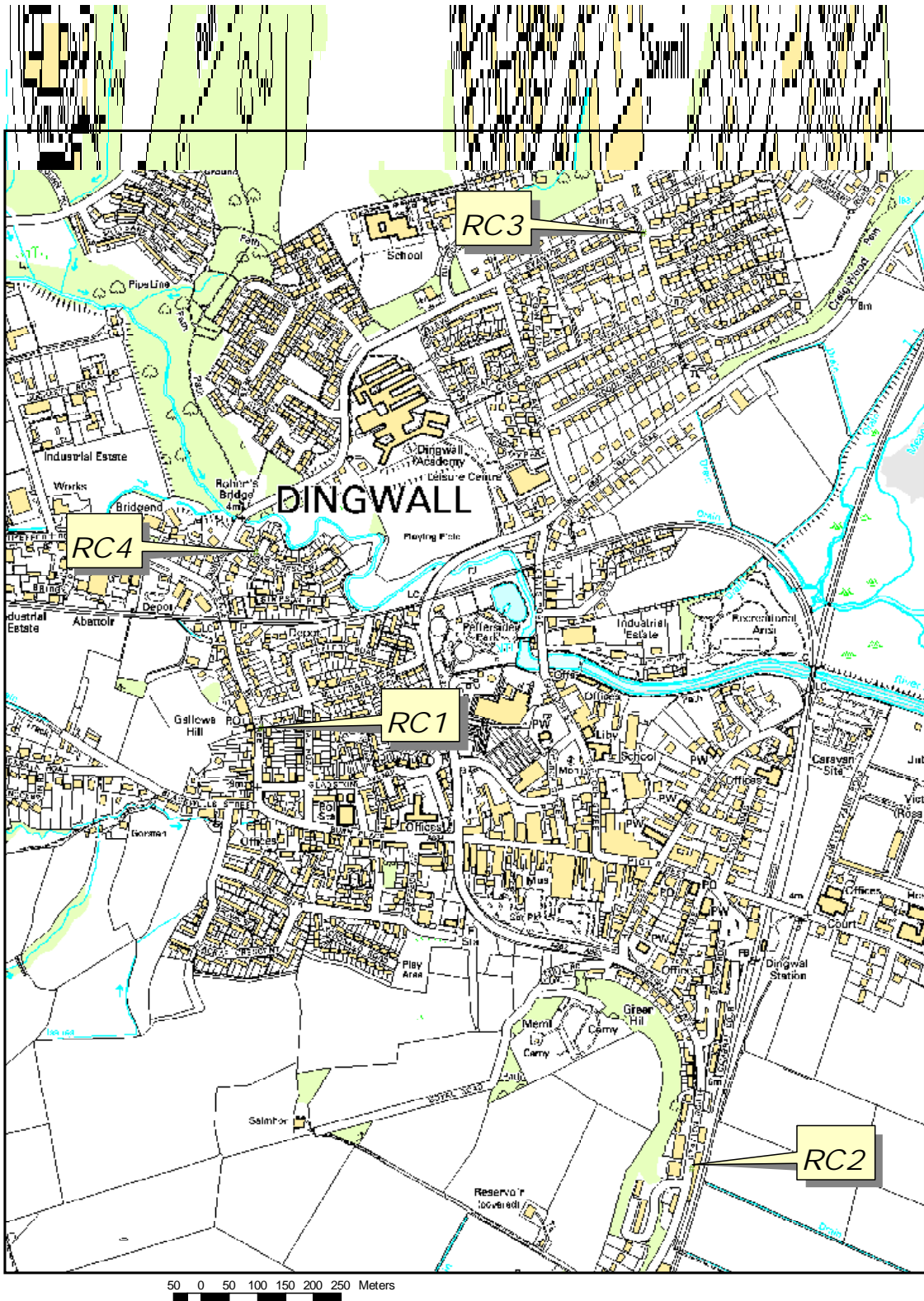



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Note – IV2A and IV3C no longer operating.

and




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Cathair na Gàidhealtachd  
The Highland Council

**Diffusion Tube Monitoring Locations**  
*Dingwall*

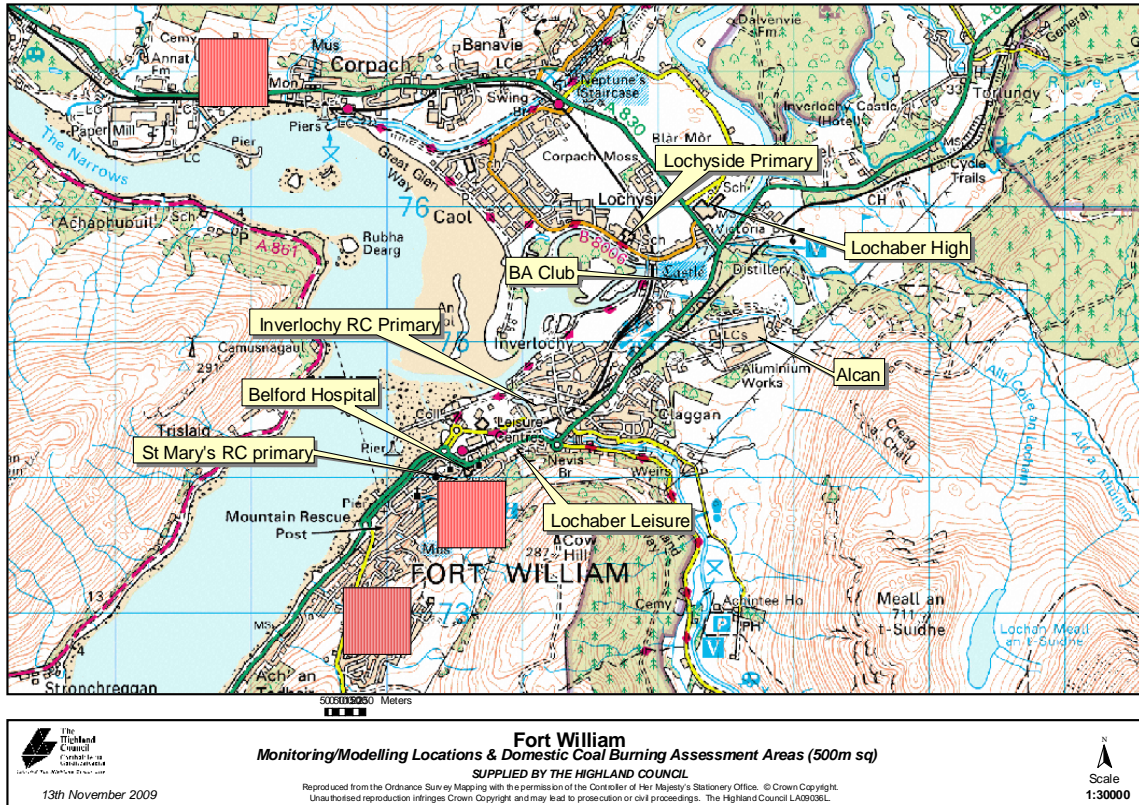
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 **Scale 1:8500**

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**Fort William**  
 Monitoring/Modelling Locations & Domestic Coal Burning Assessment Areas (500m sq)  
 SUPPLIED BY THE HIGHLAND COUNCIL



13th November 2009

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