ORKNEY
ISLANDS COUNCIL

2015 Updating and Screening Assessment for Orkney Islands Council

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

September 2015

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Executive Summary

The Update and Screening Assessment has concluded that there is no need to proceed to a detailed assessment for any pollutant.

The islands predominantly rural nature, the continued lack of large scale industrial processes and the recently acquired monitoring data clearly shows that Orkney is currently meeting the 2010 air quality objectives. Pollutant levels have remained at a consistently low level and there is no significant risk of Orkney exceeding the air quality objectives.

The current monitoring regime for NO_2 within Orkney will continue to ensure that the high standard of air quality in the county continues. At present the Orkney Islands Council have no intention of recommencing Benzene monitoring through a network of diffusion tubes as in previous years. This decision has been taken because results from previous years have for the majority been within the limits of detection. The decision will be addressed should there be any development within the county that raises potential issues for benzene. Results from, the most recent SO_2 monitoring in association with SEPA Field Chemistry confirms that levels continue to be significantly below the air quality objectives.

The next course of action for Orkney Island Council will be to submit the 2016 Progress Report.

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1 Introduction

1.1 Description of Local Authority Area

The Orkney Islands are situated situated some seven miles north of the Scottish mainland and covering an area of just under 100,000 hectares. (59 □N, 3□W). There are approximately 70 islands and 20 skerries in the island group. The county has a resident population of 21,349 in 2011 of which 17,162 inhabit the main island (called The Mainland). Orkney's two main towns of Kirkwall (population approximately 8,500) and Stromness (population approximately 2,200) are situated on The Mainland.

The main traffic routes in Orkney are a series of 'A' roads that link the west mainland to the east, through Kirkwall and southwards across the barriers to South Ronaldsay. The highest volume of traffic can be found within Kirkwall, with very light levels of traffic found across the mainland and the Outer Isles. The main airport is situated at Grimsetter, 2 miles outside Kirkwall. There are smaller airports across the Outer Isles providing links to Orkney mainland. Large ferry services link Orkney to the Scottish mainland and Shetland with other numerous smaller inter-island links throughout Orkney. Other shipping activity is present within Orkney water's and tends to be concentrated around Scapa Flow.

The county is overwhelmingly rural in character and there are few significant industrial processes in Orkney. The main industrial process comes from the oil activities at Flotta. There are other smaller industrial processes i.e. fish processing and quarrying.

The last update and screening assessment in 2012 concluded that there were no locations in Orkney where the air quality objectives were likely to be exceeded.

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.

The objective of this Updating and Screening Assessment is to identify any matters that have changed which may lead to risk of an air quality objective being exceeded. A checklist approach and screening tools are used to identify significant new sources or changes and whether there is a need for a Detailed Assessment. The USA report should provide an update of any outstanding information requested previously in Review and Assessment reports.

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

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

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 µg/m^3	Running annual mean	31.12.2003
	3.25 µg/m^3	Running annual mean	31.12.2010
1,3-Butadiene	2.25 µg/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 µg/m^3	Annual mean	31.12.2004
	0.25 µg/m^3	Annual mean	31.12.2008
Nitrogen dioxide	200 µg/m^3 not to be exceeded more than 18 times a year	1-hour mean	31.12.2005
	40 µg/m^3	Annual mean	31.12.2005
Particles (PM_{10}) (gravimetric)	50 µg/m^3, not to be exceeded more than 7 times a year	24-hour mean	31.12.2010
	18 µg/m^3	Annual mean	31.12.2010
Sulphur dioxide	350 µg/m^3, not to be exceeded more than 24 times a year	1-hour mean	31.12.2004
	125 µg/m^3, not to be exceeded more than 3 times a year	24-hour mean	31.12.2004
	266 µg/m^3, not to be exceeded more than 35 times a year	15-minute mean	31.12.2005

1.4 Summary of Previous Review and Assessments

The First stage review and assessment for Orkney Islands Council was published in December 1998 and revised in May 1999. This concluded that because Orkney is predominantly a rural island community with few significant industrial processes in the islands, and road traffic volumes are low. The risk of the air quality objectives for benzene, 1,3 butadiene, carbon monoxide, lead, nitrogen dioxide, sulphur dioxide and particulates being exceeded are considered negligible. It also concluded that there was not a requirement for a second stage review.

Further Updating and Screening Assessment of local air quality were published the most recent in 2012. The report concluded that air quality was currently meeting the national objectives and that it was not necessary to undertake a Detailed Assessment or to declare an Air Quality Management Area (AQMA).

The Council has also published Progress Reports on Air Quality, in the intervening years with the most recent progress report submitted in May 2014. These reports have confirmed that a Detailed Assessment for air quality within Orkney is not required for any pollutants, and further concluded that levels of pollutants in Orkney are way below the NAQS objectives and Orkney is not at risk of exceeding these objectives.

2 New Monitoring Data

2.1 Summary of Monitoring Undertaken

2.1.1 Automatic Monitoring Sites

There are no automatic monitoring sites with in Orkney.

2.1.2 Non-Automatic Monitoring Sites

New data for 2014 has been gathered by Orkney Islands Council via a network of five diffusion tubes for Nitrogen Dioxide (NO_2) concentrations. The tubes are exposed on a monthly basis throughout the year and sent for analysis at Edinburgh Scientific Services. The locations of the tubes are presented in Figure 2.2.

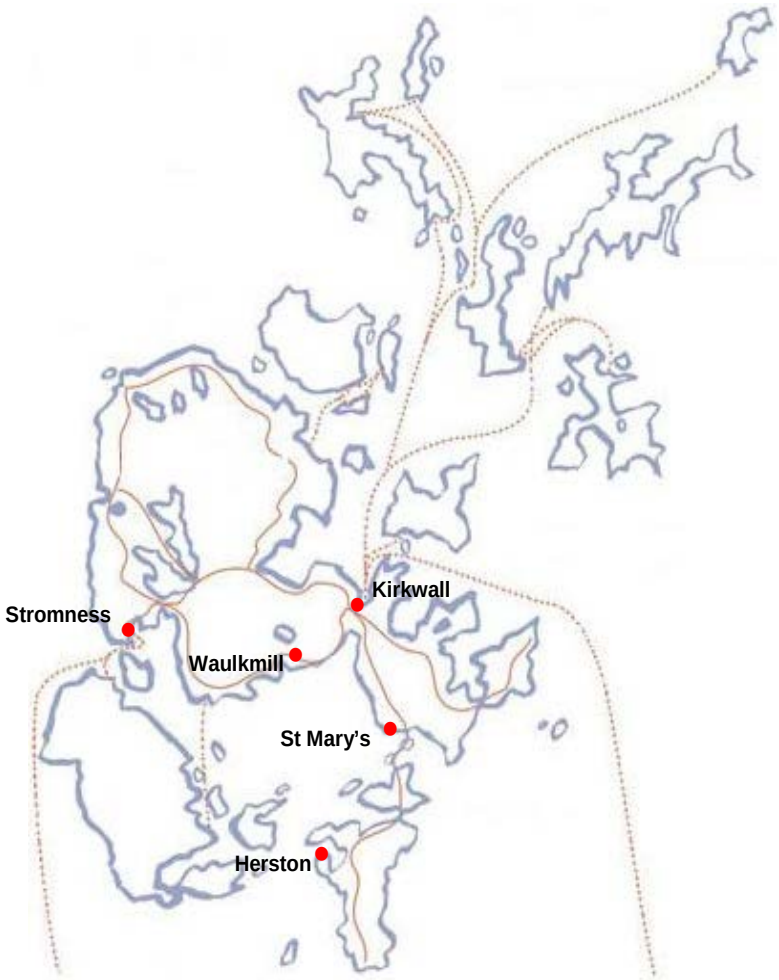

Figure 2.2 Map(s) of Non-Automatic Monitoring Sites (if applicable)

Table 2.2 Details of Non-Automatic Monitoring Sites

Site Name	Site Type	X OS Grid Ref	Y OS Grid Ref	Pollutants Monitored	In AQMA?	Is monitoring collocated with a Continuous Analyser (Y/N)	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?
Kirkwall	Roadside	344812	1011017	NO_2	N	N	Y (1m)	1m	Y
Stromness	Roadside	325590	1009553	NO_2	N	N	Y (1m)	1m	Y
St Mary's	Roadside	347140	1001235	NO_2 ,	N	N	Y (2m)	1m	Y
Waulkmill	Rural	339525	1006985	NO_2,	N	N	N	1.5m	Y
Herston	Rural	341995	991999	NO_2,	N	N	Y (10m)	2m	Y

2.2 Comparison of Monitoring Results with Air Quality Objectives

2.2.1 Nitrogen Dioxide

As stated previously, there is no automatic monitoring data with regards to Nitrogen dioxide, as it has been deemed unnecessary due to the islands rural landscape and low population. Therefore all monitoring data is obtained through the placement of diffusion tubes. As diffusion tubes cannot detect short term fluctuations in pollutant concentrations, it is not possible to compare the monitoring results against all NAQS objectives for NO_2. As can be seen from the data below, this is justified due to the County's very low NO_2 levels.

Diffusion Tube Monitoring Data

The annual mean concentrations for NO_2 are shown in Table 2.5. The full data set of results for 2014 can be seen in Appendix A

As can be seen from the results in Table 2.6 below, in 2014 there has been no significant change in levels of NO_2, with all monitoring locations continuing to show a reduction in levels since the previous year. Kirkwall as Orkney's largest town with over 40 percent of the population and the highest traffic flows continues to experience the highest levels of NO_2 in the county. The levels in Kirkwall are currently at 29 percent of the objective.

Figure 2.4 below displays the trends of NO_2 concentrations within Orkney over the last 5 years. It is unlikely that levels will ever exceed the NAQS objective of 40 mg/m^3.

Table 2.5 Results of Nitrogen Dioxide Diffusion Tubes in 2011

Site ID	Location	Site Type	Within AQMA?	Triplicate or Collocated Tube	Data Capture 2011 (Number of Months or %)	Data with less than 9 months has been annualised (Y/N)	Confirm if data has been distance corrected (Y/N)	Annual mean concentration (Bias Adjustment factor = 0.74) 2014 (μg/m^3)
KW	Kirkwall	Roadside	N	N	12 months	N	N	11.6
SN	Stromness	Roadside	N	N	12 months	N	N	7.7
SM	St Mary's	Roadside	N	N	12 months	N	N	1.7
WM	Waulkmill	Rural	N	N	11 months	N	N	2.1
HE	Herston	Rural	N	N	12 months	N	N	3.0

Table 2.6 Results of NO_2 Diffusion Tubes (2010 to 2014)

Site ID	Site Type	Within AQMA?	Annual Mean Concentration (μg/m^3) - Adjusted for Bias				
			2010 (Bias Adjustment Factor = 0.95)	2011 (Bias Adjustment Factor = 1.02)	2012 (Bias Adjustment Factor = 0.84)	2013 (Bias Adjustment Factor = 0.79)	2014 (Bias Adjustment Factor = 0.74)
KW	Kirkwall	N	18.9	18.4	17.3	15.2	11.6
SN	Stromness	N	10.6	12.6	9.9	9.6	7.7
SM	St Mary's	N	5.0	4.6	4.1	3.7	1.7
WM	Waulkmill	N	4.0	3.8	3.3	2.3	2.1
HE	Herston	N	2.8	3.1	2.7	2.1	3.0

The QA/QC for the diffusion tubes are detailed in Appendix A

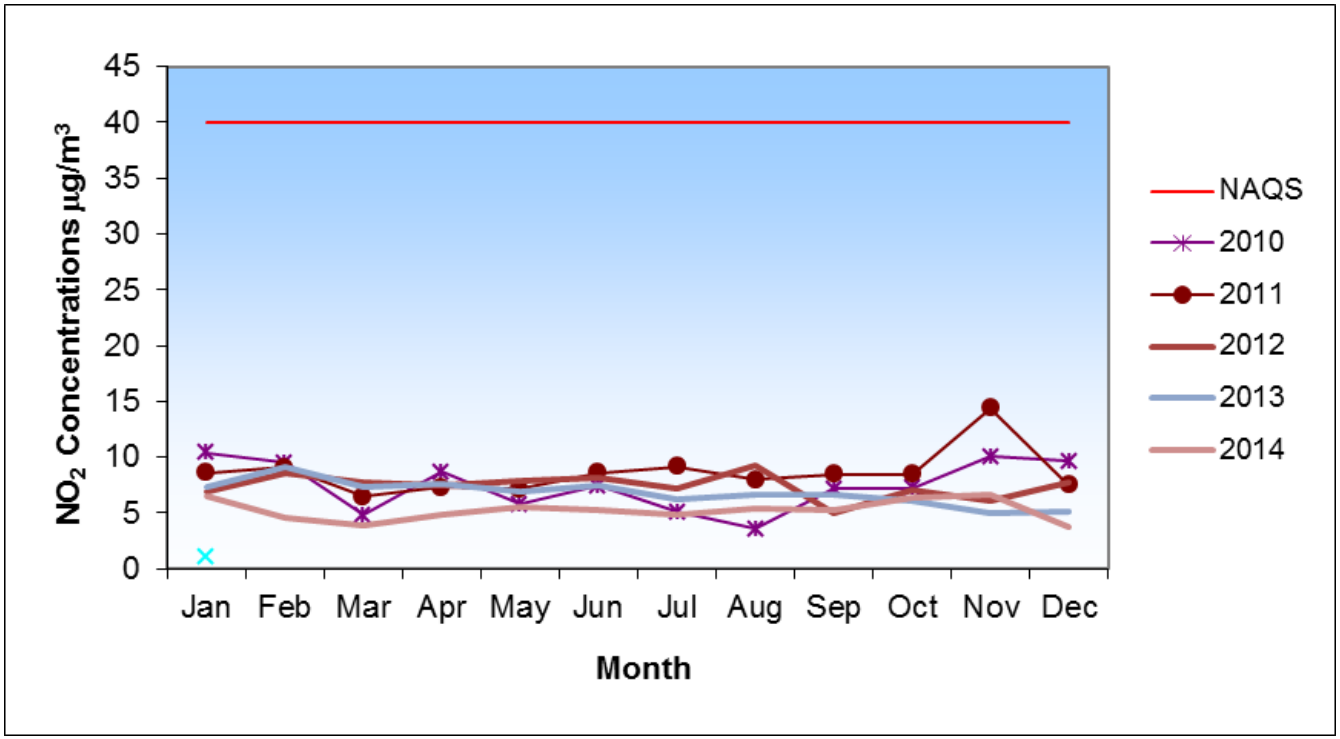

Figure 2.4 Trends in Annual Mean Nitrogen Dioxide Concentrations measured at Diffusion Tube Monitoring Sites

A trend chart may be inserted here. Please discuss any trends shown.

2.2.2 PM_{10}

Orkney Islands Council does not undertake monitoring for PM10. In previous reports background concentration maps were used and predicted that PM10 pollution levels in Orkney will not exceed 15µg/m3. Current background maps for the Scotland specific model show Orkney to have PM_{10} levels of approximately 10-12 µg/m^3. Taking these facts into consideration, and that projected furture levels are to fall it is concluded that there is no expected exceedance of the 2010 objective (18µg/m^3) in Orkney.

2.2.3 Sulphur Dioxide

As reported in the last progress report the last time SO_2 data was collected in Orkney was in 2005 when real time data for SO_2 was collected to measure ambient levels of SO_2 in Kirkwall, with the assistance of SEPA. In 2014 assistance was again provided by SEPA Field Chemistry.

SEPA Field Chemistry carried out ambient air analysis for SO_2 between April 2014 and January 2015. A continuous SO_2 analyser (using the EU reference method) was deployed, within Kirkwall, to measure concentrations in 15-minute intervals.

Throughout the monitoring period the majority of measurements were at the baseline with occasional increases in concentration. All concentrations were below the AQS value, except six measurements, between 07:00 and 08:15 on 21 September 2014. The SEPA brief in Appendix 2 attributed these SO_2 spikes to a grounding of the volcanic plume from the Holuhraun volcanic fissure near Bardarbunga, Iceland. This SO_2 plume has been observed to pass over Scotland, with these occasional incursions having been detected at various locations in the UK, via the Automatic Urban and Rural Network (AURN).

The results clearly indicate that there has been no significant change in SO_2 levels within Orkney since the last report in 2005 and are unlikely to ever exceed the air quality objectives set out by NAQS.

2.2.4 Benzene

As was reported in the 2014 Progress Report, between the months of January and October 2013 Monitoring of Benzene was undertaken via a network of diffusion tubes. Over 80 percent of the recorded values during 2013 were below the Limit of Detection (LOD) of 0.2ppb (0.65 µg/m3). It was also reported that the last two months of 2013 saw no monitoring results due to technical issues. Since this time there has been no further monitoring of benzene in Orkney. Given there have been no major changes in Orkney that would give rise to an increase in benzene levels within the County it can be concluded that benzene levels within Orkney are not likely to exceed the NAQS air quality objectives.

2.2.5 Other pollutants monitored

Orkney Islands Council does not monitor any other pollutants

2.2.6 Summary of Compliance with AQS Objectives

Orkney Islands Council has examined the results from monitoring in the County. Concentrations are all below the objectives, therefore there is no need to proceed to a Detailed Assessment.

3 Road Traffic Sources

3.1 Narrow Congested Streets with Residential Properties Close to the Kerb

Orkney Islands 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

Orkney Islands 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.

Even though Orkney's bus station is located in the centre of Kirkwall, due to the rural nature of the service and the number of buses on the roads along with low levels of HGV's it is considered that there are no roads that meet the criteria

Orkney Islands Council confirms that there are no new/newly identified roads with high flows of buses/HGVs.

3.4 Junctions

Orkney Islands 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

Orkney Islands Council confirms that there are no new/proposed roads that meet the criteria in Section A.5 of Box 5.3 in TG(09)

3.6 Roads with Significantly Changed Traffic Flows

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

3.7 Bus and Coach Stations

The main bus station in Orkney is in the main town of Kirkwall. Even though the bus station is situated in the centre of the town within 10 metres of relevant exposure, it is not considered a risk to the air quality in Orkney as there are less than 1500 bus movements in the bus station per week which does not meet the relevant criteria set out in Section A.7 of Box 5.3 of TG(09).

Orkney Islands Council confirms that there are no relevant bus stations in the Local Authority area.

4 Other Transport Sources

4.1 Airports

There is one airport within the local authority area. This is located approximately 2 miles from Kirkwall in the East Mainland. The surrounding country side is sparsely populated within 1000 metres of the airport, with Kirkwall being the closest densely populated area.

The airport is operated by Highlands and Islands Airports Ltd (HIAL). HIAL produce an annual report providing details of passenger numbers using Kirkwall Airport and the number of aircraft movements.

From the most recent published report in 2014, total aircraft movements for the year 2013-14 within the county amounted to 14,651 an increase of 2% since the last USA in 2012. Total passenger numbers for Kirkwall were 177,899 a 23% increase since the last USA in 2012. Total amount of freight for Kirkwall has not been reported, but is estimated that there has been no significant increase from the last report in 2012 which had been reported to be, equivalent to 1320 passengers (Box 5.4, Technical Guidance LAQM TG(09)). Therefore, for the purposes of this report, the total equivalent passenger numbers for the airport is 179,219 or 0.18 mppa.

As can be seen from the above, Orkney Islands Council is satisfied that the above data falls well below the levels specified within the Technical Guidance LAQM TG(09) and that it is not necessary to proceed to a detailed assessment for nitrogen dioxide.

4.2 Railways (Diesel and Steam Trains)

Orkney Islands Council confirms that there are no railways in the Local Authority area.

4.3 Ports (Shipping)

Orkney is an Island community which is reliant on shipping for transport, employment and tourism to name a few.

Because Orkney is made up of a number of islands there is a network of Ro-Ro ferry links between the islands, providing lifeline services to Orkney's population across these isles.

The largest of these ferries are those that link Orkney to mainland Scotland via either Aberdeen or Scrabster. For the purpose of this report, the Hamnavoe which sails between Stromness and Scrabster, is one of the three largest ferries that provides a service to mainland Scotland. The net weight of this boat is 2634 tonnes.

As a comparison a cross channel ferry (Ro-Ro) between Dover and Calais has a net weight of approximately 11,000 tonnes.

Orkney's three largest Ro-Ro ferries have combined movements of approximately 1420 per year, spread between the two harbours of Kirkwall (Hatston)and Stromness.

The other lifeline Ro-Ro ferries linking the different islands are considerably smaller with the busiest harbour being that of Kirkwall. Here ship movements equate to approximately 6000 per year.

The Orkney Islands Council is becoming an ever increasing destination for cruise ships sailing the North Atlantic. The majority of the cruise ships come into the Kirkwall Bay though not all dock and shuttle boats are used to bring tourists to and from the ship to shore. The total number of movements for cruise ships scheduled for 2015 is 176. This amounts to a 15% increase since the last USA in 2012.

There is one relevant receptor within 250 metres of Kirkwall harbour however considering the figures given above it is considered that the movements do not cause a significant risk to air quality.

There are a larger amount of relevant receptors within Stromness, however the movements there are negligible, over the course of the year.

Orkney's waters and in particular Scapa Flow, provide a sheltered environment for shipping. These waters are a source of commercial business for Orkney Islands Council harbours department, which attract large tankers using the flow in which to lay anchor in its sheltered waters. Scapa Flow also provides a sheltered environment for the activity of ship to ship transfers of oil. This commercial shipping generates important income for the Islands.

This activity within Scapa Flow will not increase the number of annual movements significantly as the tankers are at anchor for long periods. It is therefore envisaged that there will be no significant risk increase of SO_2 to Orkney's air quality.

The waters around Orkney fall within the Sulphur Emission Control Area comprising of the North Sea and English Channel region. From the 1st July 2010 shipping operating in these areas has to use fuel with a sulphur content of less than 1%.
In accordance with Section B.3 of Box 5.4 of TG(09), if the shipping is using fuel with a sulphur content of less than 1% then it is not necessary to take this assessment further.

Orkney Islands 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 New or Proposed Installations for which an Air Quality Assessment has been Carried Out

Orkney Islands 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.

5.1.2 Existing Installations where Emissions have Increased Substantially or New Relevant Exposure has been Introduced

Orkney Islands 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.

5.1.3 New or Significantly Changed Installations with No Previous Air Quality Assessment

Orkney Islands 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 no major fuel (petrol) storage depots within the Local Authority area.

5.3 Petrol Stations

Orkney Islands Council confirms that there are no petrol stations meeting the specified criteria**.**

5.4 Poultry Farms

Orkney Islands Council confirms that there are no poultry farms meeting the specified criteria.

6 Commercial and Domestic Sources

6.1 Biomass Combustion – Individual Installations

Orkney Islands Council confirms that there are no biomass combustion plant in the Local Authority area.

6.2 Biomass Combustion – Combined Impacts

Due to Orkney's rural nature there are a number of properties in and out with the towns that use domestic solid fuels. However the number of domestic biomass combustion installations are not known.

It is envisaged that the number of domestic biomass combustion installations will be low and likely to be in in low density or individual developments, and would not cause significant risk to PM_{10} levels in Orkney.

Other domestic solid fuel sources are present on a greater scale but considering the size of the towns in Orkney they are not considered a significant risk to the air quality of the county.

Orkney Islands 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

As has been stated previously in this report, the use of solid fuels is quite widespread through Orkney. However this is usually supplementary to rather than the primary source of heating. Therefore it is considered that there is no significant risk of SO_2 ever exceeding the NAQS objectives

Orkney Islands Council confirms that there are no areas of significant domestic fuel use in the Local Authority area.

7 Fugitive or Uncontrolled Sources

Orkney Islands 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

The recently acquired monitoring data that has been included in this report clearly shows that Orkney is currently meeting the 2010 air quality objectives. Comparing historic data against the current data clearly shows that pollutant levels have remained at a consistently low level with NO_2 levels having shown a year on year decrease and that there is no significant risk of Orkney exceeding the air quality objectives.

8.2 Conclusions from Assessment of Sources

Orkney is a rural Island community with a population that has remained fairly static in recent years. Because of this it is envisaged that emissions from road transport is unlikely to have a significant impact on the air quality in the county. Due to this conclusion it is felt that DMRB calculation for traffic in Orkney is not necessary due to the very low volumes, and it is unlikely that there will be a significant increase in the level of traffic on Orkney Roads. As well as traffic levels in Orkney remaining fairly constant over the years, as reported in the 2014 progress report Orkney has also seen a recent growth in electric car use, with Orkney Islands Council having approved a 'Orkney's Electric Vehicle Infrastructure Strategy' in October 2014 to encourage and increase this already growing usage. Although long term the aim of the strategy is to contribute to lowering CO_2 levels, the increase in the number of electric vehicles already seen in the county will continue to contribute to the lowering of NO_2 and particulate matter within the local authority area.

Ports and shipping remains an important sector within the local authority. Despite this it is envisaged that this sector does not pose a risk to the air quality objectives.

As has been mentioned previously the predominantly rural nature of Orkney, and due to the lack of large scale industrial processes, as it currently stands there is not a risk to the air quality objectives.

Solid fuel burning continues to be a source of heating in the community although usually as a secondary heating as the uptake of more environmentally heating systems such as air source heating is increases. Even if future developments of both residential and commercial solid fuel burning schemes are completed, it is unlikely that the domestic and commercial sources of solid fuel burning will pose a significant risk to air quality in the county.

From the report it can be said that Orkney is not at risk of exceeding any of the air quality objectives.

8.3 Proposed Actions

The Update and Screening Assessment has concluded that there is no need to proceed to a detailed assessment for any pollutant.

The current monitoring regime for NO_2 within Orkney will continue to ensure that the high standard of air quality in the county continues. At present the Orkney Islands Council have no intention of recommencing Benzene monitoring through a network of diffusion tubes as in previous years. This decision has been taken because previous results have for the majority been within the limits of detection. This decision will be addressed should there be any development within the county that raises potential issues for benzene.

However, the possibility of the continual increase seen in shipping activities within Orkney's water will continue to be monitored and the need for a change in the current air quality monitoring regime will be considered, to ensure the air quality of the county is not a detriment to this activity.

The next course of action for Orkney Island Council will be to submit the 2016 Progress Report.

9 References

Orkney Islands Council Update and Screening Assessment 2009

Orkney Islands Council Progress Report 2010

Orkney Islands Council Progress Report 2011

Orkney Islands Council Update and Screening Assessment 2012

Orkney Islands Council Progress Report 2013

Orkney Islands Council Progress Report 2014

Orkney Ambient Air Study, SEPA Report 2005

Orkney Islands Council Transportation section – Bus movements

Highland and Islands Airport Annual Report 2013-2014

Orkney Harbours Department Annual Performance Report 2013-2014

Orkney Ferries Timetables

Northlink Ferry Timetables

Health and Safety Executive website – Listing of Major Fuel Storage Depots.

Orkney Islands Council Environmental Health Department – Regarding Poultry.

Appendices

Appendix A: QA/QC Data

Appendix B: Orkney Sulphur Dioxide – brief summary

Appendix A: QA/QC Data

Diffusion Tube Bias Adjustment Factors

All diffusion tubes are analysed by Edinburgh Scientific Services.

A Bias Adjustment of 0.74 was used. This was taken from the National Diffusion Tube Bias Adjustment Spreadsheet (version June 2015)

Factor from Local Co-location Studies

There has been no co-location studies conducted in Orkney.

Discussion of Choice of Factor to Use

The national bias adjustment factor was used as there have been no local bias adjustment factors calculated through a co-location study.

PM Monitoring Adjustment

There has been no recent PM monitoring within Orkney

Short-term to Long-term Data adjustment

No adjustment is required for short term monitoring as all monitoring data is conducted on a monthly basis over the entire year.

QA/QC of automatic monitoring

There are no automatic monitoring sights in Orkney

QA/QC of diffusion tube monitoring

Bias and Precision taken from data supplied on R & A website.

Nitrogen Dioxide Results

Concentrations expressed in micrograms per cubic metre (ug/m^3)

2014													
Site / Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Average (with bias adjustment)
1 Kirkwall (control)	<1.0	<1.0	<1.0	<0.1	<1.0	1.1	<1.0	1.6	<1.0	1.5	<0.1	<1.0	
2 Kirkwall	14.8	12.4	11.2	14.4	17.5	17.4	15.9	16.5	16.8	17.4	17.5	15.5	11.6
3 Stromness	15.1	11.5	8.8	9.6	11.3	9.7	9.9	8.2	10.9	12.4	11.9	6.2	7.7
4 Herston	4.4	1.6	1.6	2.1	1.8	2.1	1.9	2.1	1.9	3.2	3.8	1.2	1.7
5 Waulkmill	4.0	2.6	2.0	2.1	2.2	2.8	2.0	3.0	2.2	5.2	5.3	1.0	2.1
6 St.Mary's	5.9	2.4	2.2	4.1	4.7	4.0	3.3	6.6	4.2	4.4	6.0	1.6	3.0

													Annual Average
Monthly Averages	8.8	6.1	5.2	6.5	7.5	7.2	6.6	7.3	7.2	8.5	8.9	5.1	7.1
Bias Adjustment (0.74 for Edinburgh Scientific Services):	6.5	4.5	3.8	4.8	5.6	5.3	4.9	5.4	5.3	6.3	6.6	3.8	5.2

Appendix B: Orkney Sulphur Dioxide – brief summary

To assist Orkney Island Council (OIC) in determining air quality, in the town of Kirkwall, SEPA Field Chemistry carried out ambient air analysis for SO_2 between 23/04/14 and 18/01/15. A continuous SO_2 analyser (using the EU reference method) was deployed, at a central location, to measure concentrations in 15-minute intervals. The maximum uncertainty in the measured values was 15%.

All of the weekly zero and span checks were passed but post-deployment ratification of the data has not been completed. The results of the weekly zero check should be 0 ± 4 ppb (0 ± 10.6 µg m^{-3}). Therefore, any measured value ≤ 4 ppb could be classed as undetectable. It was decided to set all values ≤ 4 ppb to 2 ppb (5.3 µg m^{-3}), as using a fraction of the lowest detectable value gives some information about the range in which the results may lie and produces a value that can be used in descriptive statistics.

Provisional 15-minute SO_2 data are compared with the Air Quality Standard (AQS) value in Figure 1. The majority of measurements were at the baseline, throughout the monitoring period, with occasional increases in concentration. All concentrations were below the AQS value, except six measurements, between 07:00 and 08:15 on 21/09/14. These SO_2 spikes represent a grounding of the volcanic plume from the Holuhraun volcanic fissure near Bardarbunga, Iceland.

The volcanic fissure began erupting on 31/08/14, emitting considerable amounts of SO_2 into the atmosphere. An estimated 35,000 tonnes SO_2 were emitted per day during the first six weeks of the eruption (http://en.vedur.is/pollution-and-radiation/volcanic-gas/measurements/) and is assumed to have continued at this level. This SO_2 plume has been observed to pass over Scotland. These occasional incursions have been detected at various locations in the UK, via the Automatic Urban and Rural Network (AURN). All the measurements above 50 µg m^{-3} (Figure 1) are likely due to volcanic SO_2 emissions but those not occurring on 21/09/14 still need to be confirmed.

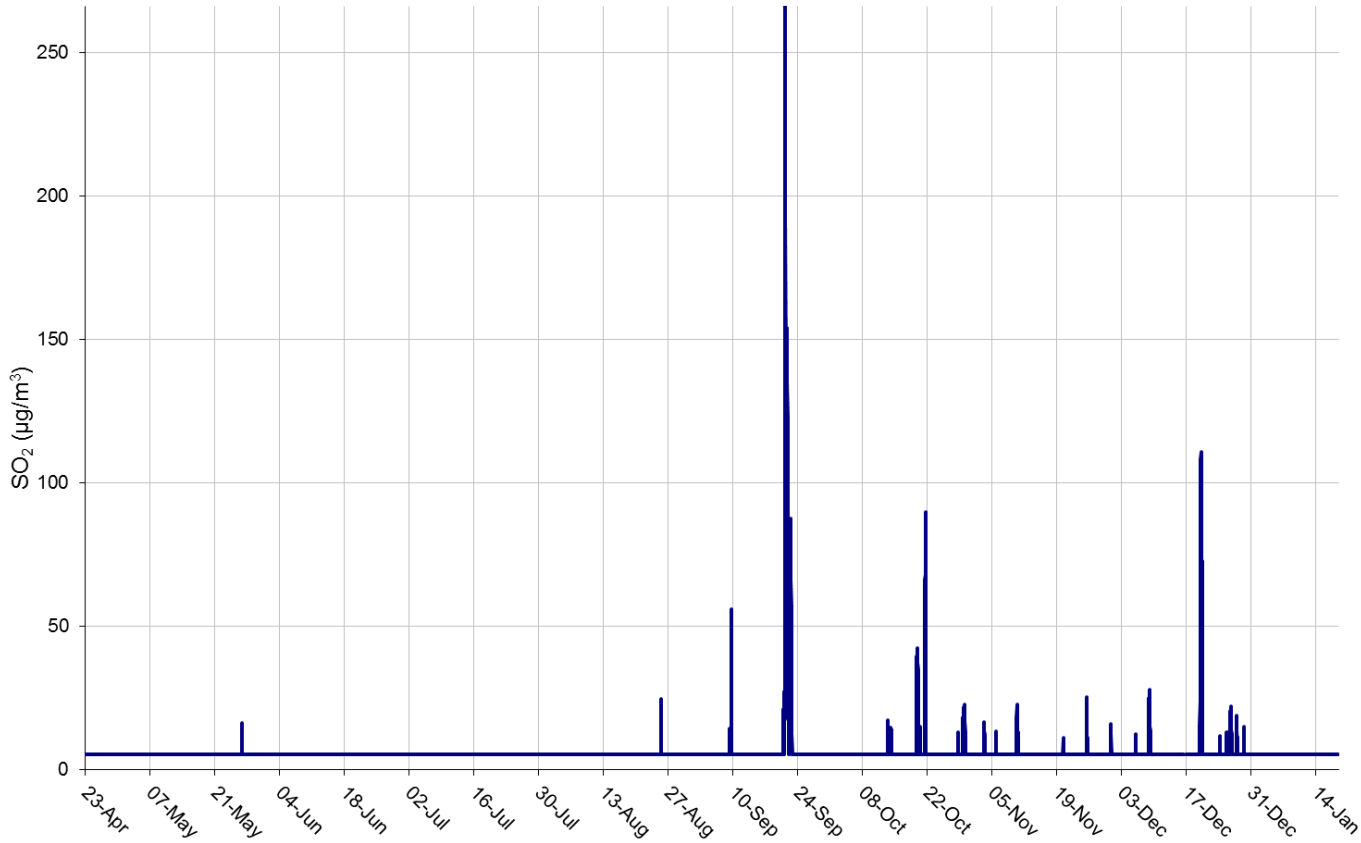

Figure 1 15-minute SO_2 data. The top of the scale is the AQS value of 266 µg m^{-3}.