

LOCAL AIR QUALITY MANAGEMENT GRANGEMOUTH AIR QUALITY MANAGEMENT AREA ACTION PLAN

Prepared by

BMT Cordah Limited

In Partnership with

Falkirk Council

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Falkirk Council



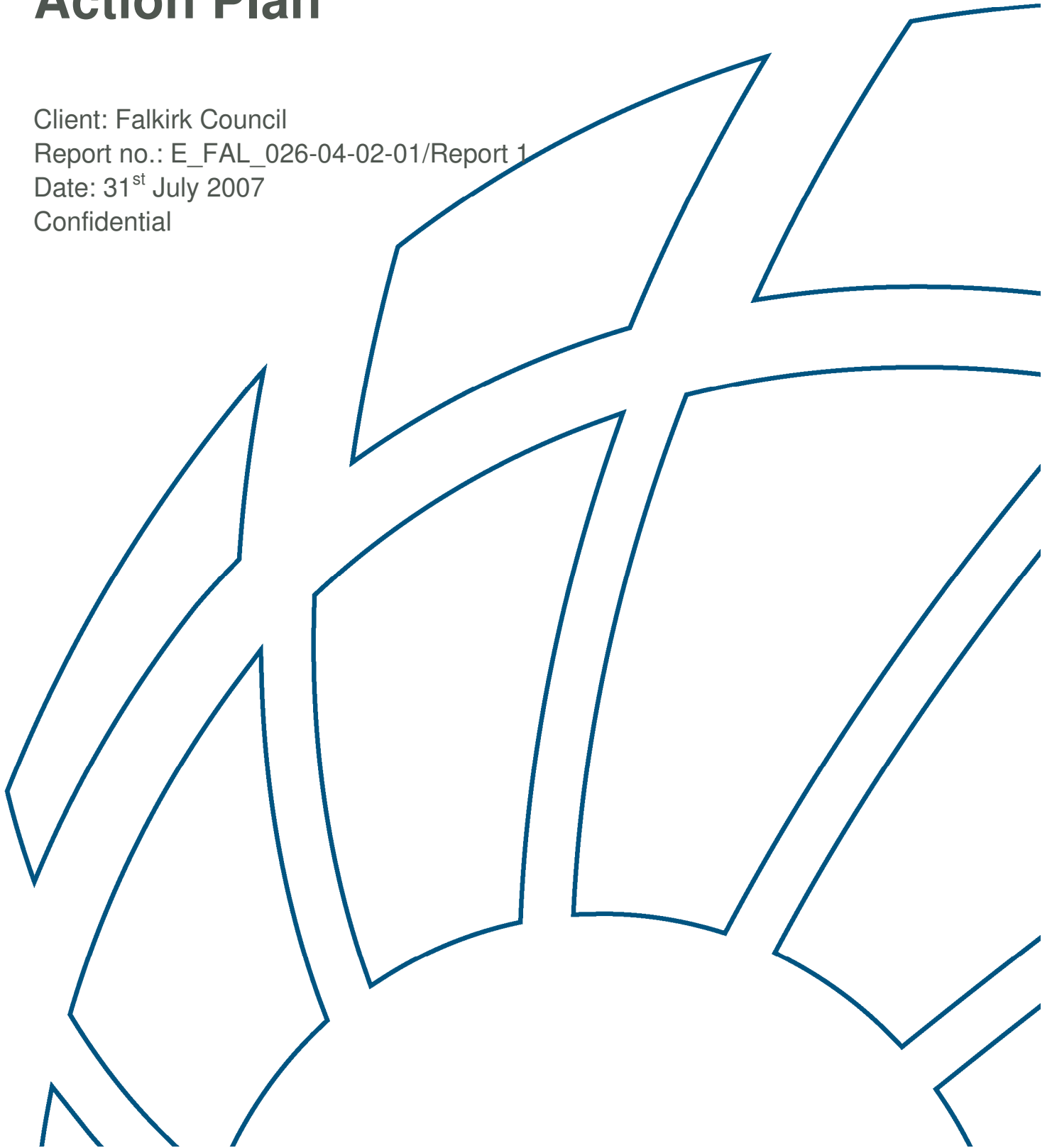
Local Air Quality Management Action Plan

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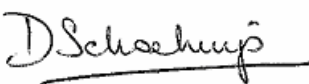
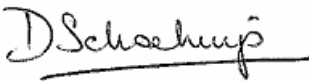
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	Name	Signature	Date
Author	Stuart McGowan		31/07/07
Reviewed by	Derek Schoehuys		31/07/07
Approved by	Derek Schoehuys		31/07/07

BMT Cordah Limited,
Pentlands Science Park,
Penicuik, Midlothian,
UK, EH26 0PZ.

Tel: +44(0)131 445 6120
Fax: +44(0)131 445 6110
Email: enquiries@bmtcordah.com
Website: www.bmtcordah.com

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1 INTRODUCTION

The National Air Quality Strategy (NAQS) sets out air quality standards and objectives for certain air pollutants. The Local Air Quality Management Review and Assessment process sets out a framework whereby each local authority is required to monitor and evaluate air quality in its area against the NAQS objectives. The relevant air quality objectives are presented in Table 1.

Table 1: Pollutant Objectives outlined in the NAQS

Pollutant	Air Quality Objective			Date to be achieved by
	Concentration	Measured as	Equivalent percentile	
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 (CO)	10 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 (NO ₂)	200 µg/m ³ not to be exceeded more than 18 times per year	1-hour mean	99.79 th percentile of 1-hour means	31/12/2005
	40 µg/m ³	annual mean	-	31/12/2005
Particulate (PM ₁₀)	50 µg/m ³ not to be exceeded more than 35 times a year	24-hour mean	90.4 th percentile of 24-hour-means	31/12/2004
	40 µg/m ³	annual mean	-	31/12/2004
	50 µg/m ³ not to be exceeded more than 7 times a year	24-hour mean	98 th percentile of 24-hour-means	31/12/2010
	18 µg/m ³	annual mean	-	31/12/2010
Sulphur dioxide (SO ₂)	125 µg/m ³ not to be exceeded more than 3 times a year	24-hour mean	99 th percentile of 24-hour means	31/12/2004
	350 µg/m ³ not to be exceeded more than 24 times a year	1-hour mean	99.7 th percentile of 1-hour means	31/12/2004
	266 µg/m ³ not to be exceeded more than 35 times a year	15-minute mean	99.9 th percentile of 15-minute means	31/12/2005

Where a local authority determines an exceedence or likely exceedence of a NAQS objective it is required to designate an Air Quality Management Area (AQMA) to encompass the area of identified exceedence and to develop an Action Plan of measures to improve air quality within the AQMA.

In 2005 Falkirk Council declared an Air Quality Management Area (AQMA) in response to measured exceedences of the 15-minute SO₂ objective in the areas surrounding the large industrial complex in Grangemouth. The extent of the AQMA is provided in Figure 1.

BMT Cordah has been commissioned by Falkirk Council to prepare a draft Action Plan of measures to improve air quality in the Grangemouth AQMA. The Action Plan has been developed following consultation with the Scottish Environment Protection Agency (SEPA).

2 BACKGROUND TO LAQM PROCESS IN THE FALKIRK COUNCIL AREA

Since the introduction of the Local Air Quality Management Review and Assessment process Falkirk Council has recognised the potential for poor air quality in the areas within and surrounding the large industrial area in Grangemouth. The industrial complex incorporates the BP oil terminal, the Ineos (formerly BP) petrochemical complex, Grangemouth Docks and several chemical manufacturing sites.

In order to accurately assess air quality in the Grangemouth area Falkirk Council installed an automatic air quality monitoring station in Grangemouth Municipal Chambers (GMC) in 1997. Following preliminary modelling studies of emissions from the various industrial sources within the Falkirk Council area, as well as sources in neighbouring areas, such as Longannet Power Station in Fife and Caberboard manufacturing site in the Stirling Council area, it was identified that it was necessary to supplement the GMC monitoring station to provide greater spatial coverage. Additional monitoring stations were located at Skinflats, Bo'ness and at Inchyra Park in Grangemouth. The Inchyra Park monitoring station was selected to be adjacent to the receptors closest to the petrochemical complex area.

The monitoring stations at both GMC and Inchyra Park recorded elevated SO₂ concentrations in excess of the 15-minute and 1-hour objectives for SO₂ in the period 1997-2000. A detailed emissions inventory was therefore compiled of SO₂ emission sources within the Grangemouth area and reported as part of the Stage 3 assessment conducted in the first round of the Review and Assessment process. The inventory identified the (then) BP petrochemical complex as having several SO₂ emission sources on site. BP Oil and Avecia were also identified as having SO₂ emission sources. Low level SO₂ emissions were identified from combustion processes on several other industrial sources in the Grangemouth area and from shipping in Grangemouth Docks. Longannet Power station in Fife was also identified as a source of SO₂ emissions with potential to contribute to ambient SO₂ concentrations in Grangemouth.

A detailed dispersion modelling study was undertaken of the emission sources identified within the emissions inventory. The modelling study predicted elevated SO₂ concentrations; however no exceedences of the NAQS objectives were predicted. The modelling studies predicted short term elevated concentrations in the Falkirk Council area attributable to emissions from Longannet Power Station under certain meteorological conditions. Similarly, under certain meteorological conditions, elevated concentrations were predicted attributable to emissions from the (then) BP petrochemical complex, particularly during instances of flaring.

Whilst the detailed dispersion modelling predicted elevated SO₂ concentrations, no exceedences of the NAQS 15-minute or 1-hour mean objectives were predicted. The modelling did not replicate the measured exceedences in either magnitude or area of occurrence. A possible reason is that the average emission rates obtained for industrial sources has led to the dispersion model predicting lower peak concentrations than might be predicted using actual time varying emissions. It is also considered that the complex meteorological conditions present in the Forth Valley are not fully replicated by the dispersion model. Uncertainties in the measurement of meteorological and SO₂ concentrations are also likely to lead to differences between the location and time at which the predicted peak concentrations and the measured peak concentrations occur.

In 2003, the second round of review and assessment commenced. The Updating and Screening Assessment (U&SA) re-evaluated the most recent monitoring data in accordance with the revised technical guidance. Based on the potential for exceedence of NAQS objectives for SO₂ it was considered necessary to undertake a Detailed Assessment of industrial emissions.

The Detailed Assessment comprised of an update of the previously compiled emissions inventory to account for new or changed emission sources. Emissions data were obtained from SEPA and from the industrial operators. A dispersion modelling assessment was undertaken based on the revised emissions data. The dispersion modelling assessment predicted potential exceedences of the 15-minute NAQS SO₂ objective. The exceedences of the objective were predicted during periods of flaring on the (then) BP petrochemical complex during certain convective meteorological conditions. The potential for exceedence of the 15-minute NAQS objective was determined to be dependant on periods of flaring and the meteorological conditions during these periods.

The Detailed Assessment was also forward looking and considered the likely emissions profile from the petrochemical complex in future years. As a result of new emissions control measures scheduled for the petrochemical complex in 2004-05, the number of instances of flaring was predicted to reduce. Modelling predictions undertaken based on the emissions following the adoption of the new emissions control measures indicated that there would be

a reduction in the number of exceedences of the 15-minute SO₂ objective. The Detailed Assessment therefore concluded that as future emissions (2005) were not predicted to result in a breach of the NAQS 15-minute objective it was unnecessary to declare an AQMA, although further monitoring and modelling should be undertaken.

Up to 2004 and the completion of the Detailed Assessment the number of measured exceedences of the 15-minute NAQS objective appeared to be reducing year on year. In the period following the completion of the Detailed Assessment a number of exceedences of the objective were measured. Analysis of the meteorological conditions at the time of the exceedences and discussions with Ineos (formerly BP) identified that some of the measured exceedences were directly attributable to events on the Ineos site. The source or sources of other measured exceedences could not be attributed. Following detailed discussions with SEPA and the Scottish Executive additional modelling work was undertaken.

A Supplementary Report was produced in November 2004 assessing further data and specific 15-minute SO₂ exceedence events for 2004. Modelling demonstrated that high ambient SO₂ concentrations could be caused locally by emissions from the Ineos Grangemouth complex, but measured exceedences could not solely be correlated to emissions from the complex.

Following discussions with SEPA and the Scottish Executive it was determined that an AQMA should be declared as a precautionary measure for the area covering residential properties within Grangemouth, due to historical exceedences of the 15-minute mean NAQS objective for SO₂.

2.1 Further Assessment

A Further Assessment of SO₂ concentrations in the AQMA was undertaken in 2006-07. The aim of the Further Assessment was to consider emissions in more detail such that the specific source or sources contributing to the measured exceedences could be identified such that the Action Plan could be targeted.

The Further Assessment included a more detailed inventory of emissions from the principal emission sources. Time varying emissions were obtained or approximated from Longannet Power station and from the Ineos petrochemical complex. Previous modelling studies had considered an annual average emission to predict ambient SO₂ concentrations. Fluctuations in the emission will have a particular effect where short term average ambient concentrations are being considered.

The effect of meteorological conditions on ambient concentrations was also identified as an important consideration in the Detailed Assessment. The Further Assessment therefore considered the effect of using meteorological data from various sources, including:

- Falkirk Council measured data from Grangemouth Municipal Chambers;
- Ineos measured data from within the petrochemical complex;
- UK Meteorological Office data from Turnhouse, Edinburgh; and
- Scottish Power measured data to the north of the River Forth.

Analysis of the meteorological data from each source identified significant variations in the meteorological conditions measured at each site. The dispersion modelling assessment therefore considered the effect of each meteorological dataset on predicted ambient concentrations.

Dispersion modelling was therefore undertaken using the time varying emissions profiles for each emission source and the different meteorological datasets. The dispersion modelling predictions within the Further Assessment indicated elevated SO₂ concentrations however it did not predict exceedence of NAQS objectives based on current emissions data. Statistical analyses of the modelling predictions in comparison to measured concentrations over the same time period indicate that modelling predictions were underestimating pollutant concentrations by between 10-15%.

When the model underestimation was accounted for the maximum predicted 15-minute and 1-hour mean SO₂ concentrations were above NAQS objective levels, however, the predicted number of exceedences were below that permitted.

Analysis of the highest predicted concentrations at the monitoring station was undertaken and it was identified that (allowing for the modelling method) emissions from Ineos contributed to over 80% of the predicted concentrations at Inchyra Park and over 90% at the Moray Place station. The contribution of other emission sources in the Grangemouth area was predicted to have an insignificant contribution to the highest predicted concentrations.

The Further Assessment therefore concluded that there is potential for exceedence of the 15-minute NAQS objective for SO₂ at sensitive receptor locations in Grangemouth resulting from emissions from the Ineos petrochemical complex depending on the frequency of occurrence of certain meteorological conditions. Exceedences of the objective have also been measured, however, when measured meteorological conditions are different to those predicted to cause exceedence of the NAQS objective. No explanation for these measured exceedences has been identified.

3 LOCAL AND NATIONAL POLICY DEVELOPMENTS

Simultaneous to the Review and Assessment process, there are other developments and processes ongoing that will affect both ambient SO₂ concentrations and the status of the AQMA. The developments include both national policy and local implementation of policy.

3.1 National Emissions Ceilings Directive and Large Combustion Plant Directive

The National Emissions Ceilings Directive places limits on national emissions of sulphur and nitrogen to atmosphere. In order to achieve the national limits the UK has prepared a national programme for reducing emissions from various sources, including industrial emissions. The emissions reduction programme will be implemented into national policy through emissions consents under IPPC authorisation.

The Large Combustion Plant Regulations (LCP) place emission limits for SO₂ on combustion plant with a net thermal output of at least 50MW. In order to comply with LCP regulations Scottish Power are scheduled to install desulphurisation plant at Longannet Power Station. The plant will reduce sulphur emissions from the plant and as such will reduce any potential impact to ambient air quality within the Falkirk Council area.

Similarly, emissions from combustion plant on the Ineos site will be regulated taking account of the LCP regulations.

3.2 Ineos PPC permit application

Ineos lodged an application with SEPA in 2006 for a permit to operate under the IPPC regulations. The PPC permit application was accompanied by an assessment of the environmental impacts of the site and an appraisal of techniques to control the environmental impact.

The PPC permit application includes an assessment of the air quality impacts determined by atmospheric dispersion modelling. The dispersion modelling study undertaken by Ineos predicted exceedences of both the 15-minute and 1-hour mean SO₂ objectives in the vicinity of the site. The dispersion modelling study also included for future emissions and also predicted exceedences of both the 15-minute and 1-hour mean NAQS objectives.

No information is available to directly compare the Ineos dispersion modelling study and that undertaken for the Further Assessment, however, based on the magnitude of the predicted SO₂ concentrations it is considered that the Ineos model has over-predicted SO₂ concentrations in comparison to measured concentrations.

The Ineos PPC application concludes that exceedences of NAQS objectives for SO₂ are probable. At the time of writing the application was still being determined by SEPA and as such the evaluation of air quality effects was not yet completed.

The PPC application will be determined by SEPA based on the data provided on emission controls and ambient impacts.

3.3 Ineos site sulphur reduction plan

In 2004 discussions between Falkirk Council and (then) BP identified a sulphur reduction plan for the petrochemical complex. Planned measures included:

- recommissioning of the FCCU and installation of a new sulphur recovery unit (SRU), leading to a slight increase in SO₂ emissions, whilst reducing episodes of flaring and increasing the reliability and availability of this equipment;
- elimination of dual firing of fuel oil and fuel gas in the power station by Dec 2003 reducing SO₂ emissions;
- reformation of the CRU fired heater leading to a reduction in SO₂ emissions;
- a sulphur recovery facilities study to be sanctioned in 2004/5;
- a review of fuel used for non-routine operations; and
- modification of burners to be implemented during planned outages in 2006/7.

In discussions with Ineos in 2007 it was identified that the sulphur reduction plan was not a formal plan but rather a number of process improvements which would facilitate a reduction in sulphur emissions. Information on the progress of the measures or other process improvements adopted since 2004 was not available.

An important facet of sulphur reduction by Ineos has not been achieved through the introduction of new plant or processes. Where possible, Ineos purchase feedstock with low sulphur content. This purchasing policy has a direct effect on reducing sulphur emissions but also has an effect on operational costs.

Ineos has identified the potential for SO₂ emissions to rise in the immediate future. These predictions are based on:

- national pressure to reduce the sulphur content in the fuels produced by Ineos leading to an increase in sulphur removal; and
- new feed streams such as the Buzzard field having higher sulphur content.

Ineos anticipate that the increase in sulphur emissions will be temporary and a reduction in emissions will be achieved over the longer term.

4 PROPOSED ACTION PLAN MEASURES

Falkirk Council has no regulatory control over emissions from the Ineos petrochemical complex or from other industrial sources in the Grangemouth area. Regulatory control lies with SEPA. The Action Plan measures proposed by Falkirk Council are therefore those within the control of the Council and as such are focussed on measures to facilitate the process of improving air quality rather than identifying of any direct measures to reduce SO₂ concentrations.

Action Plan Measure 1

Regulation and control of emissions from the Ineos and other industrial operators in the Grangemouth area is the responsibility of SEPA. The Integrated Pollution Prevention and Control (IPPC) regulatory regime requires that SEPA ensure that industrial operators adopt Best Available Techniques (BAT) to minimise emissions from regulated sites. The likelihood of adverse effects to human health resulting from any emissions from an industrial site will advise on the extent to which industrial operators should go to achieve BAT.

Falkirk Council will therefore seek to provide SEPA with sufficient information on ambient measured SO₂ concentrations (and other pollutant concentrations) to allow SEPA to adequately regulate emissions from industrial operators. Falkirk Council has developed an air quality website to which SEPA will have a privileged level of access through password control. The website will provide access to measured pollutant concentrations at each of the Falkirk Council monitoring sites and will allow access to historical data. It is hoped that the website will be fully operational by January 2008.

Action Plan Measure 2

The Review and Assessment process places a statutory responsibility on Falkirk Council to seek to improve air quality in its area where an exceedence of an air quality objective is identified. As Falkirk Council has no direct control over emissions from industrial sites the Council is reliant on SEPA to help it achieve its statutory obligation.

It is proposed that a formal working group is setup comprising officers from both SEPA and Falkirk Council. The working group will meet on a regular basis (bi-annually) to monitor air quality issues within the AQMA. Where appropriate, the working group can also meet on an ad-hoc basis. In particular, the working group should evaluate any measured pollution episodes or changes to plant, processes or emission profiles from industrial sites in the Grangemouth area. The working group would co-opt additional external members where

required, e.g. industrial representatives. It is anticipated that Falkirk Council will assume the Chair and secretarial function of the working group.

It is anticipated that the preliminary meeting of the Working Group will be scheduled for September/October 2007.

Action Plan Measure 3

Historically, in the event of a pollution episode or measured exceedence of an NAQS objective at a monitoring station in Grangemouth, Falkirk Council officers have made contact with Ineos to notify them of the event and to ascertain any reason(s) for the high SO₂ concentrations. This approach has worked well in the past with the reasons for some episodes identified due to known events on the Ineos site, however in the case of other episodes no reasons have been identified. It may be that the source of the episode is unconnected to the Ineos site or may be that a short term fluctuation in emissions could not be identified retrospectively.

Falkirk Council therefore proposes to introduce a system whereby in the event of elevated SO₂ concentrations being measured at one of the Grangemouth monitoring stations a text alert message will be sent to the mobile phones of persons on a discrete contact list. The contact list will be determined by the working group, however it is suggested that the contact list will include Falkirk Council officers, relevant officers at SEPA and relevant shift managers on the Ineos site. The threshold over which a text alert message would be triggered has yet to be identified; it is proposed that this is agreed by the Working Group.

SEPA has analysed monitoring data for 2007 and it has concluded that an automatic text message should be transmitted out as soon as the concentration of sulphur dioxide exceed 70 ppb at any of the Council's monitoring stations.

It should be noted that the proposed alert system is not intended to disrupt processes on the Ineos site, rather the system is intended such that in the event of a measured exceedence operators on the Ineos site can identify potential causes for the increase in localised concentrations of sulphur dioxide. It is also proposed that a formal monitoring system be introduced whereby any events on the Ineos site are recorded following receipt of an alert message. The circumstances of the event, along with the meteorological conditions at the time of the measured elevated concentration will then be evaluated by the next meeting of the Working Group.

It is recognised that Falkirk Council will be reliant on the goodwill of Ineos to assist with the proposed Action Plan measure or will require SEPA to enforce the system via the monitoring requirements of the site's PPC permit.

The alert system is currently in operation and used by Falkirk Council officers. The system can be rolled out for use by Ineos staff or SEPA officers where requested.

Action Plan Measure 4

The trend in measured concentrations and the inability of the modelling studies to replicate the measured concentrations means that the spatial extent of elevated SO₂ concentrations is not fully understood.

Falkirk Council proposes to introduce additional monitoring within the AQMA including the new automatic monitoring station at Moray Primary School in Grangemouth. Data from all new monitoring stations will be made available through the proposed website and message alert system.

A review of the monitoring network will be undertaken in September 2007 and any new monitoring stations proposed within the AQMA will be in place by January 2008.

5 MONITORING AND EVALUATION OF ACTION PLAN

The Council will continue to monitor air quality within the AQMA and pollution episodes will be evaluated through the proposed Working Group. The Working Group will also track and evaluate any changes to plant, processes or emissions profiles at industrial sites within the AQMA. The success of the alert system will be gauged by the Working Group and any trends identified used to inform the evaluation of sources on the Ineos site.

The ambient air quality will be monitored on an ongoing basis, however, changes in air quality can only be accurately determined over an extended period as weather and other factors can lead to inter-annual variation in pollutant concentrations.

The individual measures contained within the Action Plan will be monitored on an annual basis and the progress evaluated and reported in the relevant annual LAQM reports.

It is intended that the Action Plan will be an evolutionary process which will develop as national policies and plans and regulation of industrial sites by SEPA change or are introduced. The Action Plan will be reviewed on an annual basis and new measures introduced where appropriate.