GOVERNMENT NOTICES

DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM

No. 1241 **21 November 2008**

NOTICE OF INTENTION TO ESTABLISH THE VAAL TRIANGLE AIR-SHED PRIORITY AREA AIR QUALITY MANAGEMENT PLAN IN TERMS OF SECTION 19(1) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT, 2004 (ACT NO. 39 OF 2004)

I, Marthinus Christoffel Johannes Van Schalkwyk, Minister of Environmental Affairs and Tourism, in terms of section 19(1) of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004), hereby publish, for public comments, the draft Vaal Triangle Air-shed Priority Area Air Quality Management Plan. The executive summary of the draft Air Quality Management Plan is set out in the Schedule hereto.

Copies of the draft Air Quality Management Plan can be obtained from:

1. Ms Agnes Phahlane
   Department of Environmental Affairs and Tourism
   Fedsure Building
   315 Pretorius Street
   Pretoria, 0001
   Tel: (012) 310 3730
   Fax: (012) 320 1167
   E-mail: aphahlane@deat.gov.za

2. Project website: www.deat.gov.za/vaal

Interested persons are requested to submit written representations on, or objections to, the draft Vaal Priority Airshed Priority Area Air Quality Management Plan to the Minister within thirty (30) days from the publication of this notice. All representations or comments must be submitted in writing to the Director-General: Environmental Affairs and Tourism:

By post to: The Director-General: Environmental Affairs and Tourism
Attention: Ms Mathabo Phoshoko
Private Bag X447
Pretoria, 0001

By fax to: (012) 320-1167, and by e-mail to mphoshoko@deat.gov.za

Any questions in connection with the draft Vaal Triangle Airshed Priority Area Air Quality Management Plan may be directed to Ms Kelebogile Moroka at (012) 310-3436 or Ms Mathabo Phoshoko at (012) 310-3365

Marthinus van Schalkwyk

MARTHINUS VAN SCHALKWYK, MP
MINISTER OF ENVIRONMENTAL AFFAIRS AND TOURISM

environment
& tourism

Department:
Environment Affairs and Tourism
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOURISM

Environmental Quality and Protection

Chief Directorate: Air Quality Management and Climate Change

EXECUTIVE SUMMARY OF THE VAAL TRIANGLE AIRSHED PRIORITY AREA AIR QUALITY MANAGEMENT PLAN

November 2008

Airshed Planning Professionals (Pty) Ltd

GONDWANA ENVIRONMENTAL SOLUTIONS

ZITHOLELE CONSULTING

REPORT AUTHORS

Hanlie Liebenberg-Enslin	-	Airshed Planning Professionals (Pty) Ltd
Renee Thomas	-	Airshed Planning Professionals (Pty) Ltd
Nicola Walton	-	Gondwana Environmental Solutions (Pty) Ltd
Martin van Nierop	-	Gondwana Environmental Solutions (Pty) Ltd

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

Airshed	Airshed Planning Professionals (Pty) Ltd
AEL	Atmospheric Emissions License
APCD	Air Pollution Control Directorate
APCO	Air Pollution Control Officer
APPA	The Atmospheric Pollution Prevention Act (Act No.45 of 1965)
AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
AQM	Air Quality Management
AQMP	Air Quality Management Plan
AQO	Air Quality Objectives
BACT	Best Available Control Technology
BAT	Best Available Technology
BNM	Basa Njenjo Magogo
CAPCO	Chief Air Pollution Control Officer
CH_4	Methane
CO	Carbon Monoxide
CO_2	Carbon Dioxide
COJ	City of Johannesburg

Danida	Danish International Development Agency
DEAT	The Department of Environmental Affairs and Tourism.
DME	The Department of Minerals and Energy
EC	The European Community
EIP	Environmental Implementation Plan
EMP	Environmental Management Plan
GES	Gondwana Environmental Solutions (Pty) Ltd
GDACE	Gauteng Department of Agriculture, Conservation and Environment
HC	Hydrocarbons
H_2S	Hydrogen Sulphide
IDP	Integrated Development Plan
LFA	Logical Framework Approach
mg	Milligram
mg/Nm³	Milligram per Normalised cubic metres
NATIS	National Traffic Information System
NILU	Norwegian Institute for Air Research
NO_x	Nitrogen Oxides
NO	Nitrous Oxide
NO_2	Nitrogen Dioxide
N_2O	Nitrogen Oxide
NORAD	Norwegian Agency for Development Cooperation
NMVOC	Non Methane Volatile Organic Compounds
O_3	Ozone
Pb	Lead
ppb	Parts Per Billion
ppm	Parts Per Million
$PM_{2.5}$	Particulate Matter with an aerodynamic diameter of less than 2.5μm
PM_{10}	Particulate Matter with an aerodynamic diameter of less than 10μm
ROM	Run of Mine
SAAQIS	South African Air Quality Information System
SABS	South African Bureau of Standards
SANS	South African National Standards
SAPIA	South African Petroleum Industry Association
SAWS	South African Weather Service
SDM	Sedibeng District Municipality
SOE	State of Environment
SO_2	Sulphur Dioxide
TSP	Total Suspended Particulates
μ	Micron
μg	Microgram
μg/m³	Microgram per cubic metres
US-EPA	United States Environmental Protection Agency
VKT	Vehicle Kilometre Travelled
VOC	Volatile Organic Compounds
VTAPA	Vaal Triangle Airshed Priority Area
WBG	The World Bank Group
WHO	The World Health Organisation

GLOSSARY

According to the National Environmental Management: Air Quality Act (Act No. 39 of 2004) (AQA), the following definitions apply:

"**air pollution**" means any change in the composition of the air caused by smoke, soot, dust (including fly ash), cinders, solid particles of any kind, gases, fumes, aerosols and odorous substances.

"**ambient air**" is defined as any area not regulated by the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

"atmospheric emission" or **"emission"** means any emission or entrainment process emanating from a point, non-point or mobile source that results in air pollution.

"greenhouse gas" means gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation and includes carbon dioxide, methane and nitrous oxide.

"Department" means the Department of Environmental Affairs and Tourism.

"mobile source" means a single identifiable source of atmospheric emission which does not emanate from a fixed location;

"municipality" means a municipality established in terms of the Local Government: Municipal Structures Act, 1998 (Act No. 117 of 1998);

"national framework" means the framework established in terms of section 7(1);

"non-point source" means a source of atmospheric emissions which cannot be identified as having emanated from a single identifiable source or fixed location, and includes veld, forest and open fires, mining activities, agricultural activities and stockpiles;

"point source" means a single identifiable source and fixed location of atmospheric emission, and includes smoke stacks and residential chimneys;

"pollution" has the meaning assigned to it in section 1 of the National Environmental Management Act;

"priority area" means an area declared as such in terms of section 18;

"priority area air quality management plan" means a plan referred to in section19.

1 INTRODUCTION

The declaration of the Vaal Triangle Airshed as a priority area was published in the Government Gazette in terms of Section 18(1) of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) under Notice No. 365 of 21 April 2006, as amended by Notice 711 of 17 August 2007. The Vaal Triangle Airshed Priority Area (VTAPA) is the first priority area in South Africa and was declared such due to the concern of elevated pollutant concentrations within the area, specifically particulates. The geographical location of the area is provided in Figure 1.

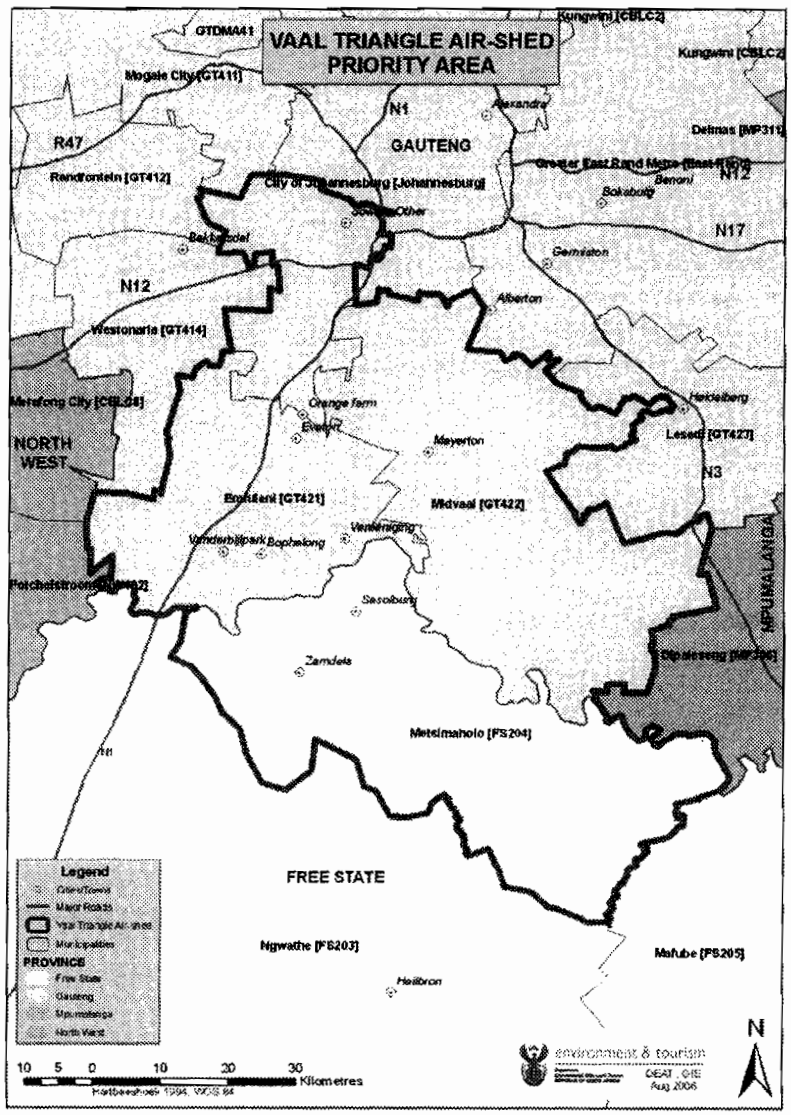

Figure 1: Demarcation of the Vaal Triangle Airshed Priority Area

The Vaal Triangle is a highly industrialised area housing numerous industries, a coal fired power station, and various smaller industrial and commercial activities in addition to a few collieries and quarries giving rise to noxious and offensive gasses. The Vaal Triangle is also home to a number of large informal settlements mainly

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using coal and wood as fuel source. This in return impacts directly on the health and well being of the people residing there. Other sources of concern contributing to the pollution mixture within the area include vehicle tailpipe emissions, biomass burning, water treatment works and landfill areas, agricultural activities and various other fugitive sources.

Air quality management is primarily the minimisation, management and prevention of air pollution, which aims to improve areas with poor air quality and maintain good air quality throughout. The complex nature of air quality issues within the VTAPA required the adoption of a holistic approach to air quality management in the area. This approach was followed during the development of the VTAPA AQMP.

As part of the requirements for priority areas according to the National Environmental Management: Air Quality Act, 2004 (AQA) an AQMP needs to be developed for the area within a giving timeframe. A consulting team comprising of Airshed Planning Professionals, Gondwana Environmental and Zitholele Consulting was appointed by the Department of Environmental Affairs and Tourism (DEAT) to assist in the compilation of an AQMP for the VTAPA. Another objective of the project was to capacitate the local authorities who will be responsible for air quality management under AQA.

*The **main objective** was the development of an Air Quality Management Plan for the Vaal Triangle Airshed Priority Area in accordance with the provisions of the National Environmental Management: Air Quality Act, 2004. This Plan is to ensure that once implemented, the air quality of the area will effectively and efficiently be brought into sustainable compliance with ambient air quality standards within agreed timeframes.*

In order to meet these objectives, immediate goals included:

(a) The development of participation forums to ensure inter-governmental communication (Air Quality Officer's Forum) and interaction but also close cooperation with the key stakeholders (Multi-Stakeholder Reference Group) in the Vaal Triangle.
(b) The planning objective which entails the methodology and scope of developing and implementing a priority area air quality management plan.
(c) Capacity development to ensure that the various spheres of government (viz. National Government, Provincial Government and District and Local Municipalities) are empowered to implement and maintain the AQMP for the priority area.

The immediate project objectives and related outputs are summarised in Table 1.

Reference was made to international and local air quality practices to ensure the plan forms an integral and practical system that will meet the objectives as defined in Table 1. Local municipalities that have developed AQMPs to date include the City of Johannesburg (partly falling within the VTAPA), the City of Tshwane, Ekhuruleni Metropolitan Municipality (bordering the VTAPA), Rustenburg Local Municipality, the City of Cape Town, eThekwini Metropolitan Municipality and Capricorn District Municipality. The plans developed by the City of Johannesburg, the City of Cape Town and eThekwini Metropolitan Municipality (based on the Durban South Multipoint Plan) were described in more detail. In addition, various cities across the world (ranging from developed to developing countries) were investigated and information provided on their air quality management practices, strategies and progress made to date.

Table 1: Summary of immediate objectives, outputs, verifiable indicators and means of verification.

Immediate Objective	Output	Verifiable Indicator	Means of Verification
A. The Participation Objective	A.1. Efficient and effective intergovernmental coordination and cooperation	Efficient and effective intergovernmental coordination and cooperation.	Meeting Minutes.
	A.2. Efficient and effective public participation	Efficient and effective public participation.	Meeting Minutes and stakeholder feedback.
	A.3. Project website	A project webpage containing current and relevant information relating to the project as available through the department's website.	Stakeholder feedback and webpage hits.
	A.4. Public outreach events and workshops	Well organised public events ensure broad-based public participation.	Event report and feedback.
B. The Planning Objective	B.1. Process Plan	A clear and unambiguous plan on how Output B is to be generated.	Implementation of the process plan results in the desired outcome.
	B.2. Problem Analysis	The causes of current and, potential, future poor air quality in the area are clearly defined and described.	The efficiency of the plan is ensured through interventions that deal with the real causes of poor air quality in the area.
	B.3. Strategy Analysis	All possible pollution mitigation strategies are described and reviewed.	The plan is directed by practical strategies that ensure a high probability for success.
	B.4. Intervention Descriptions	Interventions are clearly described that, once implemented, will have a measurable positive impact on ambient air quality in the area.	The plan describes interventions that ensure a high probability for success.
	B.5. Draft Priority Area Air Quality Management Plan	A draft plan based on current, accurate and relevant information, informed by best practice in the field of air quality management and that provides a clear and practical plan to efficiently and effectively bring air quality in the area into sustainable compliance with national ambient air quality standards within agreed timeframes.	Draft plan published in the *Gazette* for public comment.
	B.6. Priority Area Air Quality Management Plan	A plan based on current, accurate and relevant information, informed by best practice in the field of air quality management and that provides a clear and practical plan to efficiently and effectively bring air quality in the area into sustainable compliance with national ambient air quality standards within agreed timeframes.	Plan published in the *Gazette*.
C. The Capacity Development Objective	C.1. Implementation Manual	Implementation Manual for Air Quality Management in Priority Areas.	Published manual.
	C.2. National Priority Area Management Capacity	Active involvement of departmental staff in the implementation of the project.	Staff able to efficiently and effectively manage future priority areas.
	C.3. Implementation Initiated	Assistance provided in the initial plan implementation phase.	Implementation successfully launched.

STAATSKOERANT, 21 NOVEMBER 2008 No. 31615 11

1.1 Policy and Regulatory Requirements

The AQA makes provision for the setting of ambient air quality standards and emission limits on National level, which provides the means of evaluating air quality. In addition, the AQA requires the development of a National Framework (published under Notice No. 30284 of 11 September 2007) which provides national norms and standards for air quality management, ensuring compliance be achieved with ambient air quality standards and emissions limits.

National, Provincial and Local authorities (District and Metropolitan Municipalities) will be responsible to manage air quality under the National Environmental Management: Air Quality Act, 2004.

Section 15 of the Act requires that each national department or province responsible for preparing an environmental implementation plan (EIP) or environmental management plan (EMP) in terms of Chapter 3 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) include in that plan an air quality management plan (AQMP). Each municipality must include in its integrated development plan (IDP) contemplated in Chapter 5 of the Municipal Systems Act, an air quality management plan. An AQMP must achieve the following: (i) improve air quality; (ii) reduce negative impacts on human health and the environment; (iii) address the effects of fossil fuels in residential applications; (iv) address the effects of emissions from industrial sources; (v) address effects from emissions from any point or non-point sources of air pollution; (vi) implement the republic's obligations in respect of international agreements; and, (vii) give effect to best practice in air quality management. AQA also provides for regulations to be made for implementing and enforcing approved priority area AQMPs, which may include, amongst others: (i) funding arrangements; (ii) measures to facilitate compliance with such plans; (iii) penalties for any contravention of any failure to comply with such plans; and (iv) regular review of such plans. The approved AQMP for a priority area must be published in the Gazette within 90 days of approval.

AQA has delineated the responsibility of air quality management between the various spheres of government (i.e. National, Provincial and Local Authorities). This includes responsibilities such as air quality monitoring, emissions monitoring, development of AQMPs, collaboration with National and Provincial government and issuing atmospheric emissions licenses for all listed activities. In order to fulfil these functions Local authorities will have to appoint a dedicated Air Quality Officer. Provincial authorities will be responsible for similar functions as would national government. On national level however the focus is more on policy making and regulations.

DEAT has embarked on various projects to roll out the AQA. These projects include amongst others the Durban South Multipoint Plan, NEDLAC Dirty Fuel Air Quality Study, SO_2 ambient standard setting initiative, the SABS standard setting approach, the Danida support NAQMP Phase II and IIB Projects, the APPA Registration Certificate Review Project, National Framework for Air Quality Management, Listed Activities and Minimum Emissions Standard Setting Project, and DEAT Ambient Air Quality Monitoring Project.

1.2 Ambient Air Quality Standards for the Vaal Triangle Airshed Priority Area

Air quality limits and thresholds are fundamental to effective air quality management, providing the indicators to safe exposure levels for the majority of the population. Health based ambient standards have been developed for criteria pollutants internationally and locally. The current South African standards have been revised and were published for comment under Notice No. 528 on 9 June 2006. The newly proposed standards include particulate matter specifically PM_{10} (particulates with a diameter of less than 10 micrometer), sulphur dioxide (SO_2), oxides of nitrogen (NO_x), ozone (O_3), lead, carbon monoxide (CO) and benzene. These revised standards have been adopted as the VTAPA air quality objectives (Table 2). The revised National Ambient Air Quality Standards are undergoing the Standard Setting process and will be published with allowable frequency of exceedances linked to it and compliance timelines provided.

Table 2: Ambient Air Quality Standards for Common Pollutants as adopted to be the Air Quality Objectives for the Vaal Triangle Airshed Priority Area.

Substance	10-minute maximum ($\mu g/m^3$)	1-hour maximum ($\mu g/m^3$)	8-hour maximum ($\mu g/m^3$)	24-hour maximum ($\mu g/m^3$)	Annual average ($\mu g/m^3$)
Sulphur dioxide (SO_2)	500	350	-	125	50
Nitrogen dioxide (NO_2)	-	200	-	-	40
Carbon Monoxide (CO)	-	30 000	10 000	-	-
Particulate Matter (PM_{10})	-	-	-	75	40
Ozone (O_3)	-	200	120	-	-
Lead (Pb)	-	-	-	-	0.5
Benzene (C_6H_6)	-	-	-	-	5

2 VAAL TRIANGLE AIRSHED PRIORITY AREA AIR QUALITY SITUATION ASSESSMENT

The demarcation of the VTAPA includes two district municipalities and one metropolitan municipality namely Sedibeng District Municipality (Gauteng Province), Fezile Dabi District Municipality (Free State Province) and the City of Johannesburg Metropolitan Municipality (Gauteng Province). The Local municipalities include Emfuleni Local Municipality and Midvaal Local Municipality in Sedibeng, Administrative Regions 6 (Doornkop/Soweto); 10 (Diepkloof/Meadowlands), and 11 (Ennerdale/Orange Farm) within the City of Johannesburg; and the Metsimaholo Local Municipality (Northern Free State) (Figure 1). The priority area covers approximately 3,600 km^2 and houses a population of ~2,532,362 (based on the 2001 Census) with the highest population density falling within Soweto and Emfuleni Local Municipality.

2.1 Dispersion potential and ambient air quality of the Vaal Triangle Airshed

The dispersion potential varies spatially due to the extent and topography of the priority area. Surface meteorological data was obtained from weather stations owned and operated by (i) the South African Weather Services (at Vereeniging, OR Tambo Airport and Springs), (ii) industry (Sasol, ArcelorMittal and Eskom) and (iii) the City of Johannesburg (Jabavu and Orange Farm). No upper air meteorological data is recorded within the VTAPA and use was made of the South African Weather Services ETA data model results.

The spatial and annual variability in the wind field was evident in the wind roses presented. Stations located in the northeast of the priority area reflected predominant northerly winds associated with generally strong airflow. Stations in the east indicated more frequent easterly winds associated with low wind velocities. Towards the north-central parts of VTAPA, the wind flow was characterised by strong winds from the northwest to west-southwest. Around the Sasolburg area northwesterly, easterly and northeasterly winds were prevailing with northeasterly and west-southwestly winds dominating at the ArcelorMittal Vanderbijlpark Steel stations.

2.2 Ambient Air Quality of the VTAPA

2.2.1 Ambient Monitored Air Quality Data

Ambient monitoring data were obtained from various monitoring stations within the area for the period 2004 to 2006. In the analysis and presentation of the monitoring data, reference was made to the VTAPA ambient air quality targets (also proposed South African Standards) and City of Johannesburg air quality guidelines.

Ambient monitored data were obtained from the Jabavu (Soweto) and Orange Farm stations (City of Johannesburg) measuring ambient concentrations of PM_{10} and SO_2 since mid-2004. Data from the Sedibeng District Municipality stations in Meyerton (Midvaal Local Municipality) and Vanderbijlpark (Emfuleni Local Municipality) measuring NO_2, SO_2, O_3, CO (at both) and NO, NO_x, PM_{10} at Meyerton and benzene, toluene and xylene at Vanderbijlpark were not used due to poor data availability and quality. Ambient monitoring data from industrial sites included the Eskom Makalu station (decommissioned end of 2004), the five Sasol Stations and three ArcelorMittal Stations. The six DEAT stations that were commissioned between February and March 2007 had very limited data available at the time of the study and were omitted from the baseline assessment.

2.2.2 Predicted Ambient Air Quality Data within the Vaal Triangle

In addition to the ambient monitored data, use was made of dispersion modelling to determine the spatial extend of the ambient concentrations within the VTAPA. This primarily served the function to establish "hot spot" zones or focus areas. The US.EPA approved CALMET/CALPUFF suite of models was used for the dispersion simulations.

A first level emissions inventory for the VTAPA was compiled based on information received through questionnaires, EIA reports and other public documents, and the NEDLAC Dirty Fuels study (Scorgie *et.al.*, 2004). Criteria pollutants formed the focus of the impact assessment, with emissions of PM_{10}, SO_2 and NO_x accounted for. Of all the identified sources, 88% provided emissions data with 12% of the source emissions not accounted for. Domestic fuel burning emissions were based on 2001 Census data for household coal, wood and paraffin use and only national and regional roads were included for the estimation of vehicle tailpipe emissions.

2.3 Priority Pollutants within the VTAPA

Based on the available monitoring data, the major findings of the air quality assessment indicated that:

- ***Particulate*** concentrations are elevated over most areas of the VTAPA, particularly in residential areas where domestic coal burning is occurring and areas neighbouring major industrial operations.
- ***Sulphur dioxide*** concentrations are reduced in both the residential and industrial stations, although exceedances were recorded on several occasions at Jabavu and Orange Farm and in Sasolburg.
- ***Nitrogen dioxide*** concentrations are low in the VTAPA, although a seasonal signature was observed in NO_2 concentrations. Nitrogen dioxide concentrations have a regional impact within the Vaal Triangle.
- ***Carbon monoxide*** concentrations are not considered to be significant in the VTAPA.
- ***Ozone*** concentrations are elevated in areas surrounding major industrial operations with exceedances of the one hour average target recorded on numerous occasions. Ozone concentrations measured at Makalu are representative of known background concentrations in South Africa.

2.4 Priority Sources within the VTAPA

All the sources within the VTAPA (i.e. industrial, power generation, domestic fuel burning, mining, vehicle emissions etc.) to a larger and lesser extent contribute to particulates (PM_{10}), with most of the industrial sources, power generation, domestic fuel burning, and vehicle tailpipe emissions contributing to SO_2 and NO_2.

2.5 Priority Areas

Priority areas where intervention strategies will take priority were identified based on the predicted ambient air concentrations from the priority pollutants and the exposure potential. Prioritisation of sources was ranked on the basis of impacts rather than the extent of their emissions. This ensures that the main contributing sources resulting in non-compliance with the VTAPA ambient air quality objectives and hence pose the greatest risk to human health and the environment, be addressed as priority.

Simulated ground level concentrations, verified with ambient monitored data, indicated that the main pollutant of concern within the VTAPA is inhalable particulates (PM_{10}). Six priority areas were identified within the VTAPA based on highest PM_{10} concentration zones or "hotspots" (Figure 2). The areas were also selected to correspond with impact zones due to acute exposures to SO_2 and NO_2. The sensitive receptors together with the emission sources and main pollutants of concern are provided in Table 3 for each of the identified priority zones.

Table 3: Priority "hotspot" zones indicating the sensitive receptors within and the main contributing sources

Hotspot Zone	Sensitive Receptors within Zone	Emission Sources within the Zone	Additional sources not quantified and included	Pollutants of concern
1	Residential areas of Sasolburg, Zamdela and Coalbrook	Industrial activities (viz. Sasol, Omnia and Natref), mining activities (viz. Sigma Colliery) and domestic fuel burning	Agricultural activities and biomass burning	PM_{10}, SO_2 and NO_2 H_2S, VOCs
2	Located just south of the residential area of Vereeniging – no residential areas included in this zone but potential for environmental impacts	Mining activities (viz. New Vaal Colliery), power generation (viz. Lethabo Power Station) and other industrial activities	Agricultural activities and water treatment works which may result in odour impacts	PM_{10}, SO_2, NO_2,
3	Developments of Vanderbijlpark and Sebokeng	Industrial activities (viz. Iron and Steel process (ArcelorMittal and Davsteel), commercial boilers and other smaller industrial activities), and domestic fuel burning	Industrial activities just north of ArcelorMittal (a ceramics manufacturing facility, a brickworks and a quarry), water treatment works, biomass burning and agricultural activities	PM_{10}, SO_2, NO_2 and odours, Ozone, VOCs
4	Residential developments of Vereeniging and Meyerton	Industrial activities (viz. ArcelorMittal Vaal Works, ArcelorMittal Klip Works, Metalloys, commercial boilers, and other small industrial activities) and domestic fuel burning	Agricultural activities and large areas of biomass burning	PM_{10}, SO_2 and NO_2, Ozone, VOCs
5	Residential developments of Orange Farm, Evaton and Ennerdale	Domestic fuel burning	Large areas of biomass burning	PM_{10}, SO_2 and NO_2, VOCs
6	Residential area of Soweto	Domestic fuel burning	Windblown dust from gold tailings dams	PM_{10}, SO_2 and NO_2, VOCs

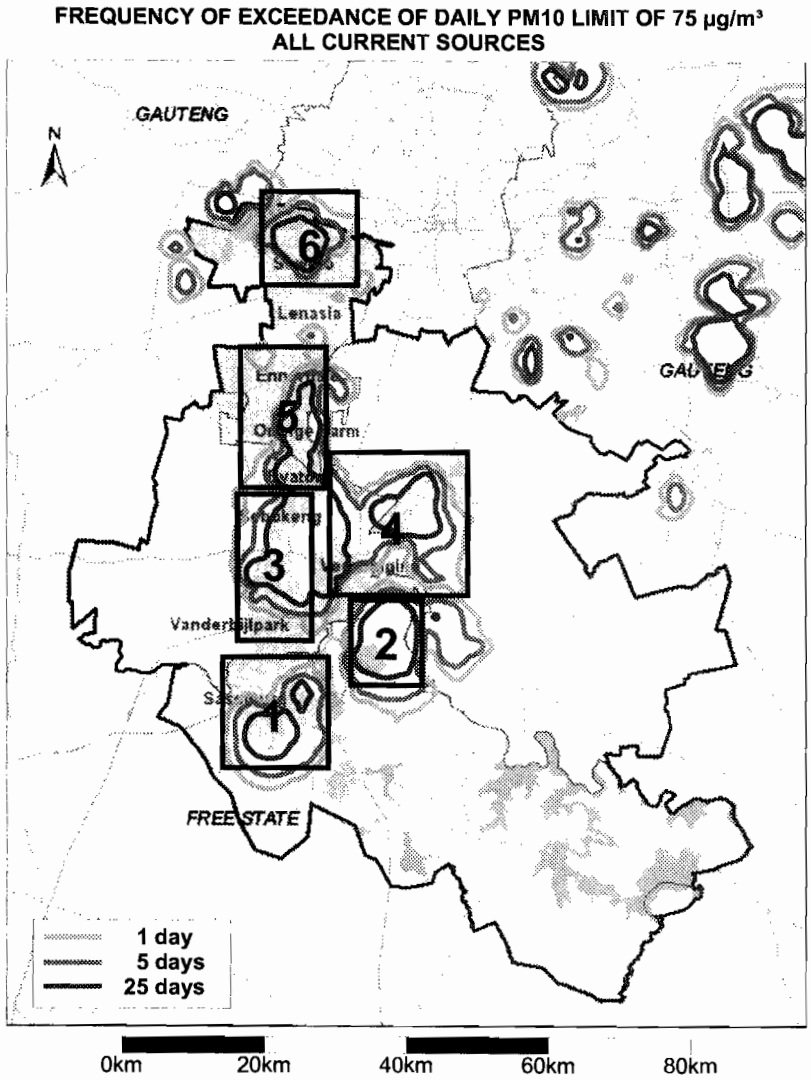

Figure 2: Six priority "hotspot" areas indentified within the VTAPA based on predicted PM_{10} ground level concentrations.

2.6 Capacity Assessment

Based on the capacity assessment of the various spheres of government (National, Provincial and Local), it is clear that there is an intentional drive from National Government (DEAT) to built capacity and implement the various components of the AQA. At National level, a Chief Directorate has been established for Air Quality Management and Climate Change with a Directorate specifically focusing on Air Quality Management. Subsequently, DEAT has established a sub-directorate clearly showing commitment to air quality management. DEAT will ultimately be responsible for the implementation and roll-out of the VTAPA AQMP. On provincial level, Gauteng has a Directorate devoted to Air Quality falling under the Chief Directorate Sustainable Use of the Environment. The Free State has a sub-directorate for Air Quality Management under the Directorate: Environmental Quality.

At local government level, the City of Johannesburg is probably the most experienced on air quality management with an AQMP already implemented in 2003. This AQMP is currently undergoing the first review period. Both Ekurhuleni Metropolitan Municipality and the City of Tshwane followed by developing AQMPs in 2004 and 2006, respectively. Within the Sedibeng District Municipality air quality are managed by Environmental Health Services with most of the air quality responsibilities being that of the Environmental Health Practitioners. Similarly, Environmental Health Practitioners are responsible for all air quality related functions at Local Municipal level. This include amongst others, compiling and updating emissions inventories on all small boiler operations within the municipality. With the exception of Emfuleni Local Municipality, no complete inventory exists. Other functions include diesel vehicle testing and air quality related complaints attendance.

The shortfalls have mainly been identified as the lack of interaction between the various spheres of government and between municipal departments. This results in duplication of work or the neglect of functions. Also, inadequate systems and procedures are in place at most municipal departments to manage air quality. A communication and reporting framework will form part an important part of the AQMP implementation.

3 METHODOLOGY FOR THE DEVELOPMENT OF AN AIR QUALITY MANAGEMENT PLAN

The main steps in the compilation of an AQMP for VTAPA included the following:

- Problem identification: Does current air quality monitoring suggest that there is a problem? What factors or sources are contributing to this problem?

- Plan development: What are the most appropriate air-emission reduction measures to achieve local goals, and what are the relative priorities?

- Implementation and reporting: How and when will the measures be implemented, and by whom? How often will progress be reviewed and reported upon? (Williams and Bhattacharyya, 2004)

The methodological approach of the Logical Framework Analysis (LFA) (NORAD, 1999) was followed:

- Situation Analysis (including Stakeholder Analysis, Problem Analysis, Objective Analysis);
- Strategy Analysis;
- Project Planning Matrix (including the Matrix, Assumptions, Objective Indications, Verification); and,
- Implementation.

4 PROBLEM IDENTIFICATION AND OBJECTIVES ANALYSIS

A problem tree was developed for an identified problem around which cause and effect relationships were established. These problems were then restated into achievable objectives that will result in the desired outcome for the VTAPA, namely acceptable air quality in the region. Using the LFA approach, the main problems and critical gaps associated with air quality and the management thereof were identified through an initial characterisation of the existing situation in the VTAPA. The Baseline Assessment determined the existing air quality in the region, identified problem sources and areas through dispersion modelling and ambient monitoring, and assessed capacity for air quality management within all spheres of Government. Subsequently, information obtained from this initial assessment was used to identify the major problems in the region and develop corresponding objectives to correct these problems.

Using this methodology, **eleven** problem complexes were identified around which problem and associated objectives trees were developed. A problem complex is a set of problems with similar cause and effect relationships that are not necessarily related to a specific location. These have been divided into 'emission' problem complexes and 'non-emission' problem complexes. Emission problem complexes identified included (listed alphabetically and not according to significance) (i) Biomass Burning, (ii) Domestic Fuel Burning, (iii) Iron and Steel, and FerroAlloys, (iv) Mining, (v) Petrochemical, (vi) Power Generation, (vii) Small Industries, (viii) Transportation and (ixi) Waste Burning. Non-emission problem complexes identified included (x) Government Capacity for Air Quality Management, and (xi) Information Management.

5 STRATEGY ANALYSIS AND INTERVENTION DESCRIPTIONS FOR THE IDENTIFIED PROBLEM COMPLEXES

Following the problem and objectives analysis, a strategy analysis was undertaken. Appropriate strategies were identified to develop feasible interventions addressing the eleven problem complexes. Various interventions have been proposed for each of the eleven problem complexes. These interventions also incorporate the suggestions from stakeholders within the VTAPA, based on the output from the problem and objectives analysis. It was however necessary to prioritise the interventions for implementation of the management plan, based on (i) the environmental benefit that will be obtained from such an intervention, (ii) whether it is technical and economically feasible, and (iii) if it is socially acceptable and desirable. Other considerations included the degree of uncertainty around the measure, the strategic and political desirability, timeframes for implementation and environmental benefit realisation, and the development of local expertise and potential for local employment.

Action plans have been developed for selected interventions (Appendix A of main report). Where possible, dates were assigned to each intervention. If dates were unknown, generic timeframes ranging from short term (1 – 2 years), medium term (3 – 5 years) and long term (5 – 10 years) were assigned.

General concerns voiced by stakeholders are listed below and have been incorporated into the intervention strategies in the short and medium term. The main concerns include:

- The air quality target is based on a single exceedance of the VTAPA Ambient Air Quality Objectives (as per individual pollutant). It is however prudent that the management plan provides clear and ambiguous targets and timelines in which these must be achieved.
- $PM_{2.5}$ is off concern given the fine fraction of the particulates posing a larger health risk than PM_{10}. The VTAPA AQMP only addressed PM_{10} and should include $PM_{2.5}$ ambient monitoring to adequately protect human health within VTAPA. Metal analysis should also be included.
- The ambient air quality must be improved beyond the Ambient Air Quality Standards to allow room for future development in the area. This is necessary for economic growth, development and employment opportunities.
- Lenient timeframes for intervention strategies and reduction plans will result in the plan not achieving its main objective, i.e. to ensure that, once the plan is implemented, the air quality within the area will effectively and efficiently be brought into sustainable compliance.
- Indoor combustion sources, specifically the use of paraffin should be discouraged.

Since the minimum emission standards setting process are primarily focusing on Best Available Technology (BAT) and the understanding that most of the sources within the Vaal Triangle Priority Airshed have conducted air quality studies in the past (mostly as part of EIAs where technology reviews are part of the investigation), the development of emission reduction strategies should not be a difficult task once all the above mentioned projects are completed. It was therefore agreed that additional time be granted to the various industries within the

VTAPA to develop detailed emission reduction strategies. Industry and government departments (National, Provincial and Local) were given until June 2008 to submit detailed emission reduction strategies ensuring compliance with ambient air quality objectives within given timeframes. This information has been incorporated into the VTAPA AQMP.

Provided the importance of clear Air Quality Objectives and implementation timelines, air quality targets as indicated in Table 4 was proposed for VTAPA. Table 4 outlines the stepped approach for air quality objectives and targets as set out in the National Framework. The VTAPA Air Quality Objectives (AQO) propose the SANS limits as immediate objectives, with allowable frequency of exceedances reducing over time to ensure air quality improvement.

Table 4: Proposed Ambient Air Quality Implementation for the Vaal Triangle Airshed Priority Area

Averaging Period	Pollutant	Concentration	Frequency of permitted Exceedance (FOE)	Compliance Date
Class 4 - Proposed SA Standards				
10 min	SO_2	500 µg/m³	526	2009
1 hour	SO_2	350 µg/m³	88	2009
	NO_2	200 µg/m³	88	
24 hour	SO_2	125 µg/m³	4	2009
	PM_{10}	75 µg/m³	28(b)	
Annual	SO_2	50 µg/m³	0	2009
	NO_2	50 µg/m³	0	
	PM_{10}	50 µg/m³	0(b)	
Class 3 - VTAPA Air Quality Objectives				
10 min	SO_2	500 µg/m³	263	2012
1 hour	SO_2	350 µg/m³	44	2012
	NO_2	240 µg/m³	44	
24 hour	SO_2	125 µg/m³	2	2012
	PM_{10}	75 µg/m³	14(b)	
Annual	SO_2	50 µg/m³	0	2012
	NO_2	40 µg/m³	0	
	PM_{10}	40 µg/m³	0(b)	
Class 2 - VTAPA Air Quality Limits				
10 min	SO_2	500 µg/m³	50	2017
1 hour	SO_2	350 µg/m³	9	2017
	NO_2	200 µg/m³	9	
24 hour	SO_2	125 µg/m³	1	2017
	PM_{10}	75 µg/m³	5	
Annual	SO_2	50 µg/m³	0	2017
	NO_2	40 µg/m³	0	
	PM_{10}	40 µg/m³	0	
Class 1 - VTAPA Air Quality Targets				
10 min	SO_2	500 µg/m³	25	2020
1 hour	SO_2	350 µg/m³	0	2020
	NO_2	200 µg/m³	0	
24 hour	SO_2	125 µg/m³	0	2020
	PM_{10}	75 µg/m³	0	
Annual	SO_2	50 µg/m³	0	2020
	NO_2	40 µg/m³	0	
	PM_{10}	40 µg/m³	0	

Notes: (a) Proposed SA standards (Draft Notice for discussion purposes March 2008)
(b) More stringent PM_{10} targets are proposed for VTAPA than what is proposed for national standards

5.1 Biomass Burning

Vast open spaces within the VTAPA primarily used for agricultural activities are prone to veld fires specifically during the dry winter months.

Problem: High seasonal and localised emissions from biomass burning.

The main causes of such high localised impacts have been identified as:

- Accidental burning;
- Perceived and real benefits from burning;
- Current management strategies; and,
- Legal requirements (fire breaks).

Objective: To minimise the impacts from biomass burning on the surrounding environment and human health.

Interventions:

Proposed ***Short term (2008/9)*** interventions are as follows:

- Identify the role of fire services to assist in air pollution control. The responsible parties include the local authorities of SDM, FDDM and COJ. Progress made to date includes the coordination and collaboration with local municipalities as done by SDM. The Community, Health and Environmental Services of FDDM is engaged with the Local Municipality Fire Departments and are in the process to investigate the feasibility of taking over the fire services.
- DEAT should develop an inversion early warning system that triggers a veld fire control response (as obtained from the meteorological data measured in the VTAPA). Such a system has not yet been developed.

Proposed ***Short – Medium term (2012)*** interventions are as follows

- The local authorities should identify and quantify emissions from biomass burning and include this into the VTAPA emissions inventory. SDM is in the process of establishing a sub-directorate to coordinate all air quality management functions within the district and this will form part of the AQMP for FDDM aimed to start in the last quarter of 2008.
- Research should be done into international best practice regarding controlled/prescribed burning. This is also a function for local authorities and will form part of the functions of the sub-directorate at SDM and the AQMP to be developed for FDDM.
- Regional scheduled burn areas that are published for agricultural and management fires should be done by Gauteng and Free State Provinces.
- DEAT should develop procedures for local authorities to conduct controlled / prescribed burning.
- Each local Fire Department should maintain and update a database of the locations of veld fires and the extent of the areas burnt. This should be overseen by the local authorities. At SDM, specifically Emfuleni Local Municipality, the Fire Department keeps record and this is available on request. Midvaal Local Municipality also formulates monthly and quarterly statistics from incidents in the region. At FDDM the Community, Health and Environmental Services is engaged in the Local Municipality Fire Departments and are in the process to investigate the feasibility of taking over the fire services.

5.2 Domestic Fuel Burning

Various informal settlements in the VTAPA rely heavily on low quality coal as an affordable source of household fuel. The main areas of concern include Soweto, Orange Farm, Evaton, Sebokeng, Sharpville, Boipatong, Bophelong and Zamdela.

Problem: Given low level of release of domestic fuel burning appliances within the breathing space of people and sometimes even in enclosed areas, the impacts are significant resulting in poor health. The required reduction in ambient PM_{10} concentrations as a result of domestic fuel burning is between 1% and 70%. For SO_2 the concentrations from this problem complex need to reduce by up to 55% and ~3% for NO_2.

Poverty is a major contributing factor to the use of domestic fuels in households and that a cyclical relationship exists with this particular 'problem complex'. Poor ventilation, inefficient stoves, and the affordability of poor quality coal is a main concern. Continuous use of coal due to the rapid urbanisation has exacerbated backlogs in the distribution of basic services such as electricity and waste removal. Also, various electrified households continue to use coal due particularly to its cost effectiveness for space heating purposes and its multi-functional nature (supports cooking, heating and lighting functions).

Objective: To reduce the current air pollution concentrations to acceptable levels in domestic fuel burning areas, and to make available alternative energy sources that are affordable, as well as promote the use of more energy efficient stoves.

Interventions:

Proposed ***Short term (2008/9)*** interventions are as follows:

- DEAT together with the local authorities must implement a Vaal Triangle Area 'Clean Air Fund' to support community initiatives. The criteria, timeline and management should be agreed up front to minimise the risk of fund mismanagement Short term alternatives to Basa Njengo Magogo (BNM) should be investigated. FDDM is to start discussions with local industries to consolidate their current individual funds towards air pollution management. At SDM all funds related to clean air initiatives are handled in terms of Municipal Finance Act.
- DEAT and DME should undertake a project to investigate how to change behaviour regarding coal burning and educate people on the alternative and benefits associated with these.
- DEAT together with DME must investigate main reasons why electrified households still use other fuels. A DEAT project conducted through NOVA indicated a number of factors including appliances costs and effectiveness of coal as bulk energy carrier to serve the purpose of both cooking and heating.
- Human rights education programmes should be promoted primarily by national government (DEAT and DME).
- Rollout of safer illuminating paraffin (IP) stoves should also be initiated by DEAT and DME.
- The local authorities of SDM, FDDM and COJ together with DEAT must implement the BNM method in Sebokeng, Sharpville, Zamdela, and Soweto over the next two years. This aims to (as a minimum) reduce emissions by ~50% and safe up to 20% on coal consumption costs. DEAT has already initiated this process through the Clean Fires Campaign and the success of this will only be determined towards the end of 2009. SDM has partnered with the Urban Environmental Program funded by Danish Government and provision is made to appoint a service provider for such a project in 2008/9. A pilot study will be done in Sharpville.

Proposed ***Short – Medium term (2012)*** interventions are as follows

- The BNM method as mentioned above should be continued over the following three years with the rollout in Orange Farm, Evaton, Bophelong, and Boipatong. The local authorities and DEAT are responsible for this initiative. This is part of DEAT's Clean Fires Campaign.
- BNM rollout to be accompanied by extensive education on the dangers/negative impacts of in-house coal burning with real death rate statistics. SDM, FDDM, COJ together with DEAT and DME are the responsible parties. Same as for the above interventions, this forms part of the DEAT Clean Fires Campaign and SDM has obtained Danish funds to start with the rollout in Sharpville. The local authorities can start with media campaigns in the local newspapers and local radio stations.

- DEAT to prioritise Vaal Triangle Area Air Quality Project support in using its social response funds. No air quality project is funded by SRPP Directorate in this financial cycle and this will be initiated in the new financial year (2009).
- Initiation of the VEJA project on alternative energy mix for Kwa-Masiza, including:
  - Biomass: Kwa-Masiza has an old organic dump which can be used to generate natural gas;
  - Solar Energy: Kwa-Masiza has four storey buildings on which solar panels can be installed. This can supply the entire Sebokeng with affordable electricity; and,
  - Wind: Kwa-Masiza is an area within the prevailing south-westerly wind zone and suitable for the erection of wind turbines that can generate electricity for the entire Sebokeng.

  VEJA has initiated the project through a research proposal. A workshop was planned for the 15th of September 2008 at Bophelong. The evaluation of the plan will be done on a continuous basis by the Energy & Air Quality task team, the VEJA Steering Committee and the Vaal Community assembly.
- A review must be done of the domestic fuel burning emissions inventory with updated population statistics as these become available. DEAT has appointed a service provider to compile a comprehensive emissions inventory for green house gasses. This will be reviewed once the project is completed.
- Implement an awareness raising programme through media campaigns and community forums.
- Introducing low smoke fuels (based on the assumption that a plant will be established to produce LSF in the VTAPA). DME is developing a standard for LSF together with SABS, looking to provide a less expensive LSF plant.
- Undertake a comprehensive study on health risks associated with domestic fuel burning. This should be based on hospital records and updated population statistics. DEAT is in the process of drafting project proposals to get this started.
- Identify alternative fuel sources as fossil fuel is not an indefinite or sustainable resource.
- Investigate the feasibility of solar energy and why it is not advanced in South Africa. Eskom has experience in the form of the Shell Renewable–Eskom joint venture conducted in 1999.
- Integrate energy efficiency measures in low-cost houses; such as:
  - Housing insulation. A search for suitable and cost effective insulation materials should be done in the short term by DME together with Department of Housing and the various local authorities;
  - Electrification (Eskom potentially can provide funding and infrastructure as part of emission reduction offsets); and,
  - Stove maintenance and replacement (start with 10% of coal burning households).

  The Department of Housing has initiated studies on energy efficient designs and locations. SDM aims to bring the various housing departments at the local municipalities on board, and FDDM wants to engage with provincial and local authorities.

5.3 Iron and Steel and FerroAlloy Industrial Sector

ArcelorMittal South Africa (Vanderbijlpark and Vereeniging Works) and Davsteel (Cape Gate) are the main Iron and Steel producing facilities within the VTAPA. Samancor Meyerton (Metalloys) is the only Ferroalloy industry producing Ferro-Manganese.

Problem: Large volumes of atmospheric emissions are the main problem associated with Iron and Steel-, and Ferroalloy industries.

Activities that generate significant quantities of dust emissions include vehicle entrainment on unpaved roads, wind-blown dust from the stockpiles and material handling operations. Old technology and outdated plant designs are one of the main causes of high emissions and specifically fugitive releases.

ArcelorMittal and Samancor Metalloys were identified as the main contributing sources to PM_{10}. ArcelorMittal needs to reduce ambient PM_{10} air quality concentrations resulting from the Vanderbijlpark Works by between 1% and 21% and SO_2 concentrations by ~6.5%. NO_2 concentrations need to be verified through monitoring but the predicted concentrations indicated a required reduction of ~23%. Samancor Meyerton must reduce ambient concentrations of PM_{10} between 1% and 44%. Davsteel and ArcelorMittal Vereeniging were not flagged as main contributing sources to the ambient concentrations and therefore not required to reduce their emissions. However, the potential exists for impacts from these sources on the immediate surrounding environment.

Objective: To comply with both national emission limits and ambient air quality standards.

Interventions: Proposed interventions are provided for ArcelorMittal Vanderbijlpark and Samancor Meyerton. In addition, interventions to be implemented by government are also listed.

ArcelorMittal Vanderbijlpark has committed towards the minimisation of impacts from their operations on the receiving environment. Specific interventions in the ***short term (2008/9)*** include:

- Stoppage of dosing with spent pickling liquor at the Sinter plant: Past practices included Spent Pickling Liquor to be sprayed into the mixing drum forming potassium chloride (KC) which form part of the gas released to atmosphere. The removal of KCl particulates downstream proved ineffective and the practice was stopped. This project was completed in May 2006 resulting in a fugitive particulate emission reduction of 5 107 tpa.
- Coke Oven Gas (COG) & Water Cleaning Plant Project: The technology was outdated and a project was initiated in 2003 to upgrade the system and reduce SO_2, NH_3 and HCN emissions. The project was completed in April 2008. The SO_2 emission reduction is 5 686 tpa.
- Reducing roof emissions from Blast Furnace D: During the current reline of BF-D, the effectiveness of the primary extraction system was improved to capture a significant portion of the roof emissions from the cast house. It is expected that this intervention will reduce the fugitive dust emissions by 300 tpa.
- Dust suppression at waste disposal site: A dust suppression system, using high pressure to create a fine water mist, is currently being constructed at the waste disposal site to prevent dust transportation. The expected reduction in fugitive dust emissions are 70 tpa.
- Secondary Dust Extraction System at EAF: Installation of a secondary dust/fume extraction system with its own bagfilter system with an average capacity of ~5,000,000 m^3/hr. Thus will capture fumes and dust currently escaping through the openings in the roof reducing dust emissions by 500 tpa.
- Direct Reduction (kilns) Electrostatic Precipitator (ESP) rebuild: Replaced the refractory linings that will improve the performance of the ESPs at the Direct Reduction kilns. The fugitive particulate emission reduction is expected to be 50 tpa. This will be done by November 2008.
- Accuracy of emission inventories to be updated further during 2008 by making use of additional monitoring equipment that was invested in during 2007.
- Values obtained for fugitive emissions need to be reviewed during 2008.
- VOC and S-VOC emissions should be quantified with a high level of confidence at all BU's during 2008.
- CO and CH_4 emissions need to be quantified with a high level of confidence during 2008.
- Heavy metal emissions (Cr, Ni, Pb, Zn) need to be quantified with a high level of confidence during 2008 (from point and fugitive sources).
- Dioxin and furan emissions need to be measured at all BU's during 2008.
- Potential NO_x reductions need to be investigated at all operations, especially by installing "low NO_x combustion technology". Investigations to be completed by June 2008.

Proposed ***Short – Medium term (2012)*** interventions for ArcelorMittal Vanderbijlpark are as follows:

- Replacement of old Coke Batteries: Replace Batteries 1, 3, 6 and 7 with two larger batteries (10 & 11). These batteries will be "best available technology' (BAT) and reduce emissions from door leaks,

charging and pushing of coke. Batteries V4, V8 and V9 will continue to operate until 2020. Fugitive particulate emission reduction expected to be 772 tpa.

- Sinter Clean Gas Unit: Installation of emission abatement technology (bag filter system) to reduce particulate emissions from the entire Sinter Plant. The addition of lime to the off-gas will be introduced to effectively remove SO_2. Emission reduction expected is 1 848 tpa for particulates. The SO_2 reduction needs to be confirmed. The project will be completed by March 2010.
- Replacement of old Coke Batteries: Replace Batteries 1, 3, 6 and 7 with two larger batteries (10 & 11). These batteries will be "best available technology' (BAT) and reduce emissions from the combustion stacks. Batteries V4, V8 and V9 will continue to operate until 2020. Particulate emissions will reduce by 318 tpa and SO_2 by 1 712 tpa. The project will be completed by December 2012.

Samancor Meyerton has indicated their commitment to improve operations in order to reduce the ambient PM_{10} concentrations resulting from their plant. Specific ***short term (2008/9)*** interventions and strategies include:

- Rehabilitation of old North dams: The project is to rehabilitate the area west of Metalloys office building where decommissioned old North plant sludge dams are situated. The project is to be considered during integrated rehabilitation planning in 2008/9 with the aim to finally green the area.
- Dust suppression at Final Products Handling: Dust suppression by added moisture, screening and washing to remove fine materials, resulting less dust generation during dispatching. The project was completed in 2008.
- Rail tippler building enclosure at Raw Materials Handling: During the windy periods the wind blows the dust out of the semi open structure. The enclosed Rail Tippler building will contain the dust and ensure that the existing wet dust suppression system works more effectively. This was completed in 2008.
- Secondary Fume extraction system upgrade at North plant: Additional extraction hoods and additional capacity on the existing bag house to increase efficiency of current secondary fume extraction system at the tapping process. This project was delayed due to amendment of the scope and will be completed by the end of 2010.
- Dust-A-Site network extension: Construction of a road and weekly maintenance of 150m of the current dirt road next to the salvage yard with dust-a-site. This project was completed in October 2007.
- A comprehensive Air Quality Management Plan and Emission Reduction Strategy (ERS) development and facilitation conducted in 2008. The ERS focussed on particulate emission with the results presented to DEAT as part of Metalloys commitment to reduce impacts in the VTAPA. The main findings are:
    - West Plant ERS will result in emission reduction of between 50% and 99% and predicted ground level concentration reductions (at the plant boundary) of between 50% and 99%.
    - ERS at the South Plant will result in emissions reductions of between 16% and 89% with off-site impact reductions predicted to range between 49% and 100%.
    - At the North Plant, planned ERS include emission reductions of 70% and 1005 with predicted reductions in concentrations of 51% and 100%.
    - Material management mitigation scenarios will result in emission reductions of between 50% and 100%. Predicted ground level PM_{10} concentrations will reduce by between 26% and 100%.

Mechanisms implemented to inform the emission reduction strategy and track future progress include:

- Installation of continuous ambient air PM_{10} monitoring on site and in downwind communities, including meteorological data. This was completed in August 2007.
- Extensive data collection of all point, fugitive, area and line sources of relevant pollutants during APPA permit review. This was also used to compile a comprehensive emissions inventory. This was completed in October 2007.
- Short term ambient air PM_{10} monitoring project to assist in emission source identification – done in February 2008.
- Dispersion modelling of current baseline conducted in March 2008, thus completed.
- Continuous online point source emission monitoring phase 1 of particulate matter to be done in 2008.

Aside from the emission reduction strategies and interventions provided by the individual industries, there are a number of recommended interventions applicable to emission problem complexes in general to be driven by government. The interventions are provided under Section 5.10 for 'Government Capacity for Air Quality Management'.

5.4 Mining Operations

The main mining operations within the VTAPA include the New Vaal Colliery, Sigma Colliery and Glen Douglas Dolomite Mine. In addition, there are numerous small mining and quarry operations that haven't been identified during the baseline assessment for the VTAPA.

Problem: Large volumes of pollution generated typically in the form of fugitive releases.

The main problem of opencast mining operations, as is the case of all three the mines located in the Vaal Triangle Priority Area, is the generation of excessive dust emissions. Gaseous emissions are also a problem but to a lesser extent.

Objective: To minimise both fugitive dust and gaseous emissions from mining operations through the implementation of mitigation measures at the main sources of emissions (i.e. materials handling operations, crushing and screening, chemically treated haul roads, control of wind erosion etc.)

Interventions were only provided by New Vaal Colliery over the ***short term (2008/9)***. These are as follows:

- Operation of a dust fallout monitoring programme: The dust fallout monitoring network will be expanded to include 32 single and 9 directional dust bucket monitoring network. This was initiated in 2008 and is an ongoing intervention.
- Implementation of dust suppression technologies including three water tankers running 24 hours per day spraying the haul roads. Also, the use of water sprays at plant conveyor belt transfer points, and spraying and compaction of seasonal coal stockpiles will be investigated. The use of a fogging cannon at tip and/or stacker/reclaimers and the use of (up to) 5 water cannons at working faces are ongoing.
- Dust-a-side application on haul roads: Currently 8km is covered and a total of 13.8km is planned for 2008.
- Enclosure of the primary tip and installation of a passive dust stilling hood is 85% complete. The upgrade of sprays and installation of a conveyor belt curtain is still to be completed.
- A dust hood was installed at the secondary crushers. The motor damper arrangement is to be finalised.
- The implementation of a buffer blasting programme to minimise ingress of air into old workings is ongoing standard operating procedure.

Performance indicators initiated to track performance include:

- An air emissions inventory has been developed for the mine but need to be updated to reflect the current operational status. This was also initiated in 2008 and will be ongoing.
- A gravimetric dust sampling programme, using random statistically representative number of employees to collate data, is ongoing standard operating procedure. A quarterly report is submitted to the inspector.
- A PM_{10} monitor has been purchased to assess the impact of dust on the surrounding community. Numerous technical difficulties have been encountered and the solar panels are to be replaced with permanent AC power. This will be completed in 2008.

Recommended interventions from the government sectors that are applicable specifically to mining are provided. The ***short term (2008/9)*** interventions are as follows:

- Detailed emission reduction strategies to ensure compliance with ambient air quality standards to be submitted to DEAT by New Vaal, Sigma, and Glen Douglas. DME is responsible to ensure local authorities are represented in the inter-departmental committee. FDDM is a member of Regional Mining

Development & Environmental Committee, Free State Department Minerals & Energy. SDM is to establish an Air Quality Management (AQM) sub-directorate to coordinate all air quality projects.

- Representation of local authorities on the inter-departmental committee tasked with the regulation of mining activities. This is the responsibility of all the local authorities, DEAT and DME.
- The local authorities together with DME are to ensure all mining operations within the VTAPA have approved EMPRs (specifically smaller mining and quarry operations). FDDM has a target date of December 2008 with the AQM sub-directorate at SDM to coordinate.
- DME and the local authorities to identify and quantify emissions from all smaller mining and quarry operations not included in the VTAPA AQMP and update the VTAPA emissions inventory.
- Annual roadworthy checks for all mine export vehicles to be done by the local authorities and provincial governments.
- Regular internal and external audits to be conducted (external by independent party) and reported to the District Municipalities. This is the responsibility of the provincial government and local authorities. FDDM proposed assistance to be supplied by DME.
- Implement priority area emissions trading system i.e. fund other projects other than own emission reduction that will result in an overall decline in emissions. It is recommended that industry provide DEAT with a written proposal.

5.5 Petrochemical Sector

Two refineries are located in the VTAPA namely Sasol Chemical Industries (SCI) and Natref. Both are located in the Sasolburg area. Omnia Fertilisers was also grouped with this sector.

Problem: Gaseous and particulate emissions from the petrochemical industry influence the air quality within the VTAPA.

Particulate emissions are associated with dust emissions from the waste dumps and stockpiles, as well as the combustion process which generates both particulate and gaseous emissions. Gaseous emissions, in particular SO_2 emissions, have also been identified during the Baseline Assessment to be of concern. This can be due to outdated and ineffective technologies.

Sasol is required to reduce ambient concentrations of NO_2 by ~18% and SO_2 concentrations by ~7%. Natref needs to reduce SO_2 concentrations by between 1% and 5% whereas Omnia is required to reduce PM_{10} concentrations by ~2.5%.

Objective: To achieve acceptable pollutant emissions through best practice management techniques to ensure the minimisation of fugitive emissions from the waste dumps and stockpiles and emission reduction from the combustion process through the implementation of Best Available Control Technology (BACT).

Interventions proposed by Sasol, Natref and Omnia are discussed below.

Sasol's proposed ***short term (2008/9)*** interventions are as follows:

- Sasol Infrachem, a division of Sasol Chemicals Industries (Pty) Ltd, has indentified 3 main SO_2 sources from its operations in Sasolburg. The smallest of the three sources will be reduced by 10% but this will not meet the overall required reduction of 7%.
- Emission off-setting: Contrary to what is required, Sasol will increase their SO_2 and NO_x emissions by re-commissioning their old boilers to generate electricity. Particulate emissions will be removed by optimising the current ESPs but SO_2 and NO_x will not be controlled resulting in an overall increase in PM_{10}, SO_2 and NO_X emissions. Sasol will off-set these increases in emissions by implementing further Basa Njengo Magogo fire making methods in Zamdela and surrounding areas.

- Sasol will investigate reduction options for the steam producing facilities (the larger sources). There are three options, namely:
    - Retrofit a number of boilers on both steam station units as to reduce SO_2 and NO_x emissions. This will result in SO_2 and NO_x compliance within 7 – 10 years.
    - Some of the steam station equipment is more than 55 years old and nearing the end of its useful lifetime. Thus, the option is to decommission the oldest equipment and rebuild it on a modular approach. This will result in a significant reduction in emissions but will take 6-8 years.
    - Building of a new unit replacing the existing two steam stations. This will result in a significant reduction in emissions but will take 10 – 20 years.

The National Petroleum Refiners of South Africa (Natref) has an approved Environmental Improvement Plan mutually agreed with DEAT and NGO's in 2002. The improvements agreed upon as well as projections towards 2009 and indicative 2015 improvements are reflected below. This is applicable to both Natref and Sasol.

Short term (2008/9) interventions:

- Alternatives to flaring, e.g. re-use for internal processes.
- Establishment of corporate minimum requirements on Environment/Health/Safety.
- Establishment of community outreach programmes and open days (information sharing).
- Corporate directive on continuous flaring.
- Reduction of fugitive HCs from oil separation basins.
- Reduction of fugitive VOC emissions from process leaks (leak detection programme).

These interventions should ensure emissions reductions of 16% for SO_2, 9% for NO_2 and 1% for VOCs. In addition, approximately 80% reduction in SO_2 emissions should be realised at the end-point user, i.e. mobile sources due to the agreed interventions.

Omnia has installed emissions monitoring and control systems at its various production units at the Sasolburg site and is also investigating others. Air emission reduction systems have also been installed and optimisation plans to improve their effectiveness are currently underway. The ***short term (2008/9)*** interventions include:

- Improve scrubber efficiencies: Optimisation of installed scrubbing system at Granulation Plant 3 is an ongoing process. Optimisation of installed scrubbing systems at the Nitrates complex will also be done in 2008.
- Online stack monitoring at the ammonium nitrate plant and online NO_x monitoring at the nitric acid plant. Committed R0.5 million for online PM monitoring at the Granulation Plants - two are installed with the next 6 to be completed.
- NO_x abatement: Committed R55 million in an EnviNO_x installation at nitric acid plant for NO_x abatement in 2008.
- Removal of fluoride emissions by changing the scrubbing liquor for the scrubber at the super phosphate plant (2008)
- Improving ambient air quality: 18 projects at Granulation Plants aimed at improving ambient air quality.
- Control of fugitive dust by enclosing raw materials storage bins.
- Installing dust suppression hoppers for raw material loading. This will result in 50% reduction in fugitive emissions. Investigating the option of installing more hoppers where viable.
- Emissions reduction technologies and air quality management practices: Sharing of best practices with other fertilising companies with regard to emissions reduction technologies and air quality management practices.
- Improve dust control systems: Optimisation of the installed C-TECH unit for dust control at Granulation Plant 2 post cyclones - installed dust control cyclones at Granulation Plant 2.

The ***medium – long term (2012)*** interventions include:

- Investigating the possible installation of bag filter unit at Granulation Plant 2.

Additional emission reduction interventions to be implemented by government at the Petrochemical industry sector in the ***short – medium (2012)*** term include:

- DEAT and the District Municipalities to investigating the funding of Basa Njenjo Magogo rollout in Zamdela by Sasol, Natref and Omnia. Sasol is already funding the rollout in Zamdela.
- Sasol should not to be allowed to re-commission old boilers without new ESPs in place and FDG should be implemented to ensure no additional SO_2 emissions. Alternatively coal beneficiation can be investigated as is done by Eskom. Also, no additional NO_x emissions should be allowed. This is primarily the responsibility of DEAT. This can be based on the EIA regulations falling under the Chief Directorate: Environmental Impact Management.
- The petrochemical industries should measure for VOCs, PM_{10}, PM2.5, and O_3 (also consider secondary pollutants). DEAT is the responsible party.
- More stringent fuel specifications could result in more production of emissions (SO_2, NO_2 and CO). This is primarily dependent on vehicle emission standards to be proposed by DEAT.
- Petrochemical industries to comply beyond ambient standards to allow for i) further expansion, ii) upset conditions and iii) failures in reduction strategies.

5.6 Power Generation

Lethabo power station is the only power generating source within the VTAPA.

Problem: Use of low grade coal in coal-fired power stations requires large quantities of coal being used as fuel source and therefore an increase in gaseous and particulate emissions. Other sources of fugitive emissions include the coal stockpiles and ash disposal dumps.

The main problem associated with coal-fired power stations is that these stations are designed to burn low grade coal. Even with Electrostatic Precipitators (ESP) implemented at Lethabo power Station to reduce fine particulates, due to the high ash content of the coal excessive particulate emissions are being emitted. Also, no control equipment is in place to reduce SO_2 emissions and Lethabo is one of the main contributing sources to SO_2 ground level concentrations and should reduce by up to ~58%. In addition, significant quantities of dust are also generated as a result of wind-blown dust from the coal stockpiles, ash disposal sites and exposed tracts of land. Dust is also generated as a result of materials handling operations and vehicle entrained dust from roads.

Objective: To reduce emissions to acceptable concentrations i.e. below the ambient air quality targets where health impacts are minimised.

Proposed ***interventions*** over the ***short term (2008/9)*** are provided below.

- ESP transformer upgrade: As the transformers fail, they will be replaced. There is a current stock of six upgraded spares. This will ensure or increase the reliability and availability of the ESP fields. This is an ongoing project.
- Installation of the ESP Plant Management System is complete and will optimise the operation of the ESPs to reduce emissions and allow better management of the rapping procedure. Installation of the load cells in Unit 5 is completed.
- SO_3 distribution lance upgrade is to prevent the blockage of the nozzles in order to ensure proper distribution of SO_3, and will thus improve the efficiency of the ESP. This has been completed.
- Replacement of the MCS1 with MCS2 to allow better control of the ESP fields, and ensure that spares are available. This is also completed.

- Replacement of the secondary air heater element packs - Unit 1 is outstanding in the current maintenance cycle. This will be conducted every six years until the end of station life.
- On-line stack monitoring: Continuous emissions monitoring system to measure SO_2, NO_x, CO and O_2 in the flue gas will be installed in Unit 1. This will allow compliance monitoring with the conditions in the emissions license.
- Ambient monitoring station: An ambient monitoring station measuring SO_2, NO_2, and PM_{10} will be established at Refengkgotso ~ 20km southeast of Lethabo. Air Quality reports detailing the findings of the monitoring at the Refengkgotso monitoring station will be compiled on a quarterly basis and submitted to DEAT.
- A network will be established to monitor fugitive emissions (PM_{10}) from the ash dump at Lethabo. It will initially include two monitoring stations and will be expanded if needed.
- Communication channel for upset conditions has been established. Complaints about emissions from Lethabo are received and addressed by the environmental practitioners at the station. This is primarily regarding start-ups and upset conditions. Notification of upsets is send to DEAT, SDM, Metsimaholo Municipality, Sasol Infrachem and a Three Rivers community representative.
- SO_2 emission reduction: The investigation into retrofitting the power station with FDG proved not feasible or economically viable. An investigation is currently underway to assess the feasibility of coal beneficiation with respect to sulphur removal. If this is feasible, steps will be taken to implement it.
- Energy efficiency measures: Extend energy supplies and reducing greenhouse gas emissions. Lethabo initiated a lighting programme to further improve energy at the power station, resulting in a saving of 735 MWh a year.
- Offset projects: Eskom was involved in the "Winter of 2008 Clean Fires Campaign" together with Sasol on the Basa Njengo Magogo activities in the Vaal Triangle Area. Eskom is also using the Eskom Energy and Sustainability Programme for education and awareness creation.
- Electrification programme: Eskom's electrification projects scheduled for the Vaal Triangle include Emfuleni (Tshepiso N ext 1 – 295 households), COJ (Nomzamo – 470 households).

Additional ***short-medium term (2012)*** interventions to be implemented by government on the power generation sector include:

- South African Mercury Assessment: An international study on Mercury Assessment is being conducted and will be facilitated and hosted by DEAT when finished.
- Use of billboards to raise awareness around the impact of good air quality management DEAT is doing this as part of the Clean Fires Campaign and Eskom is also involved.
- Investigate the feasibility of solar energy and why it is not advanced in South Africa. Eskom has experience in the form of the Shell Renewable–Eskom joint venture conducted in 1999. This should further be investigated by Eskom in partnership with DEAT and DME.
- Electrification of low cost houses as included in Eskom's interventions. DEAT and DME to also be involved in the project.
- DME to develop and enforce stricter regulations for start up emissions/cleaner technologies.
- DME to develop regulations on the restriction of export of high quality coal.
- DEAT should not allow any new power stations in the stressed area until such time as the ambient concentrations are within compliance with the VTAPA AQ Targets. This can be based on the EIA regulations falling under the Chief Directorate: Environmental Impact Management.

5.7 Small Industries

Various fuel burning appliances, including boilers at schools and hospitals, pizza ovens, stand-by generators, air heaters, (etc.) are located within the VTAPA.

Problem: Emissions are often uncontrolled and unregulated and these sources generally have low stack heights resulting in poor dispersion potential. Pollutants released from these sources tend to have a localised impact.

With the previous absence of legislation and regulations to effectively manage emissions from small industrial operations, the impact of these sources on the ambient air quality is largely un-quantified. Few databases exist of these sources in the region, and where available, these databases are outdated or incomplete.

Objective: To achieve acceptable local air quality in close proximity to these sources.

Proposed ***interventions*** are provided in below for the ***short – medium term (2012)***:

- Electronic database of all small industries to be compiled by Municipalities. The AQM sub-directorate at SDM will coordinate this function to be undertaken by the local authorities and compile this into one database at district municipality level. FDDM has set the target date for initiating this process as December 2008.
- DEAT should develop a permit system for all non-listed activities.
- Company orientated community initiatives should be steered by the District and Metropolitan municipalities. FDDM is to engage with small industries in future.
- Model scheduled trade by-laws. This is the responsibility of the District and Metropolitan municipalities. The AQM sub-directorate at SDM will coordinate development of by-laws. FDDM will draft air quality by-laws in 2009/2010.
- DEAT to declare small boilers controlled emitters. There is a proposal on the requirements for small boilers in the current standard setting process and is expected to be gazetted by the end of 2008.

5.8 Transportation

Air pollution from vehicle emissions may be grouped into primary and secondary pollutants. Primary pollutants are those emitted directly into the atmosphere, and secondary, those pollutants formed in the atmosphere as a result of chemical reactions, such as hydrolysis, oxidation, or photochemical reactions.

Problem: Although vehicles were not identified to be a major source in the VTAPA, the potential exists for emissions from vehicles to significantly contribute to the ambient air quality within the future years

An inefficient and unreliable public transport system has resulted in an increasing number of privately owned vehicles within the region, including an increase in use of taxis as the main mode of public transport. Insufficient infrastructure exists due to poor town planning resulting in traffic congestion in many areas. The proliferation of heavy vehicles on the local road network to transport heavy/bulk materials has also led to traffic problems in the region.

Objective: To reduce emissions from vehicles through improvements in the vehicle fleet and measures to reduce petrol and diesel emissions, an efficient and reliable public transport system, taxis to become an optional mode of transport, improved and informed town planning (specifically for future transport developments) and reduce the number of heavy vehicles on the roads by improving the rail network.

Proposed ***interventions*** are provided below.

Short term (2008/9) interventions:

- Synchronisation of traffic lights to promote the flow of traffic to be initiated by local authorities. FDDM recommends the form of partnerships with local and provincial traffic departments. SDM to engage and coordinate with local municipalities who should form partnerships with traffic departments.

- The DME Taxi recapitalisation programme.
- Integrate all stakeholders in road construction and planning e.g. taxi associations (SDM, FDDM, and COJ). FDDM is to form a transportation sector forum and SDM proposed liaising with taxi organisations during public meetings.
- District and metropolitan municipalities to tar or cement roads. FDDM recommend the forming of partnerships with local and provincial road networks. SDM links with ongoing projects from local municipalities.
- Vehicle emission blitz in partnership with the City of Cape Town - district and metropolitan municipalities. FDDM is to procure a Hartridge meter in 2009/10. SDM to engage and coordinate with local municipalities.
- Review vehicle emissions database with updated traffic count data as these become available. FDDM to form partnerships with local and provincial traffic departments and SDM to engage and coordinate with local municipalities and develop central database.
- Roadworthy certification to ensure vehicles is maintained by local government.

Short – medium term (2012) interventions include:

- Improved fuel quality (reduction of sulphur in petrol to 50 ppm) is to be driven by DME and it is recommended to bring the Department of Transport onboard.
- DME to stipulate new technology for vehicles.
- Heavy trucks to use alternative routes and not pass through Cities and Towns. This should be regulated by the metropolitan and district municipalities. FDDM to form partnerships with local and provincial traffic departments.
- Regulation of diesel driven vehicles: DEAT future Emitters project, Norms and Standards Project will develop regulations but will not affect the on-road vehicle fleet, thus local authorities are expected, through by-laws to establish control measures for on-road vehicles.
- Vehicles to be declared controlled emitters: DEAT's future Emitters project, Norms and Standards Project will only effects new vehicles and not on-road fleet.
- Introduction of a vehicle monitoring programme to be done by the district and metropolitan municipalities. FDDM is to procure a Hartridge meter in 2009/10 and SDM to engage and coordinate with local municipalities.

Medium – long term (2017) interventions include:

- Transnet must be called to task to address the rail network and improve it as an alternative to road transportation. This is the responsibility of the Department of Transport and Transnet.
- Update emissions inventory with airport and railway information as it becomes available or when it becomes a significant source. This will be the responsibility of the local authorities.

5.9 Waste Burning

Problem: Heavy metal, dioxin and furan emissions from waste incineration represent a considerable air quality and health risk concern related to such operations.

Particulate emissions from incinerators may comprise heavy metals such as chromium and cadmium, which are suspected human carcinogens. Emissions from waste incineration processes are directly related the type and amounts of waste. Ineffective and inconsistent municipal waste collection services in many informal areas promote the burning of domestic waste.

Objective: To have acceptable emissions from waste burning and to minimise emissions from uncontrolled burning in landfill site.

Proposed ***short term (2008/9) interventions*** are as follows:

- Introduction of tyre regulations by DEAT. The Chief Directorate: Pollution & Waste Management – Waste Stream Management has drafted a Waste Tyre regulation which is not yet in force.
- Develop National legislation for dioxin control. This will form part of the Emissions Standards document to be gazetted in March 2009. In addition, DEAT's Chief Directorate: Pollution & Waste Management – Waste Stream Management is currently looking at emissions limits for incinerators and for cement kilns co-processing hazardous waste.
- Develop an emissions inventory of waste burning sources (incinerators, sewage and waste water treatment works, etc.). SDM's AQM sub-directorate is to coordinate the process. FDDM has set a target of December 2008.
- Incineration policy. DEAT's Chief Directorate: Pollution & Waste Management – Waste Stream Management is currently looking at emissions limits for incinerators.
- Landfill permitting backlog project by DEAT.
- Use music, art, poetry and drama to disseminate information. DEAT together with local authorities. This forms part of DEAT's Clean Fires Campaign. SDM's AQM sub-directorate is to coordinate and FDDM to form partnerships with arts activists.

Short – medium term (2012) interventions are as follows:

- Undertake a comprehensive study on the impact of dioxins. DEAT's Chief Directorate: Pollution & Waste Management – Waste Stream Management is currently looking at dioxin emissions limits for the country using the internationally accepted "Dioxin Toolkit" developed through UNEP. This will give an estimate of the total dioxin emissions in the country and will identify priority areas.
- Proper refuse removal by local authorities (SDM, FDDM, COJ). FDDM has completed an Integrated Waste Management Plan (IWMP). SDM will coordinate it through their Local Municipalities.
- Local authorities to create awareness around recycling. SDM's AQM sub-directorate is to coordinate. FDDM's completed IWMP identified projects to be implemented.
- Vaal Environmental Justice Alliance (VEJA) - DEAT school programme.

Proposed ***medium - long term (2017) interventions***:

- Use energy from waste burning to generate electricity - DEAT and DME.

5.10 Government Capacity for Air Quality Management

The capacity in government pertains to all spheres of government including National, Provincial and Local Authorities. The government bodies directly involved in air quality management in the VTAPA include DEAT, Gauteng Province (in the form of GDACE), Free State Government, Sedibeng District Municipality and Fezile Dabi District Municipality.

Problem: Lack of capacity in terms of resources, tools and finances for air quality management and control in all spheres of government.

With the introduction of AQA, air quality management responsibilities are transferred to Local Government. However, Local Municipalities currently have limited capacity for air quality management and control and as a result air quality management is not prioritised. Additionally, air quality functions often form part of other environmental related functions which limits the effectiveness of air quality management in the region. As a result, air quality management and control is addressed in an adhoc manner which limits its effectiveness.

Objective: To ensure that emissions from pollution sources are controlled through good governance at a National, Provincial and Local Level through the prioritisation of air quality issues in Government, finances and resources to be made available and capacity building in air quality management.

Proposed ***interventions*** in the ***short term:***

- Development of an implementation manual for the VTAPA AQMP to be distributed to the relevant local authorities. This is to be completed in September 2008.
- Publication of National Ambient Air Quality Standards with allowable frequency of exceedances and implementation timelines. DEAT has drafted S9 notice which was approved by the minister. The draft is currently under discussion at the SABS and is likely to be gazetted for public comment in February 2009.
- Listed activities and related emission standards must be published by DEAT. The draft minimum emission standards are finalised and submitted to SABS for further technical assessment. The standards will be finalised by January 2009 and gazetted for public comment by March 2009. The emissions standards, including emissions monitoring and reporting requirements will come into effect 11 September 2009.
- On-line stack monitoring, as specified in the National Framework must be established by DEAT. Emissions monitoring and reporting requirements is to be gazetted as part of Section 21 notice and will come into effect 11 September 2009.
- National Framework Review and Publication of the National Framework by DEAT. This will be on 11 September 2009.
- Review of current APPA Registration Certificates and conforming into new revised RCs and eventually AELs by DEAT. This project will be completed by end 2008.
- The local authorities and DEAT is to develop government/community/industry liaison committees. DEAT recommends that the existing MSRG/AQOF as established during the VTAPA AQMP project be used.
- Regulations on fee calculator to be used in calculating the prescribed processing fee for atmospheric emission licenses by DEAT as part of the APPA RC Review project. The regulations will be drafted as soon as the fee calculator has been completed in October 2008.
- DEAT is to develop an atmospheric user charge concept. This will be done once the license fee calculator has been completed.
- Companies Social Responsibility programme. This pertains to all the industries within VTAPA.
- Enforcement and compliance by the Green Scorpions.
- Marketing of the priority area by DEAT.
- A standardised air quality dispersion model to be identified as part of the National Framework and housed by DEAT.
- Development of detailed action plans for all interventions as stipulated in the VTAPA AQMP to be incorporated into the revised AQMP. DEAT, together with provincial governments (GP & FSP) and the local authorities (SDM, FDDM & COJ). SDM has appointed consultants to identify and assess the resources and operational system requirements for the delivery of an effective air quality management service.
- Review and update of VTAPA AQMP to include the detailed emission reduction strategies provided by industry and government - DEAT together with together with provincial governments (GP & FSP) and the local authorities (SDM, FDDM & COJ). This should be incorporated into the central Distrci Municipality database.
- Establishment of a separate, dedicated air quality division within each level of Government whose specific functions are related to air quality management and control. SDM is in the process of establishing such as section with capacity building in progress. FDDM restructuring was approved in 2007 and the Coordinator: Municipal Health Services, Auxiliary services will deal with environmental pollution, including air pollution.
- Each sphere of Government to appoint a skilled, trained air quality officer (AQO) FDDM designation to be finalised by June 2008 and SDM is still within the structural phase.
- Air Quality Management courses to be held in collaboration with each Municipality and Province. DEAT, GP, FSP, SDM, FDDM & COJ. SDM and GDACE have successfully completed the NACA/University of

Johannesburg Air Quality Management Course. FDDM attended all courses/workshops organised by DEAT.

- Regulations for the management of ozone depleting substances. DEAT is awaiting the completion of the functional analysis.
- Emphasize prevention and improvement, not correction (DEAT).
- Generic by-law development and modelling. A draft has been developed by DEAT.
- Regulations in respect of the 'prescribed form' for atmospheric impact reports should be provided by DEAT.
- Institutional reform at Local Government Level – establishment of structure. This should be done by the district and local municipalities.
- Setting up of the 'Emission Licensing Authority' in Sedibeng District. SDM is in negotiations with DEAT to get the authority to issue APPA Registration Certificates.
- Encouragement of the planting of trees. This is an on-going process at FDDM and SDM in collaboration with the local municipalities as well as the Gauteng and Free State provinces.

Short – medium term (2012) interventions:

- Expand, upgrade and improve the first level emissions inventory developed for the VTAPA and to be housed by DEAT (within the short – medium term) in collaboration with SDM, FDDM & COJ.
- Comprehensive health risk assessment to be conducted for the VTAPA based on hospitalisation records and updated population statistics. DEAT and local authorities.
- Air Quality directives to be established in the priority regions by the district and local authorities.
- Quarterly reporting to Councils on air quality in the area by the district and metropolitan municipalities.
- Improvement projects not to be delayed by full EIA processes and waiting for RODs. Provincial government (Gauteng and Free State).
- Installation of additional monitoring stations by the local authorities, mainly SDM, FDDM and COJ. SDM has re-commissioned one Opsis station in Enfuleni Local Municipality. This will form part of the air quality management plan process to start in last quarter of 2008 at FDDM.
- Ensure all air quality monitoring stations are SANAS accredited as stipulated by DEAT. All the current ambient monitoring stations are in the process of being accredited.
- Institutional restructuring at provincial level to create a unit that specialises in air quality functions only (Gauteng and Free State).
- VEJA councillors programme to be done in cooperation with SDM, FDDM & COJ.
- Widespread public awareness and education to mobilise people so that air quality issues become prioritised by politicians (DEAT, GP, FSP, SDM, FDDM & COJ). Local Municipalities should continue ongoing educational programmes and include air quality related issues.
- Develop ways of informing politicians (e.g. PCF), and raising awareness by DEAT and the local authorities. Air quality is a standing item in the Portfolio and Mayoral committees' meetings at FDDM. SDM has information sharing sessions with politicians and through Section 80 meetings.

5.11 Information Management

Problem: The availability and dissemination of air quality information is a major obstacle affecting air quality management and control.

Very little historic air quality monitoring data is available in the region, with air quality monitoring previously undertaken by the industries in the region. In addition, current monitoring practices are not standardised and as a result, information is often scattered and fragmented and insufficient data is collected and collated, with data not routinely transferred into information.

Objective: To ensure that information is readily available to stakeholders through sufficient data collection, collation and dissemination. Prioritisation of ambient air quality monitoring (comprehensive monitoring network) and the standardisation of monitoring practices and ensure SANAS accreditation.

Proposed ***interventions*** are provided below for the ***short term (2008/9)***:

- DEAT should publish a quarterly AAQ progress report on the National website and email to stakeholders. This will eventually form part of SAAQIS.
- A centralised, electronic complaint register database should be developed at all Municipalities. Both SDM and FDDM are in the process of developing a central electronic complaints register.
- DEAT should conduct a comprehensive survey on the impact of air quality information/products by all stakeholders.
- Source apportionment by chemical mass balance at three sites (led by DEAT and Eskom to support).
- An epidemiological study should be initiated to establish baselines to allow the track of improvements between current and future improved trends. This should be led by DEAT with Eskom and other industries and local authorities as partners.
- Comprehensive emissions inventory compiled and regularly updated as part of SAAQIS. DEAT has appointed a service provider for compiling a comprehensive emission inventory for the green house gasses. This will be incorporated into SAAQIS once hand over to DEAT at finalisation of project. The South African Weather Services should also be involved to provide standardised meteorological datasets.
- Develop a 'Did You Know' website of air quality information/data. This should include positive issues e.g. reduction of emissions etc setting up of communication system i.e. complaints with industry. This should be done by DEAT together with local academic institutions.
- Wall newspapers (DEAT).
- Community Information Strategyby VTAPA MSRG & AQOF. This should be an ongoing process.
- Publish information on who's who in the air quality management industry in the area. This can be published on the National website. DEAT has developed regulations relating to information management with regard to atmospheric emission licences and will form part of the regulations as soon as APPA is repealed.
- Sedibeng to have two operational air quality monitoring stations. Feed data into the data management system at SDM.

Short – medium term interventions:

- SANAS accredited monitoring methodologies and standard QA/QC. This will be done through DEAT's SAAQIS project.
- Public access to all emission inventories. This will be through SAAQIS.
- Environmental literacy programme for learners and educators to be initiated by DEAT.
- Develop booklet of FAQ with responses from DEAT (to be updated regularly).
- All monitoring stations to have meteorological equipment and to be to be SANAS accredited (SDM, FDDM & COJ).
- VEJA to feed back to all affiliates and collaborate with SDM, FDDM & COJ.
- Development of an electronic, centralised air quality monitoring database. This will be developed as part of the South African Air Quality Information System (SAAQIS). The SAWS should also be involved.
- National upper-air meteorological network should be established by DEAT and the SAWS.

6 AIR QUALITY MANAGEMENT PLAN IMPLEMENTATION STRATEGY

An AQMP cannot be successfully implemented and revised in the absence of an effective air quality management system. Essential tools in an air quality management system include an emissions inventory, dispersion modelling and source and ambient air quality monitoring. Capacity, in terms of resources and finances, within the VTAPA needs to be developed to ensure the effective and successful implementation of the AQMP.

6.1 Ambient Air Quality Monitoring

An ambient air quality management system consists of various hardware, software, communication systems as well as activities related to the ongoing maintenance and calibration of the system. Continuous ambient air quality monitoring requires among others, a set of trace gas analysers housed in a secure shelter, meteorological equipment, a data communication and acquisition system, as well as various other mechanical, civil and electrical structures such as an inlet manifold, fencing, concrete plinth, air conditioner, Uninterrupted Power Supply (UPS) and safety devices such as a lightning conductor. The monitoring equipment must be maintained and calibrated on a regular basis.

The objectives for implementing a monitoring network will determine the pollutants to be monitored and the frequency and duration of monitoring required. Subsequently this will inform the type of equipment to be installed. Objectives for monitoring is typically to determine the status quo of the air quality in the region, or to determine compliance with ambient air quality objectives, to provide trend analysis or to track progress due to the implementation of mitigation measures, to demonstrate continuous improvement or to use as dispersion model validation. Examples of monitoring equipment have been included in the AQMP for the VTAPA.

In addition, vehicle monitoring, in particular diesel smoke testing, is an effective method to determine if vehicle emissions are acceptable. Traditionally, testing of diesel vehicle emissions has been undertaken using a Hartridge smoke meter in accordance with the requirements of APPA. Diesel vehicle testing can also be undertaken using the mobile Smoke Check 1667 instrument. An important criterion is that the instrument should be able to measure smoke from turbocharged diesel-driven vehicles.

6.2 Ambient Air Quality Management

6.2.1 Emissions Inventory

A first requirement for effective air quality management and control is the establishment of a comprehensive, accurate and electronic emissions inventory of all identified sources. An emissions inventory includes information on source parameters and associated pollutant emission rates. As part of the baseline assessment undertaken for the VTAPA AQMP, a first level emissions inventory has been established. It was recommended that this emissions inventory be updated and expanded to include all the sources of emissions. All sources of atmospheric emissions should be identified and quantified, including point and non-point sources. In order to assist in the data collection phase it was recommended that use be made of the tertiary institutions within the VTAPA. Student can do the field work in identifying additional sources of emissions, collecting information from the outstanding sources and be used for traffic counts to update the vehicle emissions database. It is however important that the emissions inventory development be done by DEAT and the skills developed in house in order to transfer these skills to the local government sector. The eventual goal is to incorporate this emissions inventory into the SAAQIS to form part of a central database.

6.2.2 Dispersion Modelling

Atmospheric dispersion modelling forms an integral component of air quality management and planning. Dispersion models calculate ambient air concentrations primarily as functions of source configurations, emission strengths, terrain features, and meteorological characteristics. The CALMET/CALPUFF suite of models used in the baseline assessment and it was recommended that this model be used in future reviews of the VTAPA AQMP in the short to medium term. A dispersion modeller should be appointed to manage, update and run the model. The model results should be linked to the GIS System and the information made available to the public. This should also eventually be incorporated into the SAAQIS system.

6.3 Human Resources

For this AQMP to be effective, co-operative governance and political buy-in across all spheres of government will be required, as well as the capacity to enforce compliance with the new legislation. It is recognised that air quality management and control is primarily a function of the Local Municipalities with emission licensing functions undertaken by District and Metropolitan Municipalities. In order to increase the capacity in Local Government, authorities need to invest both time and capital. For Municipalities to fulfil their regulatory role in terms of air quality, dedicated personnel need to be appointed. As required by current legislation, Air Quality Officers must be appointed within National, Provincial and Local Government. Requirements and responsibilities for the various positions regarded essential in air quality management were provided.

6.4 AQMP Review Requirements

The Final AQMP will be published in the Government Gazette for public comment once it has been approved by the Minister.

The VTAPA AQMP will be revised within 2 years (i.e. 2010), following which it will be revised every 5 years unless otherwise required by DEAT.

As part of the VTAPA AQMP implementation strategy, the MSRG and AQOF for the VTAPA will meet every 2 months to report on progress made on the implementation of the plan within the short term (2008/9).

7 CONCLUSION

An AQMP was developed for the VTAPA during 2007 and 2008. The main objective was to develop a plan that will ensure, once implemented, that air quality in the area will be brought into sustainable compliance with ambient air quality objectives and within agreed timeframes.

The development of the VTAPA AQMP followed a participatory approach through the development of an Air Quality Officers Forum and a Multi Stakeholder Reference Group and identification of interested and affected parties. The Air Quality Officers Forum and a Multi Stakeholder Reference Group met every month during the development of the plan, and will meet every second month during the implementation of the plan. In addition, two public workshops were held, allowing all stakeholders to partake in the process.

The AQMP is based on scientific data obtained from the baseline characterisation study conducted in 2007. All sources of emissions were indentified and quantified with dispersion modelling conducted to determine the current state of air quality within the Vaal Triangle. This was done for the criteria pollutants of PM_{10}, SO_2 and NO_2. The predicted concentrations were verified through available ambient monitoring data. Predicted PM_{10} ground level concentrations exceeded the VTAPA air quality objectives within six areas, called "hotspot zones".

Exceedances of acute SO_2 and NO_2 concentrations were predicted in localised areas. The main contributing sources were identified and the percentage reductions required to bring the ambient air quality in line with the air quality objectives were calculated. Based on this, all contributing sources developed emission reduction strategies which were included into the final intervention strategies. The various spheres of government responsible for the implementation of the plan were assessed in terms of capacity, organisational structures, systems and air quality management tools.

In addition to the impact zones, eleven problem complexes were identified i.e. (i) Biomass Burning, (ii) Domestic Fuel Burning, (iii) Iron and Steel, and FerroAlloys, (iv) Mining, (v) Petrochemical, (vi) Power Generation, (vii) Small Industries, (viii) Transportation (ix) Waste Burning (x) Government Capacity for Air Quality Management, and (xi) Information Management. A problem tree was established for each problem complex and turned into an objectives tree for which strategies and interventions were developed. The emissions reduction strategies were linked to the intervention strategies within the relevant problem complex. The intervention strategies included a implementation timeframe, the parties responsible for the intervention and the current status. A number of interventions within each problem complex were expanded into action plans providing assumptions associated with the intervention strategy, estimated costs, timeframes and indicators.

An implementation manual was drafted to assist national, provincial and local authorities in the implementation of the VTAPA AQMP. The plan will be reviewed in 2010, realigning the intervention strategies to ensure continuous improvement in ambient air quality.

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