CLEAN DEVELOPMENT MECHANISM
PROJECT DESIGN DOCUMENT FORM (CDM-PDD)
Version 02 - in effect as of: 1 July 2004)

CONTENTS

Annexes

SECTION A. General description of project activity

A.1 Title of the project activity:

Omnia Fertilizer Limited Nitrous Oxide (N_2O) Reduction Project
Version 5: September 25, 2006

A.2. Description of the project activity:

Omnia's nitric acid plant, designed by UHDE GmbH, operates on the dual pressure process; medium pressure of 4.5 bar for oxidation and high pressure of 9 bar for absorption. It was commissioned in 1983 with an original design capacity of 650 t/day of 100% nitric acid concentration equivalent. The plant has subsequently undergone several upgrades and during the 1999/2000 upgrade, the plant production capacity was increased to 748t/day, based on 100% nitric Acid.

Nitric acid (HNO_3) produced at Omnia's nitric acid plant is used as a feedstock in another section of the plant to produce ammonium nitrate (NH_4NO_3) which is in turn used for fertilizers.

The process entails taking ammonia gas and combining it with compressed air at a ratio of 1 to 9 and going through a 3 stage process to produce nitric acid as follows:

Step 1 – Ammonia Oxidation:
Ammonia gas and compressed air at a pressure of 4.5 bar and 750 to 890°C is oxidized across a precious metal catalyst to produce Nitric Oxide (NO), water (H_2O) as per the main reaction 1.

$$4\ NH_3 + 5\ O_2 \longrightarrow 4\ NO + 6\ H_2O \qquad \text{(reaction 1)}$$

Additionally, there are two side reactions which form the undesirable nitrous oxide (N_2O) and N_2 as per reactions 2 & 3:

$$4\ NH_3 + 3\ O_2 \longrightarrow 2\ N_2 + 6\ H_2O \qquad \text{(reaction 2)}$$
$$4\ NH_3 + 4\ O_2 \longrightarrow 2\ N_2O + 6\ H_2O \qquad \text{(reaction 3)}$$

NO yield, typically in the range of 95 to 97%, depends on the pressure and temperature in the ammonia oxidation reactor and the catalyst used.

The preferred catalyst typically consists of platinum wire alloyed with 5 to 10% rhodium and up to 5% palladium and knitted into mesh gauze. Under these conditions, the oxidation of ammonia to nitric oxide occurs as an exothermic reaction at temperatures of 750 to 899°C, with a range of 93 to 98% NO yield. This yield increases with temperature up to about 880 to 890°C. Catalyst temperatures above and below this range, increase the less desirable production of N_2 and N_2O production while reducing NO yield(1). Omnia operates its catalyst at very high temperatures of about 890°C to maximize NO production and reduce the undesirable production of N_2O and N_2.

During the reaction, some of the platinum and rhodium from the catalyst vaporizes. Due to such loss, the efficiency of the catalyst drops over time and increases the generation of N_2O while reducing the NO yield. Indications are that N_2O generation is about 20% below the campaign average at the beginning of

---

(1) Dutch notes on BAT for the production of nitric acid, December 1999

a campaign and 20% above the average at the end (2). In an effort to maximize NO yield, while reducing N_2O generation, the catalyst or platinum gauzes is periodically replaced. The time between the replacements of the platinum gauzes is referred to as a 'campaign'.

Step 2 – Nitric Oxide Oxidation

The gases formed from exothermic reactions 1 to 3 are cooled in a condenser or waste heat recovery boiler and the nitric oxide (NO) is subsequently oxidized with secondary air to produce nitric dioxide (NO_2) as per:

$$2\,NO + O_2 \longrightarrow 2\,NO_2 \qquad \text{(reaction 4)}$$

Step 3 – Absorption

The nitric dioxide (NO_2) is passed through the absorption column where it is absorbed by the water flowing in a counter flow direction to the gas, to produce nitric acid (HNO_3) as per reaction 5:

$$3\,NO_2 + H_2O \longrightarrow 2\,HNO_3 + NO \quad \text{(reaction 5)}$$

The cooled converted gas, consisting mostly NO_2, enters the bottom of the absorption column and flows to the top of the column through a set of about 50 sieve trays. Process water is fed to the column in two streams – demineralised water to the top tray and an ammonium nitrate plant condensate to the tray third from the top. Many of the trays have cooling coils to remove the heat of reaction. Product acid (60%wt) exits the bottom of the column inner space, under level control. The pressure of the gas to the absorption column and the temperature of the water to the column influence absorption efficiency – the product acid concentration can also be controlled by the amount of water fed to the column. Increased water flow would result in a lower concentration of product nitric acid, but this flow is controlled to give a final product acid with a concentration ranging from 58% to 60%. Spent gas exits the top of the absorption column. The gas that has not been absorbed in the nitric acid solution, generally referred to as 'tail gas', is exhausted from the top of the absorption column and vented through the stack. The aqueous solution of nitric acid at a concentration of 58 to 60% is withdrawn from the bottom of the absorption column while the NO is oxidized to NO_2 according to reaction 4.

Some of the N_2O formed in reaction 3 may be destroyed upstream of the absorption column by both high temperature homogenous gas phase decomposition and catalytic decomposition on the platinum deposits formed downstream of the ammonia burner from the metal lost from the ammonia oxidation catalyst. The absorption column acts as a very efficient scrubber and prevents any platinum dust carryover into the tail gas. Even if some does get through, the tail gas temperature is lower that what is required for homogeneous gas phase N_2O decomposition. Consequently, there is no relevant destruction of N_2O in the tail gas downstream of the absorption column unless an N_2O destruction facility is installed. In the absence of such facility, whatever N_2O has reached the tail gas section is discharged to atmosphere.

The project activity will reduce the N_2O emissions from the Omnia Fertilizer Limited (hereinafter referred to as Omnia) Sasolburg, South Africa nitric acid plant by up to 98% by installing an N_2O catalytic reduction facility in the tail gas section of the process downstream of the absorption column. Catalytic reduction of N_2O occurs when the N_2O reacts with a reducing agent in contact with a catalyst. The reaction removes the oxygen from the N_2O molecules and forms one or more compounds. In the case where the reducing agent is natural gas, comprised mostly of methane (CH_4), the reaction is:

---

(2) PDD – Nitrous oxide emission reductions at Lovochemie – CZ, August 2005 – Version 2, page 9.

$$3\ N_2O + CH_4 \longrightarrow CO + 2\ H_2O + 3\ N_2 \qquad \text{(reaction 6)}$$
$$4\ N_2O + CH_4 \longrightarrow CO_2 + 2\ H_2O + 4\ N_2 \qquad \text{(reaction 7)}$$

Note however that some side reactions between the reducing agent and other constituents in the tail gas can occur that will consume some of the reducing agent. Regardless, consumption of the reducing agent will be fully monitored and any additional CO_2 generation, due the side reactions, fully accounted for.

This project activity will not result in any revenue to Omnia other than the income from the sale of CERs. It is expected to reduce up to 98% of the N_2O emissions that would normally be emitted without the project activity. Calculations ex ante emissions reduction, based on the current monitoring data over a full campaign, indicate that the proposed project activity has the capacity to reduce greenhouse gas (GHG) emissions by 3,948,410 tCO_2e over the first 7 year crediting period.

Additionally, the project has the potential to:

- being the first nitric acid plant in South Africa to seek registration, it can act as the catalyst to encourage other South African nitric acid producers to implement N_2O reduction measures;
- create construction jobs for the initial erection of the N_2O reduction facility as well as sustainable employment in maintaining the reduction facility as well as monitoring its performance;
- use a portion of the revenue from the sale of CERs to help alleviate employment and poverty in the municipality where the nitric acid plant is located;

In effect, the project brings not only environmental benefits in the form of substantially reduced N_2O and NO_x emissions, but social and economic benefits, contributing to the South African government's sustainable development objectives.

The project proponent is requesting approval from South Africa's DNA for voluntary participation, confirming that the project is in total compliance with the country's sustainable development objectives.

A.3. Project participants:

Table 1: Project Participants

Name of Party Involved	Private or Public Entity	Is the Party Involved a Project Participant?
Republic of South Africa (host)	Omnia Fertilizer Limited (private entity	No

Project Operator

Omnia Group, in business since 1953 and listed in the Chemicals, Oils and Plastics sector of the Johannesburg Stock Exchange will be the project operator.

The Group supplies fertilizer to the agricultural industry, explosives to the mining industry and industrial chemicals. Omnia's operations are located in South Africa, Ghana, Kenya, Mauritius, Tanzania, Zambia, Zimbabwe, Australia, New Zeeland, France and Brazil.

Omnia's strength lies in a strong and distinctive culture, which was inspired by its founders and is still being nurtured by the current management. It is an ethos that combines the values of a family business with the strengths of professional management.

There is a total commitment to high standards of service and a constant drive to exceed the expectations of customers and colleagues; investors, suppliers, regulators and community enterprise with a high level of integrity.

The Sasolburg factory operates the following plants:

- a dual pressure UHDE designed Nitric Acid plant producing about 60% concentrated nitric acid
- an ammonium nitrate plant producing 89% ammonium nitrate solution
- a fertilizer granulation complex with two (2) production lines:
    - one line to produce LAN (CAN), ASN and NP, NPK and NPKS grades of granular fertilizer (except DAP type grades)
    - a second line, based on Grande Paroisse technology and commissioned in 1999, to produce any NP, NPK and NPKS grade including DAP
- a liquid and granular calcium nitrate plant developed in-house
- an ammonium nitrate/calcium nitrate mix plant producing an intermediate for emulsion explosives manufactured by its sister company Bulk Mining Explosives (BME)
- a single Superphosphate plant
- Mannheimer furnace licensed from Norsk Hydro, producing potassium sulphate and hydrochloric acid and marketed by its sister chemical company Protea Chemicals
- several dry and liquid materials handling, blending and packaging units
- animal feed grade mono calcium phosphate
- a liquid fertilizer plant producing both clear liquids and suspensions
- a specialty fertilizer (100% water soluble) blending and packaging operation
- direct ammonia to soil application equipment and technical back-up facility

Project Technology Provider

UHDE GmbH (hereinafter called UHDE), a 100% subsidiary of ThyssenKrupp Technologies AG. UHDE is one of the world market leaders in the field of fertilizer technology engineering and construction. It has constructed many modern fertilizer plants including OMNIA's Sasolburg nitric acid plant. The company has developed a tertiary catalyst based process for removing up to 98% of the N_2O from a nitric acid plant's tail gas stream.

A.4. Technical description of the project activity:

A.4.1. Location of the project activity:

A.4.1.1. Host Party(ies):

Republic of South Africa

A.4.1.2. Region/State/Province etc.:

Free State Province, Republic of South Africa

A.4.1.3. City/Town/Community etc:

Sasolburg in the municipality of Metsimaholo.

A.4.1.4. Detail of physical location, including information allowing the unique identification of this project activity (maximum one page):

The project site is located in the industrial town of Sasolburg in Free State Province. This town, founded in 1954 to provide housing and facilities to employees of SASOL (South African Coal, Oil, and Gas) lies in the heart of South Africa's chemical industry and is located about 80 km south of Johannesburg . Its population is 81,500.

Free State is the 3rd largest province in South Africa and covers an area of 129,480 km2 or 10.6% of the country's land mass of 1.220 million m2. It has 2.706 million (2001) people, with a relatively slow rate of growth measuring 2.8% from 1996 to 2001, and represents 6.1% of the country's 44.3 million population. It is centrally located within the country and is bounded by six other provinces and the country of Lesotho.

Figure A shows the Free State Province in relation to the rest of South Africa. The province is amplified in fig. B with the city of Sasolburg shown thereon. The last map, fig. C, shows the city of Sasolburg in relation to Johannesburg, South Africa's largest city.

fig. A: Map of South Africa

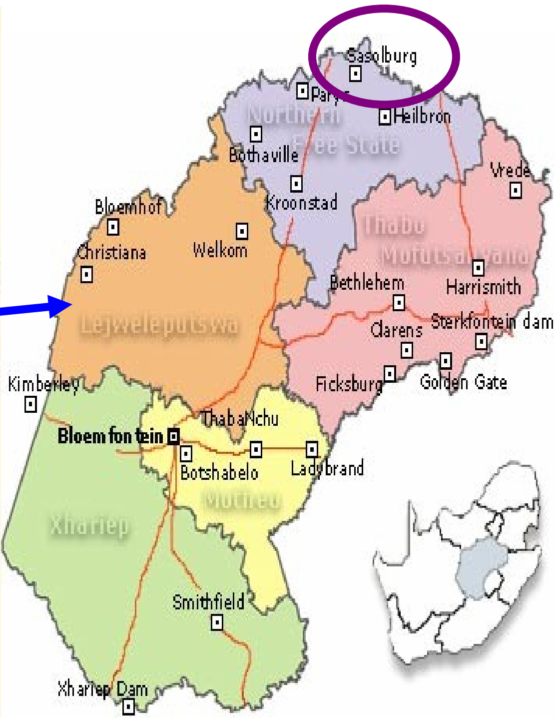


Fig. B: Free State Province

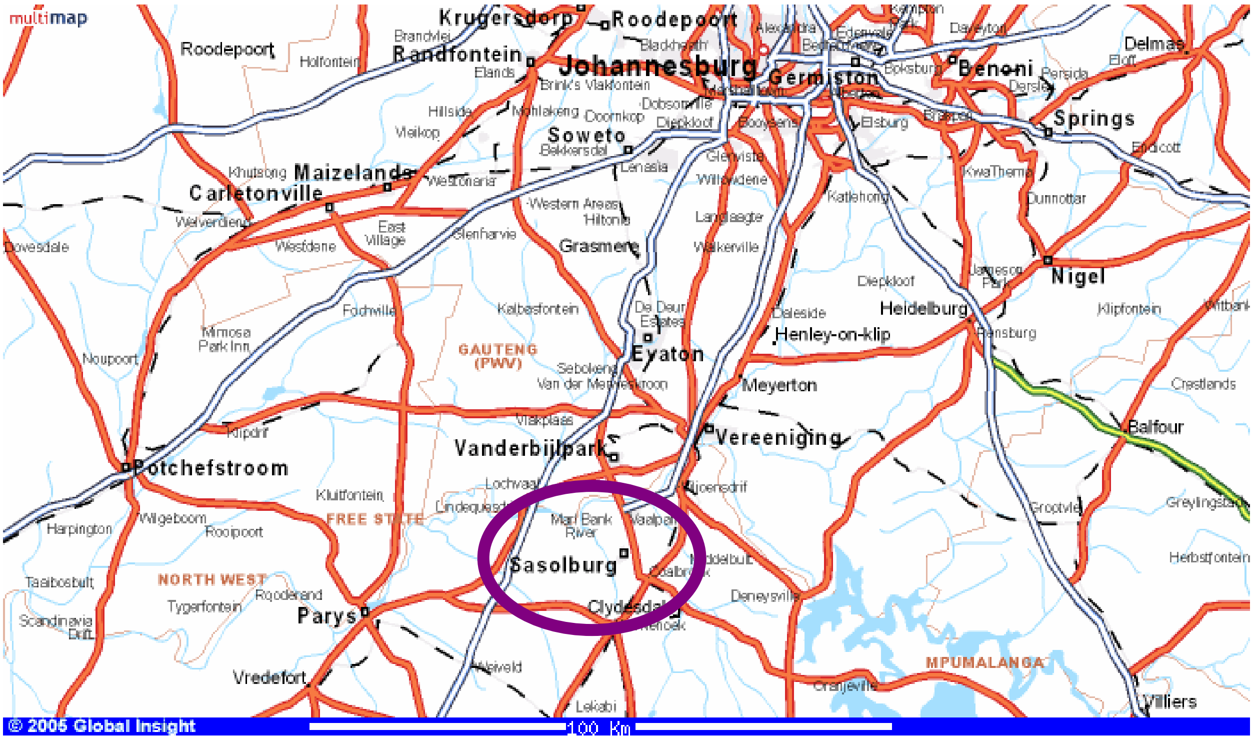


Fig. C: Map of Sasolburg Relative to Johannesburg

A.4.2. Category(ies) of project activity:

Category 5: Chemical Industries listed in the Sectoral Scopes for accreditation of the operational entities

A.4.3. Technology to be employed by the project activity:

A number of technologies are available for the destruction and/or removal of N_2O from nitric acid plants:

Non Selective Catalytic Reduction (NSCR) $DeNO_x$ Unit

A NSCR $DeNO_x$ unit, although primarily installed to destroy NO_x, also destroys much of the N_2O emissions from the tail gas of nitric acid plant. The NSCR $DeNO_x$ unit uses a fuel and a catalyst to consume the free oxygen in the tail gas and convert the NO_x to elemental nitrogen. This technology although installed in nitric acid plants built between 1971 and 1977, was largely stopped because of high energy costs and the associated high tail gas temperature, in excess of 550°C, which requires more exotic materials for the construction of the expander and increases overall maintenance costs.

Primary: In this category the technology used minimizes or prevents altogether the formation of N_2O. Implementing this technology requires modifications to the platinum/rhodium ammonia oxidation gauzes. Alternately another catalyst can be used to oxidize ammonia and produce a reduced amount of N_2O by-product but it suffers from being less selective in producing NO.

While this option reduces N_2O production in the ammonia oxidation reactor, it is deemed unattractive and unacceptable by nitric acid producers because it severely reduces the facility's capability to produce nitric acid.

Secondary or High Temperature Systems: This technology uses a catalyst to remove the N_2O by-product formed. The catalyst can be installed anywhere between the outlet of the ammonia oxidation gauzes and the inlet to the absorption column. The preferred location for this catalyst is directly below the ammonia oxidation gauzes.

This approach, while effective in reducing N_2O emissions, is virtually impossible to quantify in terms of N_2O reduction efficiency other than by before and after measurements. While claims of reducing N_2O emissions by up to 90% have been made by the various technology providers, such claims are impossible to confirm by direct measurements and rely entirely on 'before and after' type measurements. Moreover, even if one was to produce a baseline from plant data operating without the N_2O destruction catalyst, a new baseline would have to be generated every time a new supplier or configuration of the precious metal gauzes in the ammonia oxidation reactor was used.

Tertiary or Low Temperature Systems: This, the preferred technology, entails removal of the N_2O formed, from the tail gas downstream of the absorption column, by catalytic reduction. The optimum location for the catalyst in this case is at the hottest position in the tail gas stream. This option requires the construction of a separate reactor and the injection of trace quantities of natural gas and ammonia to promote the catalyst's ability to remove N_2O. Its advantages are:

- There is no interference with the nitric acid production process. It will not increase nitric acid production and there is no financial incentive to implement the proposed project activity.
- The catalyst used with this technology is expected to last more than 4 years and can be safely disposed of in the local landfill.
- It incorporates a selective catalyst capable of destroying up to 98% of the N_2O emissions and reduce NO_x to less than 5 ppmv thereby leading to additional environmental benefits;
- Technology is tried and reliable as there are several nitric acid plants in Western Europe which have operated over three (3) years with this technology, and the largest nitric acid producer in Africa (Egypt) is currently proceeding to install the same technology.
- Overestimation of the N_2O baseline is not possible because it is not technically possible to destroy N_2O downstream of the location where the tertiary technology proposed for this project activity is to be installed.
- This technology is an end of pipe process similar to well established catalytic NO_x reduction processes and should be readily accepted by plant operators.

The catalyst proposed destroys Nitrous Oxide, in the presence of a reducing agent, to nitrogen and water vapour at temperatures from 310 to 355^{o}C. It is composed of iron zeolite and spent catalyst, can be safely disposed at landfill site or returned to the local manufacturer in Sasolburg for disposal.

Transfer of this tertiary technology would entail two components. The first component involves the equipment and instrumentation and the second involves the catalyst. In the case of the equipment and instrumentation, detailed drawings would be provided by the UHDE GmbH for partial construction and full assembly in South Africa under the supervision of UHDE's on site technicians. These technicians would also direct the commissioning of the project activity and train Omnia's personnel in the maintenance of the equipment, calibration of the instrumentation and recording of the data. Detailed Operation and Maintenance Manuals would also be provided to Omnia. As regards the catalyst, it is likely that the technology to produce it will be transferred to Sud Chemie in Sasolburg by its parent corporation in Europe.

UHDE GmbH, the project technology provider, has developed a highly efficient tertiary technology based N_2O destruction process for nitric acid plants called the EnviNOx® – System. It is installed in the tail gas

stream, between the existing absorption column and the tail gas turbine as shown in fig. 1. **Error! Objects cannot be created from editing field codes.**
The EnviNOx®-System, proposed for use at Omnia, will be located between the last tail gas heater and the tail gas turbine which is the position with the highest tail gas temperature in the process. It consists of a reactor containing two catalysts and requires the addition of gaseous ammonia and natural gas into the tail gas(3). In the presence of the catalyst, the facility reduces up to 98% of the N_2O to N_2 and O_2. According to the technology provider, the NO_x content in the tail gas, currently in the range of 200 - 300 ppmv, must be reduced to practically zero in the reactor for the efficient reduction of nitrous oxide. Consequently, while such a NO_x reduction level is not required within the current regulations, installation of this project activity will provide the added environmental benefit of reducing NO_x to practically zero.

According to Uhde, the EnviNOx®-System has a life expectancy equal to that of the existing nitric acid plant. Since Omnia's nitric acid plant, commissioned in 1983 and has a life expectancy of 50 years, the project activity is therefore expected to last at least 27 years. The technical characteristics of the EnviNOx® System for the project activity are:

- Tail gas reactor vessel with two (2) catalyst beds. The first catalyst bed consists of iron zeolite that is especially effective in catalysing the reduction of NO_x with NH_3, and the second bed contains an iron zeolite which is effective in catalysing the reduction of N_2O with hydrocarbons in the natural gas. The reactor operates at an inlet tail gas temperature ranging from 310 to 350°C approximately.
- Ammonia gas feed line at an absolute pressure of 12 bar and 100°C complete with a monitoring system to measure NH_3 gas flow, temperature and pressure.
- Natural gas feed line at 2.1 bar abs and 30°C complete with a monitoring system to measure gas flow, temperature and pressure.
- Static multi stage gas mixers to ensure thorough mixing of both ammonia and natural gas in the tail gas stream
- Ammonia evaporator (will consider using tail gas downstream of existing tail gas turbine as heat source)
- natural gas compressor (may not be required if natural gas supply is available at higher than the required pressure);
- instrumentation package complete with applicable analysers as required to monitor all of the necessary points;
- Venturi tube according to ISO5167-4:2003 for measurement of tail gas flow;

For the system to operate at its optimum N_2O reduction potential it will need to reduce the NO_x to almost zero. This it will do by the addition of ammonia (NH_3) at the rate stipulated by the technology provider. Natural gas (CH_4), the N_2O reducing agent, will also be added at the stipulated rate. The natural gas to be used as the N_2O reducing agent for this project is composed as per table 2:

Table 2: Typical Composition of Natural Gas
(source: Sasol Gas Limited – Specification of Natural Gas ex Mozambique)

Component	Concentration (% by Vol.)
Methane	98.13
Carbon Dioxide	0.49
Nitrogen	0.35
Ethane	0.61
Propane	0.27

---

(3) The supplier has provided a guarantee regarding the maximum requirement for these gases relative to the N_2O concentration.

Butane	0.15
Hydrogen Sulphide	4 ppmv maximum

All of the reactions in the reactor are exothermic. The resulting higher temperature of about 20°C in the tail gas, which would increase the energy recovery by the tail gas turbine is offset by the slight reduction in energy recovery caused by the additional 50+ mbar pressure drop from the installation of the N_2O destruction facility in the tail gas.

A.4.4. Brief explanation of how the anthropogenic emissions of anthropogenic greenhouse gas (GHGs) by sources are to be reduced by the proposed CDM project activity, including why the emission reductions would not occur in the absence of the proposed project activity, taking into account national and/or sectoral policies and circumstances:

In addition to aqueous nitric acid product at a concentration of 58 to 60%, the constituent gaseous emissions from the absorption column are in the tail gas at approximately the following concentrations:

- NO_x 200 to 300 ppmv (0.02 to 0.03%)
- N_2O 800 to 1,450 ppmv (0.08 to 0.15%) but ranges from 800 to 900 ppmv during the initial phase of the campaign and 1,400 ppmv by the end of the campaign
- O_2 2 to 4%
- H_2O 0.3 to 2% (as water vapour)
- N_2 96 to 97%

The emissions of nitrous oxide (N_2O) depend on the operating pressure for nitric acid plant and are typically as follows for the various plant types:

Low pressure plant (< 1.7 bar):	generate approximately 0.0042 t N_2O or 1.302 t CO_2 equivalent per tonne of 100% nitric acid produced;
Medium pressure plant (1.7 - 6 bar):	generate approximately 0.0074 t N_2O or 2.17 t CO_2 equivalent per tonne of 100% nitric acid produced;
High pressure plant (6.5 - 13 bar):	generate approximately 0.0097 t N_2O or 3.0 t CO_2 equivalent per tonne of 100% nitric acid produced;

Omnia's nitric acid plant was designed by UHDE GmbH to operate on the dual pressure process, medium pressure of 4.5 bar for oxidation and high pressure of 9 bar for absorption. As such, baseline N_2O emissions are calculated to be in the range of 2.5 tCO_2e(4) per tonne of 100% nitric acid production.

The proposed CDM project activity will reduce GHG emissions by converting the N_2O to elemental nitrogen (N_2) and water through the use of a catalyst, natural gas and ammonia as reducing agents. Ammonia is required to reduce the NO_x concentration in the tail gas to nearly zero in order to optimize the N_2O reduction efficiency of the project activity. The reducing agents will however add some GHG emissions through the conversion of the carbon in the natural gas (methane) to CO_2 and the CO_2 generated in the production of ammonia.

Implementing the project activity will result in an ex-ante estimation of GHG emission reductions, conservatively calculated at 451,191 to 488,455 tCO_2e per year based on the guaranteed N_2O reduction efficiency provided by the technology supplier to Omnia and a global warming potential of 310(5) for N_2O according to the rules of the Kyoto Protocol. This estimate is made for reference purposes only. Actual emission reductions will be determined based on the measurement results ex-post.

Under the 'business as usual' conditions, the project activity would not be implemented because:

- There are no national or provincial regulations or other legal obligations in South Africa currently in place regarding N_2O emissions. In effect the most current Air Quality Bill, issued in 2005 did not mention N_2O whatsoever. It is highly unlikely that any such limits on N_2O emissions would be imposed in the near future.
- The installation of a tertiary N_2O destruction facility requires a significant capital investment plus an on-going operating cost for the reducing agent and the periodic replacement of the catalyst. The project activity would not be commercially viable without the revenue from the sale of the CERs.

Although N_2O is a by-product, from the production of nitric acid, it has no commercial value and is typically released into the atmosphere.

The air emissions regulations in South Africa will however be monitored and if regulations controlling the emission of N_2O are introduced during the crediting period, the baseline emissions will be adjusted in accordance with the requirements of the regulations.

---

(4) Value calculated from production data, tail gas flow & N_2O concentration in tail gas from last 2 campaigns; refer to emission red calcs

(5) In *accordance with Article 5, Section 3 of the Kyoto Protocol; GWP value as agreed at COP3.*

A.4.4.1. Estimated amount of emission reductions over the chosen crediting period:

The project activity has the capacity to reduce GHG emissions by 3,313,368 tCO_2e over the first 7-year crediting period as shown in table 3 (Refer to Section E tables 7, 8 & 9 for details).

Table 3: Emission Reduction During the First 7-year Crediting Period

Year (1)	Annual Estimation of Emissions Reduction (tCO_2e)
2008	479,391
2009	488,455
2010	458,904
2011(2)	451,191
2012	488,455
2013	479,391
2014	467,580
Total Estimated Reductions	**3,313,368**
Total number of crediting years	**7**
Annual Average of estimated reductions over the crediting period	**473,338**

Notes:

(1) Year is defined as the time period between April 1 and March 31 of subsequent year

(2) Reduced production for this year is due to the 21 day major plant shutdown that occurs every 5 years vs the normal 7 day/yr minor shut down.

A.4.5. Public funding of the project activity:

The company is not receiving any public funding from either national or international sources.

SECTION B. Application of a baseline methodology

B.1. Title and reference of the approved baseline methodology applied to the project activity:

The project activity uses approved baseline methodology AM0028/Version 01, which has been approved and made publicly available by the CDM Executive Board during its 23rd meeting (Feb. 22 – 24, 2006).

Title: **“Catalytic N_2O destruction in the tail gas of the Nitric Acid Plants”**

B.1.1. Justification of the choice of the methodology and why it is applicable to the project activity:

Approved Methodology AM0028 states that the proposed methodology is applicable to project activities that destroy N_2O emissions either by catalytic decomposition or catalytic reduction of N_2O in the tail gas of nitric acid plants (i.e. tertiary destruction), where the following conditions apply:

- The applicability is limited to the existing production capacity measured in tonnes of nitric acid. Existing production capacity is defined as the designed capacity, measured in tons of nitric acid per year, installed no later than 31 December 2005.
- The project activity will not result in shut down of an existing N_2O destruction or abatement facility at the nitric acid plant;
- The project activity shall not affect the nitric acid production level;
- The project activity will not cause an increase in NO_X emissions;
- In case a DeNOx unit is already installed prior to the start of the project activity, the installed DeNOx is a Selective Catalytic Reduction (SCR) DeNOx unit;
- The N_2O concentration in the flow at the inlet and the outlet of the catalytic N_2O destruction facility is measurable;

The approved methodology AM0028 is applicable to the project activity, which is to install a catalytic N_2O destruction facility in the tail gas of Omnia’s nitric acid plant, because of the following conditions:

- The project activity will be limited to the existing capacity of Omnia’s nitric acid plant;
- Omnia’s nitric acid plant does not have any installed N_2O destruction or abatement technology to reduce tail gas N_2O emissions;
- Nitric acid production levels will not be affected by the project activity;
- The project activity will not cause any increase in NO_x emissions;
- There is no DeNOx unit presently in place;
- The N_2O emission reduction related to the project activity is calculated in real time from continuous measurement at the inlet and outlet of the catalytic N_2O destruction facility;
- The N_2O emission destruction facility will be installed in the tail gas stream where, because it is downstream of the absorption column, no homogenous destruction of N_2O would have occurred without the project activity;
- Omnia has maintained records of its nitric acid plant production data as well as the original design capacity and the subsequent upgrades which increased the plant capacity to 748 t/d. The methodology will therefore be applied to the plant’s existing production capacity of 748 t/day.

Moreover, continuation of the current situation is in line with all applicable regulations in South Africa. The legally binding regulations related to the project activity, under the authority of the South Africa Department of Environmental Affairs and Tourism (DEAT) deal with air quality. These regulations do not prevent Omnia from continuing to operate its nitric acid plant as presently set up and without the installation of the project activity.

Installation of a catalytic N_2O destruction facility requires a major capital expenditure, for the supply and installation of the equipment, as well as an on-going operating cost for the natural gas and ammonia used as well as the periodic replacement of the catalyst and the ongoing monitoring and maintenance of the facility. Installing this technology will not increase the capacity or operating efficiency of Omnia's nitric acid plant during the crediting period.

Based on the above, the project activity meets the conditions under which baseline methodology AM0028/Version 01 is applicable.

B.2. Description of how the methodology is applied in the context of the project activity:

Approved baseline methodology AM0028, 'Catalytic N_2O destruction in the tail gas of Nitric Acid Plants' is applied to Omnia's N_2O catalytic destruction project in the tail gas as follows:

Step 1. Identify technically feasible baseline scenario alternatives to the project activity:

Step 1b: Technically feasible and credible options to reduce N_2O emissions should be identified and considered as alternatives to the baseline scenario.

For Omnia, these options are:

- Status quo: This entails the continuation of the current situation where no technology for N_2O abatement or destruction will be installed.
- Alternative use of N_2O: There are three such alternatives.
  - Recycle the N_2O as a feedstock for the plant
  - Collect and use the N_2O for external purposes
  - Use N_2O as feedstock to produce phenol
- Installation of a Non-Selective Catalytic Reduction (NSCR) DeNOx unit
- Installation of a Selective Catalytic Reduction (SCR) DeNOx unit
- Installation of an N_2O destruction/abatement technology.
  - Tertiary or low temperature technology for N_2O destruction in the tail gas
  - Secondary or high temperature technology for N_2O destruction at the ammonia oxidation reactor
  - Primary technology

Options not deemed to be technically feasible:

The technology involving the destruction of N_2O by recycling it as a feedstock for the plant, was patented by Dupont and licensed to a French company. The process recycles N_2O by burning the gas at high temperature in the presence of steam. This option, while expensive to operate because of the energy requirements, is deemed technically impractical because N_2O is not a feedstock for nitric acid production. Moreover, the technology has not been commercially proven and there is no such application in other nitric acid plants.

The collection and use of N_2O for external purposes is not technically feasible at Omnia because the volume of tail gas to be processed is huge and the concentration of the N_2O therein very low at 0.1 to 0.15% by volume. Moreover, the use of N_2O for external purposes is low relative to its availability from the tail gas emissions at Omnia and not applied either in the region or other nitric acid plants.

Using N_2O as a feedstock to produce phenol from benzene is still in the demonstration phase. This option is eliminated therefore because the technology has not been commercially proven.

In summary, the options of using N_2O for alternative purposes are deemed technically not feasible. The following options are therefore eliminated:

- Recycle the N_2O as a feedstock for the plant
- Collect and use the N_2O for external purposes
- Use N_2O as feedstock to produce phenol

Step 1b: Current NO_x emissions regulations must also be considered in determining the baseline scenario.

All technically feasible options to reduce NO_x emissions should therefore also be considered as some also reduce N_2O emissions. For example, the installation of a NSCR $DeNO_x$ unit would also reduce N_2O emissions as a side reaction to the NO_x reduction. The options identified are:

- Continuation of the status quo which has no NO_x reduction unit installed
- Extending the height of the existing evaporator column
- Installation of a Selective Catalytic Reduction (SCR) $DeNO_x$ unit
- Installation of a NSCR $DeNO_x$ unit
- Installation of a new tertiary technology which combines both NO_x & N_2O reduction

Selective Catalytic Reduction (SCR)

An SCR $DeNO_x$ unit uses a catalyst and ammonia in the presence of oxygen to reduce NO_x to elemental nitrogen. This technology is selective in that it reduces NO_x by about 86% without any reduction to N_2O emissions. Omnia is presently in compliance with NO_x emissions regulations. As there is no beneficial reduction of N_2O emissions reduction from this technology, there is no justification for further consideration of this option as a baseline scenario

Non Selective Catalytic Reduction (NSCR) $DeNO_x$ Unit

NSCR De NO_x units, although primarily installed to destroy NO_x, also destroys much of the N_2O emissions from the tail gas of nitric acid plant. The NSCR $DeNO_x$ unit uses a fuel and a catalyst to consume the free oxygen in the tail gas and convert the NO_x to elemental nitrogen. This technology although installed in nitric acid plants built between 1971 and 1977, was stopped because of high energy costs and the associated high tail gas temperature, in excess of 550°C, which requires more exotic materials for the construction of the expander and increases overall maintenance costs.

The National Environmental Management Air Quality Act(6) (NEMA) promulgated into law in 2004 for the Republic of South Africa, administered by the Department of Environment, Agriculture and Tourism (DEAT) does not require Omnia to reduce its N_2O emissions. NEMA does however limit NO_x emissions to 300 ppmv and is included in the emissions permit issued to the plant. Moreover, the permit stipulates that the NOx concentration in the tail gas must be monitored by analysing grab samples rather than through continuous monitoring.

The tail gas NOx emissions at Omnia are in the range of 200 to 300 ppmv and DEAT considers the plant to be in compliance. As there is no legal or regulatory reason to install either the SCR or NSCR $DeNO_x$ unit neither technology is conceivable as a baseline alternative and would not be considered for installation.

The following baseline scenario alternatives are not therefore deemed to be technically feasible:

- Installation of an SCR $DeNO_x$ unit
- Installation of a NSCR $DeNO_x$ unit

Step 2. Eliminate baseline alternatives that to not comply with legal or regulatory requirements

Presently, there are no national or legal requirements in the Republic of South Africa regarding N_2O emissions. All of the named baseline alternatives are therefore in compliance with the N_2O and NOx emissions regulations. None of the baseline alternatives is therefore eliminated under this item.

Step 3. Eliminate baseline Alternatives that face prohibitive barriers:

Step 3a: The project participant should establish a complete list of barriers that would prevent alternatives to occur in the absence of CDM on the basis of the alternatives that are technically feasible and in compliance with all legal and regulatory requirements. In the case of the ‘catalytic N_2O destruction project in the tail gas of Omnia’s nitric acid plant’, the barriers that would prevent baseline alternatives to occur in the absence of CDM are:

- **Financial barriers**
  N_2O destruction facilities generate no financial or economical benefits other than the CDM related revenue.

  Implementing the project activity will require a substantial up-front capital expenditure calculated to be tens of millions of Rands to install the catalytic N_2O destruction facility and monitoring system in the existing tail gas stream. Moreover it will also impose an on-going operating cost of several million Rands per year to cover the cost of natural gas and ammonia consumed by the project activity and the replacement of the catalyst every 3 years. Detailed financial information can be provided on a confidentiality basis. In return for this investment, there is no increase in nitric acid production or efficiency improvement to the nitric acid plant, nor will the project activity generate any marketable product. In effect, there will not be any income of any kind, except from the sale of CERs, to pay back the capital and ongoing operation and maintenance costs related to the N_2O destruction unit.

  As Omnia is in compliance with national NO_x emissions regulations and there are no current national or provincial N_2O regulations, the financial investment barriers are clearly identified for all baseline options which require significant investments. This applies to primary, secondary and tertiary N_2O destruction technologies as well as NSCR DeNOx units. The project activity would not therefore be undertaken without the benefit of CDM registration.

- **Technological barriers**
  The technological barriers are identified as being related to the primary and secondary N_2O emission reduction technologies because they are deemed to interfere with the nitric acid production process. As the primary technology leads to reducing the plant’s NO and subsequently HNO_3 production, there is considerable resistance by the plant to implementing

---

(6) Go to http://www.info.gov.za/gazette/acts/2004/a39-04.pdf for details.

this technology. Some concern has also been expressed that secondary technologies could cause an intervention in the nitric acid production process and as such would not be supported by the plant. Moreover, the N_2O reduction efficiency of these primary and secondary technologies is considered to be significantly lower than tertiary technology.

Implementing a tertiary technology for the project activity does not interfere with the nitric acid production process and is well within the capabilities found within a nitric acid operating plant. Consequently, while such installation introduces a new technology, this barrier is surmountable.

- **Prevailing Practice barriers**
  Prevailing practice within South Africa's nitric acid plant industry is to do nothing as it relates to N_2O emissions as evidenced by the current status. N_2O emissions are not presently regulated and any expenditure for their reduction is difficult to justify. To date, none of the existing four nitric acid plants in South Africa has installed any N_2O reduction equipment whatsoever. In effect, the proposed project activity is the first of its kind in South Africa.
  This barrier is indirectly related to the financial barrier and is virtually impossible to overcome without the benefit of CDM.

The potential barriers to the project activity can be summarized as technological, financial and prevailing practice.

The financial barrier is real and makes it impossible to justify any expenditure to destroy N_2O emissions unless there is either a regulatory requirement or a financial incentive to do so. As there is no improvement in the production of nitric acid from reducing N_2O emissions, registration of the project activity as a CDM project offers the only potential to eliminate this barrier. This barrier is insurmountable without CDM registration.

In view of the above, the following baseline alternatives are eliminated primarily because of the significant investment barrier and secondly because of prevailing practice:

- Primary and secondary technologies for N_2O destruction or abatement
- Tertiary technology for N_2O destruction (proposed project activity)

In conclusion, the single scenario that does not face any barriers is the continuation of the status quo. Since Omnia's nitric acid plant is in full compliance with all current and legal regulatory requirements, no N_2O destruction technology will be installed as the investment barrier and to a lesser extent both prevailing practice and technological barriers, are identified for all options to the baseline scenario except for the continuation of the status quo. The continuation of the status quo is selected as the baseline scenario.

Step 4. Identify the most economically attractive baseline scenario alternative:
Determine which of the remaining project alternatives, not prevented by any barrier, is the most economically or financially attractive and becomes a possible baseline scenario.

Continuation of the current situation will cause neither additional capital investment cost nor additional operating costs.

The barrier analysis under step 3 clearly identifies the baseline scenario. Step 4 of the methodology is therefore omitted.

The procedure to identify the baseline scenario clearly shows that the most likely baseline scenario is continuation of the status quo. Without the installation of the project activity, N_2O emissions to atmosphere would continue unabated.

Step 5. Reassessment of the baseline scenario in the course of the proposed project activity lifetime

At the beginning of a crediting period, the baseline scenario will be re-assessed with regards to new or modified N_2O and/or NO_x emission regulations.

Step 5a: New or modified NO_x emission regulations

If new or modified NOx emissions regulations are introduced after the project start, the baseline scehario will be reassess at the start of a crediting period. The baseline scenario alternatives to be analysed should include:

- Selective Catalytic Reduction (SCR) $DeNO_x$ technology
- Non Selective Catalytic Reduction (NSCR) $DeNO_x$ technology
- Tertiary measures incorporating a selective catalyst for destroying N_2O and NO_x emissions
- Continuation of the baseline scenario

To determine the adjusted or new baseline scenario, the project participant should re-assess the baseline scenario in accordance with the process presented in steps 1 to 5 above.

Potential Outcomes of the re-assessment of the baseline scenario to ensure compliance with NOx regulation)	**Consequence (adjusted baseline scenario)**
Extend absorption column to increase NO_x removal	continuation of the original (N_2O) baseline as such modification does not reduce N_2O emissions
Install SCR $DeNO_x$ unit (no N_2O reduction)	continuation of the original (N_2O) baseline scenario
Install NSCR $DeNO_x$ unit (emissions of N_2O would also be partly reduced)	The N_2O emissions outlet from the NSCR becomes the adjusted baseline N_2O emissions as the NSCR $DeNO_x$ unit would reduce N_2O emissions as well as NO_x
Install tertiary measure that combines NO_x & N_2O emission reduction	Adjusted baseline scenario results in zero N_2O emissions reduction
Continuation of original baseline scenario (if NOx emissions are still in compliance)	Continuation of the original (N_2O) baseline scenario

Omnia is currently in compliance with NO_x regulations, consequently, any new or modified NO_x emissions regulations introduced after the project activity starts will be taken into account in the subsequent crediting period. Confidential data on current NO_x emission is available to validator

Step 5b: New or modified N_2O regulations:

If new or modified N_2O emissions regulations are introduced or subsequently revised during the crediting period, the baseline emissions shall be adjusted at the time the legislation has to be legally implemented. Until then, the pre-selected baseline scenario remains the Baseline Scenario.

The key parameters used to determine the baseline scenario are:

Key Parameter	Detail	Data Source
Current N_2O emissions regulation	No regulation currently in place	National Environment Management Act of the Republic of South Africa
Current NOx emissions regulation	Omnia is in compliance with current NO_x regulations	Emissions Permit issued by South Africa's Dept. of Environment, Agriculture and Tourism
Technological barriers	Several technological barriers exist	A review by Omnia and its consultant has shown that primary or secondary measures could affect the production of nitric acid & is contrary to Omnia's requirements. Moreover, the ambient air quality may affect the performance and life expectancy of some catalysts used with secondary measures. Lastly, the N_2O destruction efficiency for either the primary or secondary measures if considerably lower than tertiary measures.
Capital, operating and maintenance costs	No financial incentive exists to offset these costs	there is no increase to the production efficiency of the nitric acid plant.
Other income to finance the project activity	No other source of income exists	

This step is to be applied by monitoring the relevant regulations. In effect, the DEAT inspector for air emissions from industry in the Sasolburg region would ensure that Omnia is fully aware of any new and/or modified air emissions regulations.

AM0028 specifies that the N_2O emission level, upstream and downstream of the N_2O destruction facility, is to be monitored by measuring N_2O concentration, as well as the tail gas flow, temperature and pressure at each point. As well, any hydrocarbon and/or ammonia added to act as a reducing agent for optimal catalytic destruction of N_2O will also be monitored. All measurements are to be in real-time.

The baseline GHG emissions comprise entirely the emissions of N_2O multiplied by the GWP of N_2O (310) as defined by the IPCC. These emissions are continuously monitored in real time in the tail gas stream immediately upstream of the absorption column. The resultant greenhouse gas emissions following the project activity comprise:

- N_2O emissions in the tail gas downstream of the project activity: these emissions will be continuously monitored and the IPCC GWP value of 310 will be used to convert emissions to tCO_2e.
- Hydrocarbon consumption by the project activity as reducing agent: monitor consumption of hydrocarbons (natural gas) used as a reducing agent and the concentration of CH_4 (unconverted CH_4) in the tail gas downstream of the N_2O destruction facility. The applicable IPCC standard emissions factors will be used for both the converted and non-converted CH_4 (natural gas).
- Ammonia input required to reduce NO_x emissions in order for the N_2O destruction facility to function optimally: The flow of ammonia will be monitored together with its temperature and pressure and converted to standard conditions. Total ammonia consumption will then be multiplied by the default CO_2 generation factor for the production of ammonia as contained in AM0028;

Total methane emissions and fugitive emissions from natural gas use will be converted to equivalent CO_2 emissions using the GWP of 21 and N_2O emissions will be converted to equivalent CO_2 emissions using the GWP of 310 both of which were agreed on for the First Commitment Period of the Kyoto Protocol. Ammonia consumption will be converted to CO_2 generated using the conversion factor of 2.14 tCO_2e/tNH_3.

According to the approved baseline methodology, the key data used to determine the baseline and project activity emissions ex post is presented in table 4:

Table 4: Key Data

Parameters	Data Source
Baseline Scenario:	
Global Warming Potential of nitrous oxide, GWP N_2O	According to Article 5, Section 3 of the Kyoto Protocol, GWP of 310 is as agreed on at COP 3
Project Activity Scenario:	
Global Warming Potential of nitrous oxide, GWP N_2O	According to Article 5, Section 3 of the Kyoto Protocol, GWP of 310 is as agreed on at COP 3
Global Warming Potential of methane, GWP CH_4	According to Article 5, Section 3 of the Kyoto Protocol, GWP is 21 as agreed on at COP 3
CO_2e generated from production of ammonia	According to the default factor of 2.14 tCO_2e/tNH_3 suggested in AM0028/Version 01

Variables	Data Source
Quantity of N_2O emission in the tail gas upstream the project activity	Omnia Fertilizer Limited – monitoring system
Quantity of N_2O emission in tail gas downstream of the project activity	Omnia Fertilizer Limited – monitoring system
Quantity of natural gas input to N_2O destruction facility	Omnia Fertilizer Limited – monitoring system
Quantity of ammonia input to N_2O destruction facility	Omnia Fertilizer Limited – monitoring system

B.3. Description of how the anthropogenic emissions of GHG by sources are reduced below those that would have occurred in the absence of the registered CDM project activity:

The baseline scenario consists of the continuation of the status quo and N_2O emissions are not reduced by any N_2O destruction technology at Omnia. As such, the N_2O emissions from the baseline scenario are measured at the inlet to the N_2O destruction facility (Uhde's EnviNOx® System).

The project activity consists of installing a tertiary N_2O destruction unit provided by Uhde GmbH and referred to as the EnviNOx® System at Omnia's nitric acid plant in Sasolburg.

Tertiary technologies, also called Low Temperature Systems destroy the N_2O emissions through catalytic action, in the presence of a reducing agent, in the tail gas downstream of the absorption column. The optimum location for the catalyst in this case is at the hottest position in the tail gas stream. While this technology is more costly to install than secondary technologies, it offers significant advantages over other technologies as follows:

- There is no interference with the nitric acid production process and will neither cause an increase nor a decrease in nitric acid production.
- It incorporates a selective catalyst suitable for destroying both N_2O and NO_x and will therefore lead to additional environmental benefit.
- N_2O reduction efficiency of up to 98% can be expected.
- Primary and secondary technologies require modifications to the ammonia oxidation reactor and may create some operational risks.
- The destruction of N_2O is easy to monitor in real time with a high degree of accuracy.
- This tertiary technology is provided by UHDE GmbH, the same company who designed and constructed the existing nitric acid plant, consequently it should marry well within that design.

GHG reductions achieved by the proposed project activity will only be claimed for the destruction of N_2O emissions beyond regulatory requirements. Should regulatory requirements for N_2O emissions be introduced or modified during the crediting period, the baseline emissions will be adjusted effective of the time the legislation has to be implemented by Omnia.

Project additionality was analysed using the tool proposed in the approved baseline methodology AM0028/Version 01 - **Catalytic N_2O destruction in the tail gas of the Nitric Acid Plants** and the latest 'tool for demonstration and assessment of additionality' agreed by the CDM EB.

Step 1: Identification of Alternatives to the project activity consistent with current laws and regulations:

This step of the additionality tool for the demonstration and assessment of additionality can be ignored as it is similar to the approach used to determine the baseline scenario in section B.3.

Step 2: Investment Analysis

Step 2a: Determine appropriate analysis method:

Installation of the project activity does not generate any financial or economic benefit other than the revenue from the sale of CERs. Consequently, as stated in the applied baseline methodology, option 1, the simple cost analysis has been chosen

Step 2b: Option 1 – Apply simple cost analysis:

The project activity, comprising the installation of the EnviNOx® system to reduce N_2O emissions in the tail gas, will not generate any financial benefit to Omnia as it does not increase the production of nitric acid or produce any other revenue generating product. Only the revenue from the sale of CERs will allow for the payback of the capital cost, estimated at tens of millions of Rands and the ongoing operating and maintenance costs, comprised of the reducing agents required and the periodic replacement of catalyst, estimated at several million Rands/yr. Detailed investment information is available and can be provided on a confidentiality basis.

The baseline scenario, consisting of 'the continuation of the current situation' will not require any additional investment nor impose any additional operating and maintenance cost to Omnia.

Without the revenue from the sale of CERs, the proposed CDM project activity is substantially less attractive financially than the baseline scenario.

Step 3: Barrier Analysis

The main barriers to the proposed project activity are:

- Investment barrier, as discussed in step 2 is real and insurmountable.
- Prevailing practice: as discussed in section B.2, the project activity is the "first of its kind": No project activity of this type is currently operational in any of the four (4) nitric acid plants in the Republic of South Africa. In effect, throughout the African continent, only one other nitric acid plant, in Egypt, is looking to install an N_2O destruction project but only if approved as a CDM project.

As noted in step 2 and 3, both the investment barrier and the barrier due to prevailing practice are real and would prevent installation of the project activity without CDM registration.

Step 4: Common practice analysis

Prevailing practice within South Africa's nitric acid plant industry is to do nothing as it relates to N_2O emissions as evidenced by the current status. N_2O emissions are not presently regulated and any expenditure for their reduction is difficult to justify. To date, none of the existing four (4) nitric acid plants in South Africa(6) has installed any N_2O reduction equipment whatsoever. In effect, the proposed project activity is definitely not common practice as it is the first of its kind in South Africa.

Step 5: Impact of CDM Registration

CDM registration will allow Omnia to alleviate the economic obstacles mentioned above. It will provide benefits and incentives such as cleaner air quality through substantial GHG & NOx emission reductions a revenue stream from the sale of CERs over the crediting period and public recognition due to the environmental benefits of the project contributing to reduced health costs. Moreover, Omnia is committed to contributing five percent (5%) of the net revenue generated from the sale of CERs to increasing job creation and reducing poverty in the surrounding community. The exact community based projects to be funded from this contribution would be selected in consultation with local community representatives who would also be involved in the overall administration of selected projects.

In summary, it is clear from above discussion that the obstacles to the project activity would not be done without the incentive of revenue to be generated from the sale of the resultant CERs. The baseline scenario would remain the continuation of the status quo, the emissions from which are considerably greater than the project emissions. The proposed project activity is therefore additional.

Summary:

The baseline scenario, which is to continue the current operation of the nitric acid plant without any N_2O emission reduction, will cause no additional capital or operating costs. It can therefore be considered the baseline scenario. Without the revenue from the sale of CERs, the proposed CDM project activity is substantially less attractive than the baseline scenario.

The proposed project activity is therefore additional because it is deemed to comply with the stipulated criteria for the assessment of additionality. The registration of the project activity as a CDM project, with the revenue from the sale of CERs to finance the project, is the decisive factor for the realization of the proposed project activity.

B.4. Description of how the definition of the project boundary related to the baseline methodology selected is applied to the project activity:

N_2O is a by-product of the nitric acid manufacturing process. It is formed in conjunction with the desirable NO, during the catalytic oxidation of ammonia/air blend across the precious metal gauzes in an exothermic reaction. Some N_2O is destroyed in the reactor at the high temperature by homogeneous gas phase decomposition and some by catalytic decomposition but most of it passes through the rest of the nitric acid process unchanged and is emitted to the atmosphere in the tail gas. No attempt has been made to collect it because it has no economic value.
The project boundary encompasses the entire nitric acid plant and all of the greenhouse gas emissions from all sources which are directly or indirectly attributed to the project activity as shown in fig. 2.
Error! Objects cannot be created from editing field codes. More specifically, the project boundary comprises the N_2O destruction facility including the auxiliary
ammonia and natural gas input. For monitoring purposes however, the project boundary encompasses the nitric acid plant, to measure the nitric acid production and the operating parameters at the ammonia oxidation reactor.

The possibility that in the future some national, provincial or local regulation governing the emissions of N_2O may occur has been taken into account in the baseline methodology. Accordingly, the baseline emissions will be adjusted at the beginning of the following crediting period following the coming into force of a new N_2O emissions regulation.

Table 5 shows the type of gaseous emissions in the project and baseline scenarios.

Table 5: Emissions In The Project and Baseline Scenarios

	Project Scenario	Baseline Scenario
Emissions	• N_2O emissions in the tail gas downstream of the project activity • CO_2 emissions associated with the use of natural gas as a reducing agent • CO_2 emissions associated with un-converted CH_4 (natural gas) in tail gas • CO_2 emissions generated from the production of ammonia used to reduce NO_x	★ N_2O emissions in the tail gas up upstream of the project activity

The equipment used to monitor GHG emissions for the baseline and the project activity comprises:

- Continuous tail gas flow volume measuring equipment (m^3/hr);
- Analyzer to monitor N_2O concentration both upstream and downstream of the N_2O destruction facility;
- Flow measurement equipment for the input of natural gas required to act as the reducing agent to the N_2O destruction facility;
- Analyzer for CH_4 monitoring in the tail gas;
- Flow measurement equipment for the input of ammonia into the destruction facility as required to reduce NO_x;
- Temperature and pressure monitoring equipment in the tail gas and ammonia gas stream;

To prevent any attempt to increase the baseline N_2O emissions, the following will also be monitored by using the following existing measuring equipment:

- measuring device for temperature and pressure of the ammonia upstream of the ammonia converter

- measuring device for the ammonia flow rate to the ammonia converter
- measuring device for nitric acid output (quantity and concentration)

Furthermore, the composition of the ammonia oxidation catalyst (platinum gauzes) at the start of each campaign will also be recorded.

B.5. Details of baseline information, including the date of completion of the baseline study and the name of person (s)/entity (ies) determining the baseline:

The Baseline study was completed on March 31, 2006
The baseline study was prepared by:
DNS Consultants (Pty) Ltd.
4 Wethered Rd.
Johannesburg, South Africa
Tel: +27 11 646 7564 fax: +27 11 447 7885 e-mail: vincent@donato.co.za
cell: +27 76 873 9792 vjdonato@hotmail.com

Vincent Donato, Quentin Kirkby

Vincent Donato and Quentin Kirby are not project participants.

SECTION C. Duration of the project activity / Crediting period

C.1 Duration of the project activity:

C.1.1. Starting date of the project activity:

The construction phase of the project activity is foreseen to start immediately after the submission of the PDD for validation. Expected starting date of the project activity is December 2006.

C.1.2. Expected operational lifetime of the project activity:

The existing nitric acid plant, with a design capacity of 650 t/day nitric acid, was commissioned in 1983. Since that time, it has undergone a number of upgrades the last of which occurred in 1999/2000 increased the plant capacity to 748 t/day. Based on the continuous upgrades at the plant, its operational lifetime is 50 years from original commissioning date. Consequently, the existing nitric acid plant has greater than 25 years from current date.

According to the Uhde GmbH, the N_2O Reduction technology supplier and equipment manufacturer, the project activity has a life expectancy similar to the nitric acid plant of 25+ years.

C.2 Choice of the crediting period and related information:

C.2.1. Renewable crediting period

C.2.1.1. Starting date of the first crediting period:

April 1, 2007

C.2.1.2. Length of the first crediting period:

7 years

C.2.2. Fixed crediting period:

C.2.2.1. Starting date:

- Not Selected -

C.2.2.2. Length:

- Not Selected -

SECTION D. Application of a monitoring methodology and plan

D.1. Name and reference of approved monitoring methodology applied to the project activity:

The project activity uses an already existing monitoring methodology, which has been approved and made publicly available by the CDM Executive Board at CDM EB 23 on Feb. 22-24, 2006. The monitoring methodology is designated as AM0028/Version 01 and entitled:

Monitoring Methodology for catalytic N_2O destruction in the tail gas of Nitric Acid Plants

D.2. Justification of the choice of the methodology and why it is applicable to the project activity:

Methodology AM0028/Version 01 is applicable to this project activity, which is to install a catalytic destruction facility in the tail gas at Omnia's nitric acid plant in Sasolburg that would otherwise continue without any N_2O destruction during the crediting period, because it complies with the conditions specified under AM0028 as follows:

- Omnia's nitric acid plant has not installed any N_2O destruction or abatement technology to reduce N_2O emissions
- The project activity will not cause any increase in nitric acid production
- There is no existing NO_x emission reduction facility
- the project activity will not cause any increase in NO_x emissions
- The N_2O baseline and project emissions will be measured in real time upstream and downstream of the project activity
- Historical nitric acid production level data as well as design capacity data for the existing nitric acid plant are available

- The monitoring methodology will be used in conjunction with the **“Baseline Methodology for Catalytic N_2O Destruction in the Tail Gas of Nitric Acid Plants”** approved as AM0028

As previously noted, the proposed project activity, comprising the installation of a catalytic N_2O destruction facility in the tail gas stream between the absorption column and tail gas turbine, does not result in any process change to the nitric acid plant.

Continuation of the current situation is in compliance with the applicable air emission regulations in South Africa and there is no legal or economic reason to install the project activity. The additional investment in capital and operating costs imply that the project activity would not be cost effective.

Thus the proposed project activity meets the conditions under which methodology AM0028/Version 01is applicable.

D.2. 1. Option 1: Monitoring of the emissions in the project scenario and the baseline scenario

The monitoring methodology follows option 1. The data collected to monitor the N_2O emissions in the project scenario and the baseline scenario are given below.

The resultant emissions will be monitored by a single component multichannel infrared analyser, a venture to measure tail gas flow and other instrumentation to monitor temperature and pressure.

Data acquisition and storage is performed by the DCS which also controls the operation of the EnviNOx® Reactor. Data is stored at one minute intervals. Data storage is redundant. On a weekly basis, the data stored will be transferred to Omnia's secure storage facility in Johannesburg. Electronic data will be maintained for a period of 2 years beyond the life of the project activity.

In addition, the shift process leader will also take separate readings of the N_2O emissions levels at 4 hr intervals throughout the 24 hr day and store this data electronically on the computer's hard drive and the back-up system.

Monitoring equipment will be maintained by Omnia's instrumentation technician. The accuracy of the N_2O emissions monitoring results will be ensured by installing, operating and maintaining a monitoring system that has been certified to meet or exceed the best industry practice.

D.2.1.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to D.3)*	Data variable	Source of data	Data unit	measured (m) calculated (c) estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment
P1	**PE_y** Project Emissions	monitoring System Omnia	tCO_2e	C	annual	100%	electronic crediting period + 2 years	
P2	**$PE_{ND,y}$** Project emissions from N_2O not destroyed	monitoring system Omnia	tCO_2e	C	daily	100%	electronic crediting period + 2 years	

P3	**$PE_{DF,y}$** Project emissions from destruction facility	monitoring system Omnia	tCO_2e	C	annual	100%	electronic crediting period + 2 years	
P4	**$PE_{N2O,y}$** N_2O not destroyed by facility	monitoring system Omnia	tN_2O	C	daily	100%	electronic crediting period + 2 years	
P5	**$F_{TG,i}$** Volume flow of tail gas at N_2O destruction facility	flow meter Omnia	m^3/h	M continuously	daily	100%	electronic crediting period + 2 yrs	Flow metering system will automatically record tail gas volume flow adjust to standard temperature and pressure conditions
P6	**$CO_{N2O,i}$** N_2O concentration at destruction facility outlet	single component multichannel infrared analyser	tN_2O/m^3	M continuously	Daily	100%	electronic crediting period + 2 yrs	
P7	**M_i** Measuring interval	Measuring device; Data Management System	h	M continuously	Daily	100%	electronic crediting period + 2 yrs	
P8	**$PE_{NH3,y}$** Emissions from ammonia use in destruction facility	Monitoring system Omnia	tCO_2e	C	Annual	100%	electronic crediting period + 2 yrs	
P9	**$PE_{HC,y}$** Emissions from natural gas use in destruction facility	monitoring system Omnia	tCO_2e	C	Annual	100%	electronic crediting period + 2 yrs	

P10	**$Q_{NH3,y}$** N_2O destruction facility: project ammonia input	flow meter	tNH_3	M	Monthly	100%	electronic crediting period + 2 yrs	Measure flow + NH_3 temperature and pressure; corrected to standard temperature and pressure conditions
P11	**EF_{NH3}** Ammonia Production GHG Emission Factor	IPCC default value	$tCO_2e/$ tNH_3	C	Once	100%	electronic crediting period + 2 yrs	The IPCC default value of 2.14 tCO_2e/tNH_3 will be used for the project activity in the absence of more definitive value from the existing ammonia supplier.
P12	**$HCE_{C,y}$** Converted hydrocarbon emissions	monitoring system Omnia	tCO_2e	C	Annual	100%	electronic crediting period + 2 yrs	
P13	**$HCE_{NC,y}$** non-converted methane emissions	Monitoring system Omnia	tCO_2e	C	Annual	100%	electronic crediting period + 2 yrs	
P14	**$Q_{HC,y}$** Hydrocarbon input as reducing agent	gas flow meter	m^3	M	Daily	100%	electronic crediting period + 2 yrs	
P15	$_{HC}$ Hydrocarbon density	hydrocarbon supplier	t/m^3	M	Yearly	100%	electronic crediting period + 2 yrs	Density value from Sasol Gas Limited specification for natural gas supply
P16	**EF_{HC}** Hydrocarbon CO_2 emissions factor	IPCC	tCO_2/t	C	Once	100%	electronic crediting period + 2 yrs	
P17	**$OXID_{HC}$** Hydrocarbon Oxidation factor	Measuring device	%	M continuously	Daily	100%	electronic crediting period + 2 yrs	Infrared gas analyzer in tail gas to measure CH_4 concentration;

P18	**Type**$_{HC}$ Type of hydrocarbon used	Sasol Gas Limited	-na-	-na-	Once	100%	electronic crediting period + 2 yrs	Sasol Gas Limited provides natural gas from its Mozambique gas wells

Determination of conversion rates for Natural Gas:

Natural gas is available from Sasol Gas Limited to be used as the reducing agent. The carbon atom in natural gas (CH_4) will be mainly converted to CO_2 but trace amounts are expected to escape in the tail gas. In order to measure the fraction of unconverted CH_4 in the tail gas, the infra-red tail gas analyzer, which is capable of also reading CH_4 concentration, will be upgraded to read CH_4 as well.

D.2.1.2. Description of formulae used to estimate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

The project GHG emissions from within the project boundary correspond to the emissions from the N_2O not destroyed by the destruction facility ($\mathbf{PE}_{ND,y}$) plus the emissions arising from ammonia (NH_3) and natural gas (CH_4) input required for the operation of the N_2O destruction facility ($\mathbf{PE}_{DF,y}$). Total project emissions are calculated from equation 1.

$$\mathbf{PE}_y = \mathbf{PE}_{ND,y} + \mathbf{PE}_{DF,y} \qquad (1)$$

where:

$\mathbf{PE}_y$	Project emissions in year y (tCO_2e)
$\mathbf{PE}_{ND,y}$	Project emissions from N_2O not destroyed in year y (tCO_2e)
$\mathbf{PE}_{DF,y}$	Project emissions related to the operation of the N_2O destruction facility in year y (tCO_2e)

Project emissions not destroyed by the project activity:

The project activity is expected to destroy up to 98%+ of the N_2O emissions. The N_2O emissions not destroyed will be calculated based on the continuous measurement of the N_2O concentration in the tail gas downstream of the N_2O destruction facility and the volume flow rate of the tail gas corrected to standard temperature and pressure conditions. The emissions of the N_2O not destroyed are calculated from equation 2 as follows:

$$\mathbf{PE}_{ND,y} = \mathbf{PE}_{N2O,y} \text{ x } \mathbf{GWP}_{N2O} \qquad (2)$$

where:

$\mathbf{PE}_{ND,y}$	Project emissions from N_2O not destroyed in year y (tCO_2e)
$\mathbf{PE}_{N2O,y}$	Project emissions of N_2O in year y (tN_2O)
$\mathbf{GWP}_{N2O}$	Global Warming Potential of N_2O, set as 310 tCO_2e/tN_2O for the 1st commitment period

and

$$\mathbf{PE}_{N2O,y} = \sum_{i}^{n} \mathbf{F}_{TG,i} \times \mathbf{CO}_{N2O,i} \times \mathbf{M}_{i} \qquad \mathbf{(3)}$$

where:

$\mathbf{PE}_{N2O,y}$	Project emissions from N_2O not destroyed in year y (tN_2O)
$\mathbf{F}_{TG,i}$	Volume flow rate at the outlet of the destruction facility during interval i (m^3/h)
$\mathbf{CO}_{N2O,i}$	N_2O concentration in the tail gas of the N_2O destruction facility during interval i (tN_2O/m^3)
$\mathbf{M}_i$	Length of measuring interval i (hours or h)
i	interval
n	number of intervals during the year

Project emissions from the operation of the N_2O destruction facility:

The operation of the N_2O destruction facility requires the injection of ammonia and natural gas into the tail gas upstream of the destruction facility. The resultant emissions are related to the production of the ammonia used as input and the onsite emissions due to the natural gas used as input to the N_2O destruction facility and calculated from equation 4:

$$\mathbf{PE}_{DF,y} = \mathbf{PE}_{NH3,y} + \mathbf{PE}_{HC,y} \qquad \mathbf{(4)}$$

where

$\mathbf{PE}_{DF,y}$	Project emissions related to the operation of the N_2O destruction facility in year y (tCO_2e)
$\mathbf{PE}_{NH3,y}$	Project emissions related to ammonia input to the destruction facility in year y (tCO_2e)
$\mathbf{PE}_{HC,y}$	Project emissions related to natural gas input to destruction facility in year y (tCO_2e)

The emissions due to the ammonia input to the destruction facility will be calculated by equation 5:

$$\mathbf{PE}_{NH3,y} = \mathbf{Q}_{NH3,y} \times \mathbf{EF}_{NH3} \qquad \mathbf{(5)}$$

where

$\mathbf{PE}_{NH3,y}$	Project emissions related to ammonia input to the destruction facility in year y (tCO_2e)
$\mathbf{Q}_{NH3,y}$	Ammonia input to the destruction facility in year y (tNH_3)
$\mathbf{EF}_{NH3}$	GHG emissions factor for ammonia production, set at 2.14 tCO_2e/tNH_3 as per AM0028 (Sasol, the NH_3 supplier had partial information on this number but as it did not cover all of the CO_2e generated from the process the value suggested in AM0028 was used despite it being higher than the IPCC value)

As for the natural gas consumption, it consists of the natural gas used as a reducing agent to enhance the catalytic N_2O reduction efficiency and that which remains intact and escapes into the tail gas as methane. The resultant emissions from the natural gas consumption in tCO_2e is given by equation 6.

$$\mathbf{PE}_{HC,y} = \mathbf{HCE}_{C,y} + \mathbf{HCE}_{NC,y} \tag{6}$$

where

$\mathbf{PE}_{HC,y}$	Project emissions related to methane (natural gas) input to destruction facility in year y (tCO_2e)
$\mathbf{HCE}_{C,y}$	Project emissions from methane (natural gas) converted in year y (tCO_2e)
$\mathbf{HCE}_{NC,y}$	Project emissions from methane (natural gas) not converted in year y (tCO_2e)

The emissions related to the natural gas converted and those to the natural gas not converted are calculated from equations 7 and 8 respectively:

$$\mathbf{HCE}_{C,y} = \rho_{HC} \times \mathbf{Q}_{HC,y} \times \mathbf{EF}_{HC} \times \mathbf{OXID}_{HC}/100 \tag{7}$$

where

$\mathbf{HCE}_{C,,y}$	Project emissions from methane (natural gas) converted in year y (tCO_2e)
ρ_{HC}	natural gas density of 0.000698 t/m^3 as per Sasol Gas Limited natural gas specification
$\mathbf{Q}_{HC,y}$	natural gas input in year y (m^3)
$\mathbf{EF}_{HC}$	Carbon emissions factor of natural gas (tCO_2/tHC)
$\mathbf{OXID}_{HC}$	Oxidation factor for natural gas converted (%)

And

$$\mathbf{HCE}_{NC,y} = \rho_{HNC,y} \times \mathbf{Q}_{HC,y} \times \mathbf{GWP}_{CH4} \times (1 - \mathbf{OXID}_{CH4}/100) \tag{8}$$

where

$\mathbf{HCE}_{NC,y}$	methane emissions in year y (tCO_2e)

$\rho_{HNC,y}$ Methane density of 0.00071 t/m^3 CH_4 (calculated by dividing mol weight of CH_4 by vol of 1 mol – 16/22.41)
$\mathbf{Q}_{HC,y}$ Methane used in year y, and based on measurements of CH_4 concentration in tail gas & tail gas flow (m^3)
$\mathbf{GWP}_{CH4}$ Global warming potential of methane, set at 21 tCO_2e/tCH_4 for the 1st commitment period
$\mathbf{OXID}_{CH4}$ Oxidation factor for methane (%)

The hydrocarbon CO_2 emission factor is calculated by the molecular weights and the chemical reaction when methane is converted to CO_2. Each tonne of CH_4 generates 44/16 tonnes of CO_2. Therefore, the CO_2 emission factor for CH_4 is 2.75 tCO_2/tCH_4. Since natural gas contains 98% CH_4, the carbon emission factor for natural gas ($\mathbf{EF}_{HC}$) in equation 7 becomes 2.77 tCO_2/tNat Gas.

D.2.1.3. Relevant data necessary for determining the baseline of anthropogenic emissions by sources of GHGs within the project boundary and how such data will be collected and archived :

ID No.	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data monitored	How will the data be archived? (electronic/ paper)	Comment
B1	$\mathbf{P}_{HNO3,\,y}$ Plant Output of HNO_3	Omnia Production Reports	t $HN0_3$	M	daily	100%	electronic crediting period + 2 yrs	subject to QA/QC
B2	$\mathbf{QI}_{N2O,\,y}$ Quantity of N_2O at inlet to destruction facility	Omnia	tN_2O	C	daily	100%	electronic for duration of crediting period + 2 yrs	
B3	$\mathbf{CI}_{N2O,\,y}$ Quantity of N_2O at inlet to destruction facility	Gas chromatography	tN_2O/m^3	M continuous	Daily	100%	electronic for duration of crediting period + 2 yrs	Omnia to maintain periodic contact with South Africa Department of Environmental Affairs & Tourism (DEAT)
B4	$\mathbf{QR}_{N2O,\,y}$ Regulation 1: Annual quantity N_2O Limited	National Legislation	tN_2O	C	At date of regulation	100%	electronic crediting period + 2 yrs	Omnia to maintain periodic contact with South Africa Department of Environmental Affairs & Tourism (DEAT)

B5	**RSE**$_{N2O, y}$ Regulation 2: N_2O emissions per unit of nitric acid limited	National Legislation	$tN_2O/tHNO_3$	C	At date of regulation	100%	electronic crediting period + 2 yrs	Omnia to maintain periodic contact with South Africa Department of Environmental Affairs & Tourism (DEAT)
B6	**CR**$_{N2O}$ Regulation 3: N_2O concentration in tail gas limited	National Legislation	tN_2O/m^3	C	At date of introduction or change of regulation	100%	electronic crediting period + 2 yrs	Omnia to maintain periodic contact with South Africa Department of Environmental Affairs & Tourism (DEAT)
B7	**P**$_{HNO3, hist}$ Design Capacity	Manufacturer's specifications/ plant production records	t 100% conc. HNO_3	M/C	Once	100%	Electronic Crediting period + 2 yrs	
B8	**T**$_{g, hist}$ historical operating temperature range of the ammonia oxidation reactor	Manufacturer's specifications/ plant production records	°C	M/C	Once	100%	Electronic Crediting period +2 yrs	
B9	**P**$_{g, hist}$ historical operating pressure range of the ammonia oxidation reactor	Manufacturer's specifications/ plant production records	Pa	M/C	Once	100%	Electronic Crediting period + 2 yrs	
B10	**T**$_{g}$ Actual operating temperature ammonia oxidation reactors	Temperature measuring device	°C	measured	continuous	100%	Electronic Crediting period + 2 yrs	
B11	**P**$_{g}$ Actual operating pressure at ammonia oxidation reactor	Pressure measuring devise	Pa	measured	continuous	100%	Electronic Crediting period + 2 yrs	

B12	$\mathbf{Reg}_{NOx}$ National regulation on NOx emissions	National Regulations South Africa Dept. of Environmental Affairs & Tourism (DEAT)	$tNOx/m^3$	calculated	Date of Regulation	100%	Electronic Crediting period + 2 yrs	
B13	$\mathbf{G}_{sup}$ Supplier of the ammonia oxidation catalyst	supplier information	-na-	-na-	-na-	100%	Electronic Crediting period + 2 yrs	
B14	G_{com} composition of the ammonia oxidation catalyst	Supplier information	%	-na-	date of changing gauze composition	100%	Electronic Crediting period + 2 yrs	
B15	**G**sup, hist Historical supplier of ammonia oxidation catalyst	Annual reports, supplier information	-na-	-na-	Once	100%	Electronic Crediting period + 2 yrs	
B16	$\mathbf{G}_{com, hist}$ Historical composition of the ammonia oxidation catalyst	Supplier Information	%	-na-	Date of start of use of catalyst	100%	Electronic Crediting period + 2 yrs	
B17	$\mathbf{SE}_{N2O}$ N_2O emission rate per ton of nitric acid	Monitoring reports	$tN_2O/tHNO_3$	C	Yearly	100%	Electronic Crediting period + 2 yrs	
B18	$\mathbf{A}_{OR, hist}$ Max. historical ammonia flow rate to the ammonia oxidation reactor	Production reports /manufacturer's specifications	tHN_3/day	M/C	Once	100%	Electronic Crediting period + 2 yrs	
B19	$\mathbf{A}_{OR, d}$							

	Actual ammonia flow rate to the ammonia oxidation reactor	ammonia flow measuring system	tNH_3/day	M	continuous	100%	Electronic Crediting period + 2 yrs	

D.2.1.4. Description of formulae used to estimate baseline emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

Baseline emissions are calculated in the tail gas, based on measurements taken at the points upstream of the project activity. The baseline emissions flow monitoring equipment will monitor tail gas flow, temperature and pressure and N_2O concentration upstream of the tail gas activity. The resultant N_2O baseline emissions are calculated by multiplying the total gas flow at standard conditions (ideal gas at 1.01315 bar abs and 0^oC) by the N_2O concentration (mg/L) by the tail gas density. Tail gas density is calculated based on the molecular weight of the various emission gases in the tail gas stream multiplied by the concentration of each gas relative to the total. Given the tail gas consists of about 97% N_2, 2% O_2 and the remaining 1% made up of NO_2, NO, N_2O and H_2O, the overall density of the tail gas will remain relatively constant throughout the production period at about 0.00251 kg/Nm3

Total baseline emissions over the given period are given by:

$$\mathbf{BE}_{y} = \mathbf{BE}_{N2O,\,y} \times \mathbf{GWP}_{N2O} \qquad \textbf{(9)}$$

where:

$\mathbf{BE}_{y}$	total baseline emissions in year y (tCO_2e)
$\mathbf{BE}_{N2O,\,y}$	Baseline emissions of N_2O in year y (tN_2O)
$\mathbf{GWP}_{N2O}$	Global Warming Potential (GWP for N_2O is 310 in accordance with Article 5, Section 3 of the Kyoto Protocol; as agreed on at COP3)

Case 1: No N_2O emissions control regulations in place. In view of the substantial economic and technological barrier, the baseline scenario is that no N_2O emissions would be abated in the absence of the project activity. Consequently, the baseline emissions are equal to the actual N_2O emissions supplied to the destruction facility as defined by equation 10:

$$\mathbf{BE}_{N2O,\,y} = \mathbf{QI}_{N2O,\,y} \qquad \textbf{(10)}$$

where:

$\mathbf{BE}_{N2O,\,y}$	Baseline emissions of N_2O in year y (tN_2O)
$\mathbf{QI}_{N2O,\,y}$	Quantity of N_2O supplied to the destruction facility in year y (tN_2O)

The quantity of N_2O supplied to the N_2O destruction facility (DF) is calculated on the basis of continuous monitoring of the tail gas volumetric flow rate, temperature, pressure and N_2O concentration. The tail gas temperature and pressure is required to convert flow rate to standard conditions. Therefore the quantity of N_2O at the inlet to the DF is given by equation 11:

$$\mathbf{QI}_{N2O,\,y} = \sum_{i}^{n} \mathbf{F}_{TG,\,i} \text{ x } \mathbf{CI}_{N2O,\,i} \text{ x } \mathbf{M}_i \qquad \textbf{(11)}$$

where:

$\mathbf{QI}_{N2O,\,y}$	Quantity of N_2O emissions at the inlet to the destruction facility in year y (tN_2O)
$F_{TG,\,i}$	Volume flow rate at the inlet of the destruction facility during interval i (m^3/h)
$\mathbf{CI}_{N2O,\,i}$	N_2O concentration at destruction facility inlet during interval i (tN_2O/m^3)
M_i	Length of measuring interval i (h)
i	interval
n	number of intervals during the year

In all cases the baseline emissions will be limited to the design capacity of the existing nitric acid plant. If the actual production of nitric acid ($P_{HNO3,y}$) exceeds the plant's design capacity ($P_{HNO3,max}$) of 748t/day converted to similar units, the emissions related to production above $P_{HNO3,max}$ will neither be claimed for the baseline nor for the project scenario.

If $P_{HNO3,y} > P_{HNO3,max}$ (converted to similar units)

then $B_{EN2O,y} = SE_{N2O,y} \text{ x } P_{HNO3,max}$ **(12)**

where:

$BE_{N2O,y}$	Baseline emissions of N_2O in year y (tN_2O)
$SE_{N2O,y}$	Specific N_2O emissions per output of nitric acid in year y ($tN_2O/tHNO_3$)
$P_{HNO3,\,max}$	Design capacity of nitric acid plant ($tHNO_3$)

The specific N_2O emissions per unit of output nitric acid (100% acid concentration equivalent) are defined as:

$SE_{N2O,y} = QI_{N2O,y} / P_{HNO3,y}$ **(13)**

where:

$SE_{N2O,y}$	Specific N_2O emissions per output nitric acid in year y ($tN_2O/tHNO_3$)
$QI_{N2O,y}$	Quantity of N_2O emissions a the inlet to the N_2O destruction facility in year y (tN_2O)
$P_{HNO3,y}$	Production of nitric acid in year y ($tHNO_3$)

Case 2: N_2O Regulations are implemented

Until such time as control regulations are legislated, the baseline emissions will be as discussed under Case 1. If N_2O emissions control regulations are legislated during the crediting period, the impact on the baseline emissions will be considered effective as of the date the nitric acid plant is required to implement the new regulations.

Depending on how the N_2O control regulations are structured, the baseline emissions would be taken as follows:

Case 2.1 Regulations set a threshold for an absolute quantity of N_2O emissions per nitric acid plant over a given time period:

If $\mathbf{QI}_{N2O,\,y} > \mathbf{QR}_{N2O,\,y}$

then

$$\mathbf{BE}_{N2O,\,y} = \mathbf{QR}_{N2O,\,y} \qquad \mathbf{(14)}$$

else,

$$\mathbf{BE}_{N2O,\,y} = \text{min of } [\mathbf{QI}_{N2O,\,y}, \mathbf{SE}_{N2O,\,y} \times \mathbf{P}_{HNO3,\,max}] \qquad \mathbf{(15)}$$

where:

$\mathbf{QI}_{N2O,\,y}$	Quantity of N_2O emissions at the inlet to the destruction facility in year y (tN_2O)
$\mathbf{QR}_{N2O,\,y}$	Regulatory limit of N_2O emissions in year y (tN_2O)
$\mathbf{BE}_{N2O,\,y}$	Baseline emissions of N_2O in year y (tN_2O)
$\mathbf{SE}_{N2O,\,y}$	Specific N_2O emissions per output nitric acid in year y ($tN_2O/tHNO_3$)
$\mathbf{P}_{HNO3,\,max}$	Production of nitric acid in year y ($tHNO_3$)

As in Case 1, the quantity of N_2O emissions at the inlet of the N_2O destruction facility ($\mathbf{QI}_{N2O,\,y}$) is calculated on the basis of continuous measurement of the tail gas volume flow rate and the N_2O concentration at the inlet to the N_2O destruction facility.

Case 2.2 Regulation setting of a threshold for specific N_2O emissions per unit of product:

If $\mathbf{SE}_{N2O,\,y} > \mathbf{RSE}_{N2O}$

then

$$\mathbf{BE}_{N2O,\,y} = \text{min of } [\mathbf{RSE}_{N2O} \text{ x } \mathbf{P}_{HNO3,\,y}, \mathbf{SE}_{N2O,\,y} \text{ x } \mathbf{P}_{HNO3,\,max}] \qquad \textbf{(16)}$$

else

$$\mathbf{BE}_{N2O,\,y} = \text{min of } [\mathbf{QI}_{N2O,\,y} \text{ x } \mathbf{P}_{HNO3,\,max}]$$

The N_2O emission per unit of nitric acid output is defined as:

$$\mathbf{SE}_{N2O,\,y} = \mathbf{QI}_{N2O,\,y} / \mathbf{P}_{HNO3,\,y} \qquad \textbf{(17)}$$

where

$\mathbf{SE}_{N2O,\,y}$	Specific N_2O emissions per output nitric acid in year y ($tN_2O/tHNO_3$)
$\mathbf{QI}_{N2O,\,y}$	Quantity of N_2O emissions at the inlet to the destruction facility in year y (tN_2O)
$\mathbf{P}_{HNO3,\,max}$	Production of nitric acid in year y ($tHNO_3$)

As in Case 1, the quantity of N_2O emissions at the inlet of the N_2O destruction facility ($\mathbf{QI}_{N2O,\,y}$) is calculated on the basis of continuous measurement of the tail gas volume flow rate and the N_2O concentration at the inlet to the N_2O destruction facility.

Case 2.3 Regulations set a threshold for N_2O concentration in the tail gas:

If $\mathbf{C}_{N2O,i} > \mathbf{CR}_{N2O}$

then

$$\mathbf{BE}_{N2O,y} = \sum_{i}^{n} \mathbf{C}_{N2O,\,i} \text{ x } \mathbf{F}_{TG,\,i} \text{ x } \mathbf{M}_i \qquad \textbf{(18)}$$

and

$$\mathbf{C}_{N2O,i} = \text{min of } [\mathbf{C}_{N2O,i}, \mathbf{CR}_{N2O}, \text{ and } \{(\mathbf{SE}_{N2O,y} \text{ x } \mathbf{P}_{HNO3,max})/\text{sum}(\mathbf{F}_{TG,i} \text{ x } \mathbf{M}_i)\}] \qquad \textbf{(19)}$$

else,

$$\mathbf{BE}_{N2O,y} = \mathbf{QI}_{N2O,y} \qquad \textbf{(20)}$$

where:

$\mathbf{C}_{N2O,i}$	N_2O concentration at destruction facility inlet during interval i (tN_2O/m^3)
$\mathbf{CR}_{N2O}$	Regulatory limit for specific N_2O concentration (tN_2O/m^3)
$\mathbf{BE}_{N2O,y}$	Baseline emissions of N_2O in year y (tN_2O)
$\mathbf{F}_{TG,i}$	Volume flow rate of tail gas at destruction facility during interval i (m^3/hr)
$\mathbf{M}_i$	Length of measuring interval
i	interval
n	number of intervals during the year
$\mathbf{QI}_{N2O,y}$	Quantity of N_2O emissions at the inlet of the destruction facility in year y (tN_2O)

As in Case 1, the quantity of N_2O emissions at the inlet of the N_2O destruction facility ($\mathbf{QI}_{N2O,\,y}$) is calculated on the basis of continuous measurement of the tail gas volume flow rate and the N_2O concentration at the inlet to the N_2O destruction facility.

Change in NO_x or N_2O regulations will automatically cause a re-assessment of the baseline scenario.

3. Procedures to determine the permitted operating conditions of the nitric acid plant to ensure accurate calculation of emission reductions:

To avoid any chance of manipulating the operation of the nitric acid plant to increase N_2O generation, thereby increasing the CERs, the following procedures relating to the operating temperature and pressure and the use of ammonia oxidation catalysts will be applied:

3.1 Operating temperature and pressure of the ammonia oxidation reactor (AOR):

The following parameters will be monitored for comparison to the historical values:

$\mathbf{T}_{g,d}$	Actual operating temperature of the AOR on day d (°C)
$\mathbf{P}_{g,d}$	Actual operating pressure of the AOR on day d (Pa)
$\mathbf{T}_{g,hist}$	Historical operating temperature range of the AOR (°C)
$\mathbf{P}_{g,hist}$	Historical operating pressure range of the AOR (Pa)

If the actual average daily operating temperature ($T_{g,d}$) or pressure ($P_{g,d}$) in the ammonia oxidation reactor are outside of the permitted operating temperature ($T_{g,hist}$) and pressure ($P_{g,hist}$) range, the baseline emissions will be calculated for that respective period, based on the lower value amongst:

a) the conservative IPCC default value of 4.05 $kgN_2O/tHNO_3$
b) $SE_{N2O,y}$ and
c) the regulatory value such as $RSE_{N2O,y}$, if applicable

To determine the ‘permitted range’ for temperature and pressure at the AOR, a statistical analysis of the historical data was made. This analysis covered the data over the period from Jan 2002 to March 2006. The statistical analysis, excluding the 2.5% and 97.5% outliers yields the following ranges:

$\mathbf{T}_{\text{g hist}}$	886.75 to 894°C from historical data but 885 to 895°C from the operating manual provided by the technology supplier.
$\mathbf{P}_{\text{g hist}}$	308 to 433 kPa at inlet side of Ammonia Oxidation Reactor from historical data but 300 to 450 kPa from the operating manual. 290 to 438 kPa at outlet side of Ammonia Oxidation Reactor from historical data but 290 to 440 kPa from the operating manual.

If the permissible operating limit recommended in the operating manual is exceeded for either temperature or pressure, the baseline N_2O emissions for that period will be capped at the conservative IPCC default value of 4.05 $kgN_2O/tHNO_3$.

3.2 Composition of Ammonia Catalyst

Omnia has traditionally purchased its ammonia oxidation catalyst from two (2) reputable manufacturers – Heraeus & Johnson Matthey. It is the company’s intention to continue using a common ammonia oxidation catalyst produced by a reputable manufacturer during the crediting period. The composition of ammonia oxidation catalyst to be used during the first crediting period will be of the same kind of catalyst composition as what is already in operation in its nitric acid plant. Should the company decide to switch ammonia oxidation catalysts, it will provide appropriate and verifiable reasons to the Designated Operational Entity (DOE) retained to verify the CERs. If the company fails to demonstrate such reasons to the DOE’s satisfaction, its baseline emissions will be limited to that of the previous periods ($tN_2O/tHNO_3$) documented in the verified monitoring reports.

To ensure strict compliance with the above requirements, Omnia will be monitoring the following parameters:

$\mathbf{G}_{\text{sup}}$	Supplier of the ammonia oxidation catalyst
$\mathbf{G}_{\text{sup,hist}}$	Historical supplier of the ammonia oxidation catalyst
$\mathbf{G}_{\text{com}}$	Composition of the ammonia oxidation catalyst
$\mathbf{G}_{\text{com,hist}}$	Historical composition of the ammonia oxidation catalyst (refer to section E for details)
$\mathbf{SE}_{\text{N2O,y}}$	Specific N_2O emissions per ton HNO_3 in year y ($tN_2O/tHNO_3$)

A review of the available plant data disclosed the following:

$\mathbf{G}_{\text{sup hist}}$	Of the last 9 sets of platinum gauzes, eight (8) sets were purchased from Heraeus and one (1) from Johnson Matthey (Pty) Limited (for the May 2004 campaign)
$\mathbf{G}_{\text{com hist}}$	Specific data on the composition of the Heraeus platinum gauze as well as the Johnson Matthey one used in the 2004 campaign for the last 9 campaigns to the degree provided by the manufacturers is as follows:

Gauze pack composition (high activity plus catchment)	Pt(g)	Pd(g)	Rh(g)
Heraeus FTC 1	41,897.25	25,025.71	4,005.94
Heraeus FTC 2	41,939.19	24,035.63	2,705.67
Heraeus FTC 3	43,521.4	24,424.79	2,797.02
Heraeus FTC 4	43,141.29	24,992.63	2,788.78
Heraeus FTC 5	42,228.71	24,718.82	2,735.08
Heraeus FTC 6	43,268.02	24,868.31	2,792.88
Johnson Matthey (2004)	52,481	46,476	2,971
Heraeus FTC 7	37,420.45	24,019.05	2,467.50
Heraeus FTC 8	38,809.89	25,811.78	1,837.34
Heraeus FTC 9	36,760.35	25,524.68	2,463.98

3.3 Ammonia flow rate to the Ammonia Oxidation Reactor

If the actual daily ammonia flow rate exceeds the upper limit as established from the daily permitted ammonia flow rate, the baseline emissions for that operating day will be calculated on the basis of the conservative IPCC default values as limited by the legal regulations. Calculation of the upper limit on ammonia flow will be determined on the basis of the plant's historical operating data on maximum daily average ammonia flow.

If the daily ammonia input to the oxidation reactor exceeds the permissible ammonia input limit, the baseline N_2O emissions will be capped at the conservative IPCC default value.

To ensure strict compliance with the above requirements, Omnia will monitor the following parameters on a daily basis:

$\mathbf{A}_{OR,d}$	Actual ammonia input to oxidation reactor (tNH_3/day)
$\mathbf{A}_{OR,hist}$	Maximum historical ammonia input to the oxidation reactor (tNH_3/day)

Analysis of the operating data from Jan 2002 to March 2006 shows the maximum ammonia input to the oxidation reactor over this 4+ year period to be 232 t NH_3/day.

D. 2.2. Option 2: Direct monitoring of emission reductions from the project activity (values should be consistent with those in section E).

D.2.2.1. Data to be collected in order to monitor emissions from the project activity, and how this data will be archived:

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c), estimated (e),	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

- not applicable as option 1 is chosen –

D.2.2.2. Description of formulae used to calculate project emissions (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.):

- not applicable as option 1 is chosen -

D.2.3. Treatment of leakage in the monitoring plan

D.2.3.1. If applicable, describe the data and information that will be collected in order to monitor leakage effects of the project activity

ID number *(Please use numbers to ease cross-referencing to table D.3)*	Data variable	Source of data	Data unit	Measured (m), calculated (c) or estimated (e)	Recording frequency	Proportion of data to be monitored	How will the data be archived? (electronic/ paper)	Comment

Leakage:

In accordance with AM0028, leakage emissions due to the potential need to heat the tail gas need only be considered if the project activity does not involve any energy recovery from the tail gas. Omnia's nitric acid plant does have an existing tail gas turbine and recovers the energy from the hot pressurized tail gas. The existing tail gas turbine is a GHH model GTAN9/100.2 rated for 7.54MW. Its normal operating inlet conditions are temperature and pressure conditions are 330 to 340°C and 670 to 850 kPa respectively based on whether the nitric acid plant is operating at low or high load. The respective outlet temperature and pressure from the tail gas turbine is 103 to 115°C and 0 kPa. As this existing tail gas turbine is to be retained, in accordance with AM0028 Version 01, leakage is deemed to be 0.

D.2.3.2. Description of formulae used to estimate leakage (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

-not applicable-

D.2.4. Description of formulae used to estimate emission reductions for the project activity (for each gas, source, formulae/algorithm, emissions units of CO_2 equ.)

As mentioned above, baseline emissions (**BE** $_y$) and project emissions (**PE**$_y$) are given by:

$$\mathbf{BE}_y = \mathbf{BE}_{N2O,\,y} \ \text{x} \ \mathbf{GWP}_{N2O} \qquad \mathbf{(9)}$$

where the value of $\mathbf{BE}_{N2O,\,y}$ is dependent on whether there is legislation regulating N_2O emissions and if so how are the emissions regulated. As there are no N_2O emissions regulations presently in effect, the equation becomes:

$$\mathbf{BE}_{N2O,\,y} = \mathbf{QI}_{N2O,\,y}$$

$$= \mathbf{\Sigma}^{n}_{\mathbf{i}} \mathbf{F}_{TG,\,i} \ \text{x} \ \mathbf{CI}_{N2O,\,i} \ \text{x} \ \mathbf{M}_i \qquad \mathbf{(21\ )}$$

$$\mathbf{PE}_y = \mathbf{PE}_{ND,y} + \mathbf{PE}_{DF,y}$$

$$= [\mathbf{PE}_{N2O,y} \ \text{x} \ \mathbf{GWP}_{N2O}] + [\mathbf{PE}_{NH3,y} + \mathbf{PE}_{HC,y}]$$

$$= [\sum_{i}^{n} \mathbf{F}_{TG,i} \ \text{x} \ \mathbf{CO}_{N2O,i} \ \text{x} \ \mathbf{M}_i \ \text{x} \ \mathbf{GWP}_{N2O}] + [\{\mathbf{Q}_{NH3,y} \ \text{x} \ \mathbf{EF}_{NH3}\} + \{\mathbf{HCE}_{C,y} + \mathbf{HCE}_{NC,y}\}]$$

$$= [\sum_{i}^{n} \mathbf{F}_{TG,i} \ \text{x} \ \mathbf{CO}_{N2O,i} \ \text{x} \ \mathbf{M}_i \ \text{x} \ \mathbf{GWP}_{N2O}] + [\mathbf{Q}_{NH3,y} \ \text{x} \ \mathbf{EF}_{NH3} + \rho_{HNC} \ \text{x} \ \mathbf{Q}_{HNC,y} \ \text{x} \ \mathbf{GWP}_{CH4} \ \text{x} \ (1 - \mathbf{OXID}_{CH4}/100) +$$

$$+ \ \rho_{HC} \ \text{x} \ \mathbf{Q}_{HC,y} \ \text{x} \ \mathbf{EF}_{HC} \ \text{x} \ \mathbf{OXID}_{HC}/100] \qquad \mathbf{(22)}$$

therefore, the emission reductions will be calculated as per equation 23:

$$\mathbf{ER}_y = \mathbf{BE}_y - \mathbf{PE}_y$$

$$= [\mathbf{BE}_{N2O,\,y} \times \mathbf{GWP}_{N2O}] - ([\sum_{i}^{n}\mathbf{F}_{TG,i} \times \mathbf{CO}_{N2O,i} \times \mathbf{M}_i \times \mathbf{GWP}_{N2O}] + [\mathbf{Q}_{NH3,y} \times \mathbf{EF}_{NH3} + \rho_{HNC} \times \mathbf{Q}_{HNC,y} \times \mathbf{GWP}_{CH4} \times (1 - \mathbf{OXID}_{CH4}/100) +$$

$$+ \rho_{HC} \times \mathbf{Q}_{HC,y} \times \mathbf{EF}_{HC} \times \mathbf{OXID}_{HC}/100]) \qquad \mathbf{(23)}$$

Total emission reduction will be estimated ex-ante, as shown in Section E.5, and determined ex-post as explained in Sections D.2.1.2, D.2.1.4 & D.3.2.

If regulations are implemented, the above equations will be revised to ensure the appropriate factors are used. In all cases however, the actual operating conditions of temperature ($T_{g,d}$), pressure ($P_{g,d}$) and ammonia input (tNH_3) into the ammonia oxidation reactor (AOR) will be tested against historical or plant operating design data and the appropriate calculated or default values, as required, will be used in the equations.

D.3. Quality control (QC) and quality assurance (QA) procedures are being undertaken for data monitored		
Data *(Indicate table and ID number e.g. 3.-1.; 3.2.)*	Uncertainty level of data (High/Medium/Low)	Explain QA/QC procedures planned for these data, or why such procedures are not necessary.

B1 **$P_{HNO3,y}$**	Low	Meter used to measure nitric acid production as well as its concentration and temperature is a Mass Flow meter with a coriolis Micro Motion Elite Sensor. Degree of accuracy for mass flow is +/- 0.03%. Accuracy of concentration is +/- 0.0002%. The measurement devices will be subject to regular calibration, maintenance and testing to ensure degree of accuracy is maintained. **At beginning of the project:** The nitric acid flow meter and associated on-line density meter will be checked by Omnia's instrumentation technician to ensure it is operating in accordance with the manufacturers' instructions. **Throughout the project lifetime:** • maintenance and checking will be carried out in accordance with the manufacturer's recommendations. • the density and concentration of the nitric acid will be measured on a regular basis by Omnia's laboratory and the results compared to the readings from the on line meter. • Omnia will also conduct periodic plausibility checks based on the ammonia nitrogen balance of the plant. This check will require input from the ammonia flow meter to the ammonia oxidation reactor and an estimate of the amount of ammonia nitrogen converted to elemental nitrogen, N_2. Such plausibility checks will be done with the plant operating at constant conditions for several hours prior to and during the checks to minimize the effects of tower sump pump out and time delays between the ammonia oxidation reactor and the product nitric acid. QA/QC program will be integrated in Omnia's quality management system. Omnia Fertilizer Limited already has ISO 14001 and OHSAS 18001 certification and will receive ISO9001:2000 certification by May 2006. Its lab is already ISO 9001:2000 certified.

B10 $\mathbf{T}_g$	Low	The temperature of the ammonia at the ammonia oxidation reactor (AOR) is measured with a PT100 resistance bulb c/w a Rosemont Model 244P temperature transmitter. Degree of accuracy is +/- 0.1% The pre-mixed air and NH_3 temperature and the mixed air/NH_3 gas temperature are also measured with PT100 resistance bulbs. The temperature of the converted gas (below the gauzes) is measured with 6 Type K thermocouples and each connected to a Rosemont transmitter. Degree of accuracy is +/-0.1%
B11 $\mathbf{P}_g$	Low	The ammonia pressure at the AOR, is measured with a pressure Rosemont pressure element c/w Rosemont pressure transmitter. Degree of accuracy is +/- 0.05% Temperature and pressure sensors, transmitters and recording devices will be subjected to a regular calibration, maintenance and testing regime between campaigns – unless it is seen from recorded data that the readings are abnormal .
P5 $\mathbf{F}_{TGi}$	Low	Tail gas flow is measured with venture tube or Verabar Accelerator instrument c/w Rosemont D/P sensors and transmitters. Degree of accuracy is +/- 0.75% , with a repeatability of +/- 0.075% and a turndown ratio of 65:1. As the nitric acid production rate will be relatively constant, it will be well within the turndown ratio and thereby maintain a high level of accuracy. Flow meter was calibrated for a volumetric flow range from 60,000 to 150,000 Nm3/hr. Actual flow is in the range of 100,000 Nm3/hr. Flow meter and associated transmitter and recording device will be subject to regular calibration, maintenance and testing regime between campaigns, unless it is seen from recorded data that the readings are abnormal, to maintain a high degree of accuracy.
P6 $\mathbf{CO}_{N2O,i}$ B3 $\mathbf{CI}_{N2O,i}$	Low Low	Concentration of N_2O in the tail gas is measured with a single component multichannel infrared analyzer. The meter has a repeatability of +/-2% of full scale. Both N_2O concentration measurement devices will be subject to regular calibration, maintenance and testing regime to maintain a high degree of accuracy. Instrumentation will be calibrated weekly with the installed automatic calibration system. Moreover, quarterly grab samples will also be taken and analysed by an external laboratory.
P7 $\mathbf{M}_i$	Low	Meters for measuring intervals will be subject to regular calibration, maintenance and testing regime to ensure accuracy.

P10 **$Q_{NH3,y}$** P14 **$Q_{HC,y}$** B17 **SE_{N2O}**	Low Low Low	Ammonia flow to AOR is measured with an orifice plate and Rosemont D/P transmitter. Flow is converted to standard conditions based on the temperature and pressure measurements by Rosemont PT100 and 244P respectively. To maintain a high degree of accuracy flow straighteners are installed upstream of the orifice and the length of straight pipe upstream and downstream of the orifice is over 2 times the recommended distance. This provides a reading with an accuracy of +/- 2.5%. The natural gas used as a reducing agent will be measured by a turbine flow meter gas meter. All meters will be subject to regular calibration, maintenance and testing regime of once per campaign, unless it is seen from recorded data that the readings are abnormal in which case it will be more often, to ensure a high level of accuracy.

As a chemical plant, Omnia has established a set of internal procedures that ensures the utmost accuracy level from the installed instrumentation including sensors, transmitters and recording equipment. Moreover it has a dedicated instrument technician to periodically check the calibration of the instruments and recalibrate as necessary. Omnia is presently in the process of obtaining ISO 9001 certification and should be so certified by May 2006. Refer to section D4 for details.

D.4 Please describe the operational and management structure that the project operator will implement in order to monitor emission reductions and any leakage effects, generated by the project activity

Omnia will operate the tail gas catalytic N_2O destruction facility and all associated monitoring equipment. The staff has been operating the fertilizer plant for over 22 years and is quite experienced in operating the project activity and calibrating and maintaining the associated monitoring equipment. In case of emergencies, such as failure of the catalyst to reduce N_2O to the expected levels, the technology provider will be available. More specifically, the operational and management structure to monitor this project activity will be established as per table 6 below.

Table 6: Operational and management structure

Department	**Responsibility**	**Monitoring**	**Methodology**
Omnia Nitric Acid Plant	Eugene Muller, Production Manager Nitric Acid Plant	N_2O concentration and tail gas flow at inlet and outlet of N_2O destruction facility, ammonia gas flow rate and associated operating temperature and pressure.	Monitoring equipment will be calibrated on a scheduled period basis and in accordance to Omnia's standards. Calibration will be done by Omnia's electronic technologist. Data is archived by a chart recorded measurement.
Instrumentation	Wessie van der Westhuizen	Quality assurance for low uncertainties in the measurement instruments.	This is in accordance to ISO 9001 instructions, procedures and maintenance planning.
Instrumentation	Wessie van der Westhuizen	Nitric acid production and concentration is manually recorded at 4 hr intervals. Recording operation may however be automated through a datalogger.	mass flow meter, based on the coriolis principle, complete with density meter, and temperature sensor is used to monitor nitric acid prod.n and concentration. Meter is removed and sent to supplier for calibration at the start and end of each campaign.
SHER (Safety, Health, Environmental and Risk)	Zain Mohamed	Emissions of N_2O & NOx	An infrared monitoring system monitors N_2O emissions in tail gas and a verabar meter monitors gas flow in the stack. Data is logged electronically.

The ISO 9001 quality management system adopted by Omnia also includes the following issues:

- Identification of training needs for the project (operation, maintenance, monitoring, etc.) and imparting the trainings.
- Procedures addressing what records to keep, storage area of records, and how to process performance documentation.
- Procedures identified for internal audits of GHG project compliance with operational requirements.
- Procedures identified for corrective actions in order to provide for more accurate future monitoring and reporting.

An emergency in the project can result in a reduction of N_2O destruction. The equipment monitoring N_2O emissions will be programmed to alarm in case the emissions level is outside of the expected concentration level by +/-10%. In case of an alarm the following action will occur:

- **Process Technician/Foreman contact plant production manager and instrumentation personnel on standby**
- **Production manager will be in contact with instrumentation technician to ascertain what went wrong and how to sort out the problem.**
- **If they cannot fix the problem, the equipment supplier will be contacted for help**

The probability of such an incident occurring is minimal. If it does happen, aside from Omnia's technical staff, the technology provider is readily available for electronic consultation. The technology provider is available 24hours/day if the plant experiences any problems. Moreover, the plant has a link with the technology provider whereby its experts in Europe can access the equipment status via the internet to help sort out any emergencies and get the project activity operating within the expected performance range. Any problem with the project activity equipment will be handled as a plant break down and fixed as soon as possible.

D.5 Name of person/entity determining the monitoring methodology:

Vincent Donato, P.Eng.
DNS Consultants (Pty) Limited
24 Sturdee Ave.
Parklands 2121,
Johannesburg, South Africa
tel: +27 11 447 7883 fax: +27 11 447 7885
e-mail: Vincent@cbla.org.za

Vincent Donato is not a project participant.

SECTION E. Estimation of GHG emissions by sources

E.1. Estimate of GHG emissions by sources:

As discussed in section D, the project GHG emissions within the project boundary area correspond to the emissions from the N_2O not destroyed and the emissions arising from the operation of the N_2O destruction facility.

The project emissions are estimated ex-ante, for reference purposes only, by using the following:

- estimated nitric acid production over the crediting period,
- average N_2O and NO_x formation calculated from data collected over the past 2 campaigns
- expected efficiency of the catalytic N_2O destruction process of between 94% & 98%
- estimated natural gas and ammonia input requirements

Actual project and baseline emissions will be determined from measurement results on an ex-post basis.

Consequently the ex-ante project emissions $\mathbf{PE}_y$ (tCO_2e/year) are given by:

$$\mathbf{PE}_y = [\sum_i^n \mathbf{F}_{TG,i} \times \mathbf{CO}_{N2O,i} \times \mathbf{M}_i \times \mathbf{GWP}_{N2O}] + [\mathbf{Q}_{NH3,y} \times \mathbf{EF}_{NH3}{}^{(7)} + \rho_{HNC} \times \mathbf{Q}_{HNC,y} \times \mathbf{GWP}_{CH4} \times$$

$$\times (1 - \mathbf{OXID}_{CH4}/100) + \rho_{HC} \times \mathbf{Q}_{HC,y} \times \mathbf{EF}_{HC} \times \mathbf{OXID}_{HC}/100]$$

$$= [\mathbf{F}_{TG,1} \times \mathbf{CO}_{N2O,1} \times 1 \times 310] + [\mathbf{F}_{TG,2} \times \mathbf{CO}_{N2O,2} \times 1 \times 310] + \ldots + [\mathbf{F}_{TG,n} \times \mathbf{CO}_{N2O,n} \times 1 \times 310] +$$

$$+[\mathbf{Q}_{NH3,y} \times 2.14^{(7)} + 0.00071 \times \mathbf{Q}_{HNC,y} \times 21 \times (1 - \mathbf{OXID}_{CH4}/100) + 0.000698 \times \mathbf{Q}_{HC,y} \times 2.75 \times$$

$$\times \mathbf{OXID}_{HC}/100] \qquad \textbf{(24)}$$

In the above calculations for $\mathbf{BE}_y$, the time interval Mi is taken as 1 hour and thus substituted 1 for $\mathbf{M}_i$.

the ex-ante estimation of the project emissions ($\mathbf{PE}_y$) inside the plant are shown in table 7:

Table 7: Ex-ante Project Emissions

Year (1)	Emissions from N_2O not destroyed (tCO_2e)	Emissions from natural gas used (tCO_2e)	Emissions from NH_3 used (tCO_2e)	Total Project Emissions (tCO_2e)
2008	30,731	1,276	789	32,797
2009	31,312	1,300	804	33,417
2010	51,219	1,276	789	53,284
2011	50,358	1,255	776	52,389
2012	31,312	1,300	804	33,417
2013	30,731	1,276	789	32,797
2014	52,187	1,300	804	54,292
Total	**277,851**	**8,983**	**5,556**	**292,391**

Notes:
(1) Year is defined as the time period between April 1 and March 31 of subsequent year

---

[7] IPCC value for $\mathbf{EF}_{NH3}$ is 1.6 t CO_2/tNH_3. AM0028 suggests value of 2.14 . Higher value of 2.14 is used to be conservative.

E.2. Estimated leakage:

As discussed in section D.2.3.1, the existing nitric acid plant does have an energy recovery turbine installed in the tail gas downstream of the N_2O destruction facility. Consequently, no leakage is expected as per AM0028.

E.3. The sum of E.1 and E.2 representing the project activity emissions:

As there is no leakage to be considered, the project activity emissions are 292,391 tCO_2e over the seven (7) year crediting period, as per table 7.

E.4. Estimated anthropogenic emissions by sources of greenhouse gases of the baseline:

Baseline GHG emissions within the project boundary correspond to the emissions of the N_2O in the tail gas. The ex-ante baseline emissions **BE**$_y$ (tCO_2e/year) are given by equation 25 shown below. The ex-ante baseline GHG emissions within the project boundary, also discussed in section D, correspond to the N_2O emissions in the tail gas, based on tail gas flow volume and N_2O concentration at the inlet to the catalytic N_2O destruction facility per unit of time over the entire year and are calculated as follows:

$$\mathbf{BE}_y = \sum_i^n \mathbf{F}_{TG,i} \text{ x } \mathbf{CI}_{N2O,i} \text{ x } \mathbf{M}_i \text{ x } \mathbf{GWP}_{N2O}$$

$$= [\mathbf{F}_{TG,1} \text{ x } \mathbf{CI}_{N2O,1} \text{ x } 1 \text{ x } 310] + [\mathbf{F}_{TG,2} \text{ x } \mathbf{CI}_{N2O,2} \text{ x } 1 \text{ x } 310] + ... + [\mathbf{F}_{TG,n} \text{ x } \mathbf{CI}_{N2O,n} \text{ x } 1 \text{ x } 310] \quad \mathbf{(25)}$$

In the above calculations for **BE**$_y$, the time interval Mi is taken as 1 hour and have thus substituted 1 for Mi.

The ex-ante baseline emissions are calculated from equation 25 using values of total baseline N_2O concentration in tail gas and the volume flow rate.

Thus, ex-ante estimation of baseline emissions over the 7 year crediting period is 3,605,759 tCO_2e as per table 8:

Table 8 Ex-ante Baseline Emissions

Year (1)	N_2O Emissions in tail gas (tN_2O)	Baseline Emissions (tCO_2e)
2008	1,652.2	512,188
2009	1,683.5	521,872
2010	1,652.2	512,188
2011	1,624.5	503,580
2012	1,683.5	521,872
2013	1,652.2	512,188
2014	1,683.5	521,872
Total	**11,631**	**3,605,759**

Notes:

(1) Year is defined as the time period between April 1 and March 31 of subsequent year

E.5. Difference between E.4 and E.3 representing the emission reductions of the project activity:

As previously noted, the baseline emissions ($\mathbf{BE}_y$) and project emissions ($\mathbf{PE}_y$) in tCO_2e are given in equations 24 (Section E.1.) and 25 (Section E.4.). Therefore, the emission reductions ER (tCO_2e/year) attained by the project activity are given by:

$$\mathbf{ER}_y = \mathbf{BE}_y - \mathbf{PE}_y$$

$$\begin{aligned}
\mathbf{ER}_y = {} & [\sum_i^n \mathbf{F}_{TG,i} \times \mathbf{CI}_{N2O,i} \times \mathbf{M}_i \times \mathbf{GWP}_{N2O}] - [\{\sum_i^n \mathbf{F}_{TG,i} \times \mathbf{CO}_{N2O,i} \times \mathbf{M}_i \times \mathbf{GWP}_{N2O}\} + \{\mathbf{Q}_{NH3,y} \times \mathbf{EF}_{NH3} \\
& + \rho_{HNC} \times \mathbf{Q}_{HNC,y} \times \mathbf{GWP}_{CH4} \times (1 - \mathbf{OXID}_{CH4}/100)\} + \{\rho_{HC} \times \mathbf{Q}_{HC,y} \times \mathbf{EF}_{HC} \times \mathbf{OXID}_{HC}/100\}] \\
= {} & [\mathbf{GWP}_{N2O} \times (\mathbf{F}_{TG,1} \times \mathbf{CI}_{N2O,1} \times \mathbf{M}_1 + \mathbf{F}_{TG,2} \times \mathbf{CI}_{N2O,2} \times \mathbf{M}_2 + \ldots + \mathbf{F}_{TG,n} \times \mathbf{CI}_{N2O,n} \times \mathbf{M}_n)] - \\
& - [\mathbf{GWP}_{N2O} \times \{\mathbf{F}_{TG,1} \times \mathbf{CO}_{N2O,1} \times \mathbf{M}_1 + \mathbf{F}_{TG,2} \times \mathbf{CO}_{N2O,2} \times \mathbf{M}_2 + \ldots + \mathbf{F}_{TG,n} \times \mathbf{CO}_{N2O,n} \times \mathbf{M}_n\} + \\
& + \{\mathbf{Q}_{NH3,y} \times \mathbf{EF}_{NH3}\} + \{\rho_{HNC} \times \mathbf{Q}_{HNC,y} \times \mathbf{GWP}_{CH4} \times (1 - \mathbf{OXID}_{CH4}/100)\} + \{\rho_{HC} \times \mathbf{Q}_{HC,y} \times \mathbf{EF}_{HC} \times \\
& \times \mathbf{OXID}_{HC}/100\}] \qquad \mathbf{(26)}
\end{aligned}$$

thus ex-ante emission reductions are given by the following equation using the individual readings over the selected interval (say every hour) for tail gas flow, N_2O concentration at the inlet and outlet of the N_2O destruction facility and the ammonia (NH_3) and natural gas (CH_4) input to the destruction facility.

$$\begin{aligned}
\mathbf{ER}_y = {} & [310 \times (\mathbf{F}_{TG,1} \times \mathbf{CI}_{N2O,1} \times \mathbf{M}_1 + \mathbf{F}_{TG,2} \times \mathbf{CI}_{N2O,2} \times \mathbf{M}_2 + \ldots + \mathbf{F}_{TG,n} \times \mathbf{CI}_{N2O,n} \times \mathbf{M}_n)] - \\
& - [310 \times \{\mathbf{F}_{TG,1} \times \mathbf{CO}_{N2O,1} \times \mathbf{M}_1 + \mathbf{F}_{TG,2} \times \mathbf{CO}_{N2O,2} \times \mathbf{M}_2 + \ldots + \mathbf{F}_{TG,n} \times \mathbf{CO}_{N2O,n} \times \mathbf{M}_n\} + \\
& + \{\mathbf{Q}_{NH3,y} \times 2.14\} + \{\rho_{HNC} \times \mathbf{Q}_{HNC,y} \times 21 \times (1 - \mathbf{OXID}_{CH4}/100)\} + \{\rho_{HC} \times \mathbf{Q}_{HC,y} \times 2.75 \times \\
& \times \mathbf{OXID}_{HC}/100\}] \qquad \mathbf{(27)}
\end{aligned}$$

When the time interval Mi = 1 hr, then the equation becomes:

$$\begin{aligned}
\mathbf{ER}_y = {} & [310 \times (\mathbf{F}_{TG,1} \times \mathbf{CI}_{N2O,1} + \mathbf{F}_{TG,2} \times \mathbf{CI}_{N2O,2} + \ldots + \mathbf{F}_{TG,n} \times \mathbf{CI}_{N2O,n})] - \\
& - [310 \times \{\mathbf{F}_{TG,1} \times \mathbf{CO}_{N2O,1} + \mathbf{F}_{TG,2} \times \mathbf{CO}_{N2O,2} + \ldots + \mathbf{F}_{TG,n} \times \mathbf{CO}_{N2O,n}\} + \{\mathbf{Q}_{NH3,y} \times 2.14\} + \{\rho_{HNC} \times \\
& \times \mathbf{Q}_{HNC,y} \times 21 \times (1 - \mathbf{OXID}_{CH4}/100)\} + \{\rho_{HC} \times \mathbf{Q}_{HC,y} \times 2.75 \times \mathbf{OXID}_{HC}/100\}] \qquad \mathbf{(28)}
\end{aligned}$$

E.6. Table providing values obtained when applying formulae above:

The project has the capacity to reduce GHG emissions by 3,313,368 tCO_2e over the first 7-year crediting period. The results obtained from applying the formulas above are shown in table 9. All the calculations are based on using current regulations regarding N_2O emissions regulations of which there is none, and average values for N_2O concentration in the tail gas and flow to the destruction facility and an estimated of the expected N_2O concentration in the tail gas downstream from the destruction facility.

Table 9: Estimated Ex-ante Emissions Reduction during the first 7-year crediting period (tCO_2e)

Year [(1)]	Project Emissions	Leakage	Baseline Emissions	Emissions Reduction
2008	32,797	0	512,188	479,391
2009	33,417	0	521,872	488,455
2010	53,284	0	512,188	458,904
2011	52,389	0	503,580	451,191
2012	33,417	0	521,872	488,455
2013	32,797	0	512,188	479,391
2014	54,292	0	521,872	467,580
Total	**292,391**	**0**	**3,605,759**	**3,313,368**

Notes:
(1) Year is defined as the time period between April 1 and March 31 of subsequent year

SECTION F. Environmental impacts

F.1. Documentation on the analysis of the environmental impacts, including transboundary impacts:

The installation of a catalytic N_2O destruction facility (DF) in the tail gas has a positive environmental impact because it reduces N_2O emissions to the atmosphere as well as NO_x up to 98% and thereby results in cleaner overall air quality in the Sasolburg area.

The project implementation involves installing a catalytic N_2O DF in the tail gas of the nitric acid plant plus piping to supply ammonia and natural gas. The natural gas is required as a reducing agent for NO_x removal, as the DF works best at low NO_x levels, and the ammonia is required as a reactant with the catalyst to destroy the N_2O. Additionally, the installation will also include all of the flow, temperature and pressure monitoring equipment as required to accurately calculate the baseline and project GHG emissions. This work is readily done off line and connected to the main tail gas pipe during a minor plant shutdown for replacement of the precious metal gauzes. The environmental impact of these activities is expected to be insignificant.

The catalyst used in the N_2O Destruction Facility is expected to last more than four (4) years. The spent catalyst is not considered a hazardous waste and can be readily disposed through the local landfill. Alternately, it can be returned to the catalyst manufacturer for disposal. A copy of the MSDS for the catalyst is attached under Annex 5.

F.2. If environmental impacts are considered significant by the project participants or the host Party, please provide conclusions and all references to support documentation of an environmental impact assessment undertaken in accordance with the procedures as required by the host Party:

No significant negative environmental impact is expected from the project activities and an environmental impact assessment (EIA) is not required by the provincial South African authorities. In effect, an initial letter from the Assistant Director: Environmental Impact Management of the Free State provincial Dept. of Tourism, Environmental and Economic Affairs, dated August 19, 2005 states that:

- ***The proposed project which including the use of a new catalyst by upgrading the current operation, does not fall under the requirements in terms of the Environmental Impact Assessment (EIA) Regulations: Regulations No. 1182 and No. 1183 of he Environment Conservation Act (Act No. 73 of 1989, Sections 21, 22 & 26)***
- ***The proposed project does not constitute a process change***
- ***No new or increased detrimental effect is foreseen on the environment***

Based on the above, and on the grounds of the information currently available, the Department requires the following:

- ***Overall mass balance that indicates reduction in N_2O in the reaction step of the nitric acid production process.***

The mass balance was subsequently submitted to the Free State Province Dept. of Tourism, Environment and Economic Affairs as per its request and the Dept. has acknowledged its receipt. A copy of the subsequent letter exempting the project activity from the requirements of an EIA is appended in Annex 5.

SECTION G. Stakeholders' comments

While not requested by regulations or other government directives, Omnia has taken it upon itself to better acquaint its immediate industrial neighbours, provincial and federal environmental authorities, as well as other potential stakeholders such as local residents and NGOs through a public information forum held on Oct. 5, 2005.

G.1. Brief description how comments by local stakeholders have been invited and compiled:

The process followed to collect stakeholder comments for Omnia's Nitric Acid Plant N_2O reduction project was through a survey developed by Omnia in conjunction with its consultant. Stakeholders selected for consultation by Omnia included representatives from local NGOs (as recommended by Mr. K. Nassiep, Chief Director of Energy Planning within the Department of Minerals and Energy and responsible for South Africa's DNA) and representatives from the following government agencies:

- Free State Dept. of Tourism, Environment and Economic Affairs
- South Africa Dept. of Minerals and Energy (DME)
- SALGA – South Africa Local Government Association
- SANGOCO – South African NGO Coalition

Moreover, to ensure that other interested parties were also invited, Omnia published advertisements in both English and Afrikaan in the local Vaal Ster newspaper from August 22 – 26, 2005.

The following set of questions were given to stakeholders present at the public information forum:

1. In relation with the information that you have and your knowledge about environmental issues, climate change, Kyoto Protocol, Clean Development Mechanism, and Global Carbon Market; please express your opinion on the Omnia N_2O Reduction Project.

2. Would you recommend to other private companies, to develop this kind of project under the Clean Development Mechanism?

3. Do you consider that Omnia's N_2O Reduction project will contribute to sustainable development of the region and South Africa?

4. Any additional comment that you want to express.

The questionnaire was completed by five (5) of the stakeholders attending the public forum as follows:

Table 10: Stakeholders Who Responded To The Questionnaire

Name	Position	Company/Institution
Ian Kennon	Site Leader	Dow Plastics SA
John Savakis	Manager	Sascrete
Tobie Prinsloo	Manager	Sud-Chemie Sasol Catalysts
Julius van Graan	APCOC	South Africa DEAT
Solomon Mahalwiri	Environmental Specialist	Sasol Environmental Centre

STAKEHOLDER REPORT OMNIA	ITEM 1: Public Information forum held by Omnia at its Sasolburg Nitric Acid Plant on October 5, 2005	
Omnia representatives present at the public Information Forum	**Rudi Kriese – Business Development Manager** **Eugene Muller – Manager Nitric Acid Plant**	
Stakeholders present at the EIA Forum	**Ian Kennon – Site Leader; Dow Plastics** **John Sevakis – Manager; Sascrete** **Tobie Prinsloo – Manager; Sud-Chemie Catalysts** **Julius van Graan – APCOO D.E.A.T** **S.S. Mahalwiri – Env. Specialist; Sasol Environmental Centre** **Vincent Donato – DNS Consultants (Pty) Limited**	
DIRECTIVE FROM GOVT	**Action Taken By Omnia**	**Omnia Person Responsible & Comments**
None	**Letters of invitation to a project public forum were sent out to all neighbouring parties around the plant site on Sept. 22, 2005. Parties included Dow Chemicals, Sud Chemie, Natref, SBH Bricks, Sascrete & Sasol,**	**Invitation letter drafted by R. Kriese (Omnia) & V. Donato (DNS Consultants)**
	Letters of invitation were sent	**Belinda Kotze managed the**

	to the following additional interested parties: **David Bambata - SALGA** (South Africa Local Govt Assoc.n) **Madoda Ontibele Moalusi- SANGOCO** (South Africa NGO Coalition) **Mr. Matooane** – **DME** (S.A. Dept Minerals & Energy **Free State DTEEA** – David Mofokeng **Sasolburg District Municipality** – Gerhard Homan **DEAT South Africa** – Julius van Graan *See Annex 5 for sample letter*	**delivery of letters to SALGA, SANGOCO, DME, DEAT, Free State Dept of Tourism, Environment & Economic Affairs,**
Put ad in the local community newspaper inviting interested parties to attend.	**An ad was drafted in consultation with Omnia's Communications Department and was published in the "Vaal Ster" local newspaper in both English & African from August 22 – 26, 2005:** *See Annex 5 for copy of ad*	**R.Kriese oversaw that the communication process was followed through. He also oversaw preparation of the ad and its publication in the local papers.**
Ensure that all attendees register – stating name, company they work for, telephone numbers, address, e-mail address	**An attendance register was circulated and filled in by all attendees. Refer to the page 1 for a list of attendees**	**Belinda Kotze managed the registration of attendees.**
Provide tour of area where project activity will take place	**A tour of nitric acid plant was undertaken and questions were encouraged from those attendees.**	**R. Kriese & V. Donato conducted the tour.**
Provide a short presentation about the project. The following issues were covered in the presentation: 1. ***What is the impact of the project on air & water emissions*** *(reduced)* 2. ***what is the impact of the project on vehicular traffic*** *(none)* 3. ***how does the project affect local stakeholders***	**Presentations were prepared and conducted by:** **R. Kriese - a brief summary about Omnia, its history, holdings and a description of the nitric acid plant.** **V. Donato – presented on the technical aspects of the project presentation.** ***See Annex 5* for the**	**R. Kriese managed the content of all the material presented on the day.**

4. would they consider a similar project or recommend it to others? If no one would recommend or implement it themselves, determine why they would not do it. ***5. how does project contribute to the sustainable development of South Africa*** ***6. how will project impact on the socio-economic condition of the region***	**programme of the day and the various presentations.**	
Solicit questions and comments from audience and record the following information regarding each question and comment: ***1. Question*** ***2. name of individual raising question*** ***3. answer provided*** ***4. follow-up discussion if any***	**Questions from the forum were recorded on a questionnaire provided and were responded to in detail to all presenting. *See Annex 5 for questionnaire responses* & for questions/ comments posed.**	**R. Kriese managed the Q&A session with co-presenter.**
Following the meeting: ***1. follow up with letter thanking all attendees*** ***2. summarize in the letter the project, the comments/ questions received and general overall outcome from meeting***	**Letters have already been drafted they will be sent out before the end of April.**	**R. Kriese**
Follow up with calls to invitees requesting their attendance Record all follow-up calls, person spoken to, and general summary of discussion.	**follow up calls to all invitees were made on between Sept. 26 and October 3, 2005.**	**R. Kriese will follow up**
Maintain contact with key stakeholders on an	**Follow up communiqués to key stakeholders.**	**R. Kriese**

on going basis		

G.2. Summary of the comments received:

Five questionnaires were completed and submitted at the public forum. In general, the project was well received and the comments were favourable towards the project. The only issue raised was the question related to the disposal of the spent iron zeolite catalyst. The attendees were advised that, based on information received from the catalyst supplier, the material was not considered hazardous and could be safely disposed at the local landfill. Alternately, the local catalyst supplier has agreed to take the catalyst back and dispose of it. A summary of the comments received is presented in Table 11.

Table 11: Comments Received

Name of Respondent	Question & Comments 1	2	3	4
Ian Kennon	a responsible pro-active step. Aligns well with the Dow focus on Responsible Care & internal requirements of continuous improvement to the triple bottom line.	Yes, internal focus needs to be the driver on environmental improvements, not awaiting govt regulation intervention.	Yes	Would this have a detrimental effect on water or ground quality? How will the spent catalyst be disposed?
John Savakis	Good	Yes	Yes	no comment
Tobie Prinsloo	Very good project	Yes	Yes	no comment
Julius van Graan	Positive development	already recommended	Yes	no comment
S.S. Mahalwiri	This is a very important project as its going to contribute in the development of cleaner production.	Yes. The benefits are great. Sustaining our environment is very important.	Yes, this message must be spread to other industries	To maintain the ozone layer, all producers of ghg must do their best to contain harmful waste.

Omnia Fertilizer invites comments from other stakeholders once the methodology has been published at the UNFCCC CDM website during the methodology approval process.

G.3. Report on how due account was taken of any comments received:

The only question arising from the stakeholders was regarding the disposal of the spent catalyst. The attendees were advised that the spent catalyst would either be returned to the catalyst supplier for disposal or disposed through the local landfill. All were advised that the spent catalyst was not deemed to be hazardous and could be readily disposed at the local landfill.

Annex 1

CONTACT INFORMATION ON PARTICIPANTS IN THE PROJECT ACTIVITY

Organization:	Omnia Fertilizer Limited
Street/P.O.Box:	Eugene Houdry Street
Building:	Northern Industries
City:	Sasolburg
State/Region:	Free State Province
Postfix/ZIP:	P.O. Box 384, Sasolburg 1947
Country:	South Africa
Telephone:	+27 16 970 7200
FAX:	+27 16 976 2650
E-Mail:	rkriese@ommia.com
URL:	www.omnia.co.za
Represented by:	
Title:	Business Development Manager
Salutation:	Mr.
Last Name:	Kriese
Middle Name:	
First Name:	Rudi
Department:	
Mobile:	+27 83 601 5663
Direct FAX:	
Direct tel:	
Personal E-Mail:	rkriese@omnia.co.za

Annex 2

INFORMATION REGARDING PUBLIC FUNDING

No funds from public national or international sources were used in any aspect of the proposed project.

Annex 3
BASELINE INFORMATION

Data	Value	Data Source
Carbon dioxide emission factor for ammonia production	2.14 tCO_2e/tNH_3	Default factor as noted in AM0028 Version 1, 03 March 2006
Carbon emission factor for CH_4 (EF_{HC})	2.75 tCO_2e/tCH_4	Default factor as noted in AM0028 Version 1, 03 March 2006
Global Warming Potential of methane, (GWP_{CH4})	21	Article 5, section 3 of the Kyoto Protocol, GWP value is as agreed at COP3.
Global Warming Potential for Nitrous Oxide (GWP_{N2O})	310	Article 5, section 3 of the Kyoto Protocol, GWP value is as agreed at COP3.
Historical operating temperature range at Ammonia Oxidation Reactor (AOR) ($T_{g,hist}$)	885 – 895°C	Manufacturer's (Uhde) Operating Manual
Historical operating pressure range at AOR ($P_{g,hist}$)	300 – 450 kPa	Manufacturer's (Uhde) Operating Manual
Historical composition of the ammonia oxidation catalyst ($G_{com,hist}$)	59.7% Platinum 36.6% Palladium 3.8% Rhodium	Average composition for the last 8 gauzes provided by Heraeus
Historical supplier of the ammonia oxidation catalyst ($G_{sup,hist}$)	Heraeus	Plant Operating Records (Omnia)
Maximum historical ammonia input to oxidation reactor ($A_{OR,hist}$)	232 tNH_3/day	Plant historical records from Jan 2002 to March 2006
Nitric Plant design capacity	748 t/day	Uhde GmbH – plant technology supplier
Mean plant HNO_3 production	745 t/day	mean production over the past 12 months
Average plant production	686 t/day	average production over the past 12 months
Tail gas volume (**F**$_{TG,i}$)	85,865 Nm^3/hr	Average flow over the past 12 months (Aug. 1/05 to July 31/06)
N_2O concentration in tail gas ($CO_{N2O,i}$)	1,177 ppm	Average concentration over the past 12 months (Aug. 1/06 to July 31/06)
Total available production days per year	359 d/yr	Based on 2 campaigns per year with 3 day shut-down per campaign to change catalyst
Ammonia demand by N_2O destruction facility	[redacted] kg NH_3/t HNO_3	Technology provider (Uhde GmbH) (refer to emissions calcs for NH_3 demand)
Natural gas demand by N_2O destruction	[redacted] kg CH_4/hr or [redacted] kg CH_4/t HNO_3	Technology provider (Uhde GmbH)
Oxidation factor for natural gas	100%	Technology provider (Uhde GmbH)

Table 8 shows the estimated baseline N_2O emissions in the tail gas during the crediting period based on projected plant nitric acid production and historical data on tail gas flow and N_2O concentration over the past 12 months (Aug. 1, 2005 to July 31, 2006).

Table 8: Ex-ante Baseline Emissions

Year [(1)]	HNO_3[(2)] Production (tonnes)	N_2O Emissions in tail gas (tN_2O)	Baseline Emissions (tCO_2e)
2008	243,000	1,938.4	600,908
2009	247,500	1,974.3	612,036
2010	243,000	1,938.4	600,908
2011	234,000	1,866.6	578,652
2012	247,500	1,974.3	612,036
2013	243,000	1,938.4	600,908
2014	247,500	1,974.3	612,036
Total		**13,605**	**4,217,482**

Notes:

(1) Year is defined as the time period between April 1 and March 31 of subsequent year

(2) HNO_3 production forecast is actual production converted to 100% concentration

Annex 4

MONITORING and VERIFICATION PLAN

The Monitoring and Verification Plan (MVP) describes the procedures for data collection and auditing required for the project in order to determine and verify the emissions reductions achieved by the project. Much of the required data is already being collected at Omnia's nitric acid plant and collecting the remaining required data will be relatively straightforward. In effect, under the project activity all of the required data points will be collected and stored in a common data logger. The data logger will be periodically downloaded and the data stored electronically in a secure off site data storage facility.

The Monitoring and Verification Plan document fulfils the CDM Executive Board requirement that CDM projects have a clear, credible and accurate set of monitoring and verification procedures. The purpose of these procedures is to direct and support continuous monitoring of the project performance and enable periodic auditing, verification and certification activities to determine the project outcome related to greenhouse gas (GHG) emissions reduction. The MVP is a critical component of the project design and is subject to 3rd party verification along with the project baseline and other project design features.

The project owner must maintain credible and transparent data monitoring, collection, tracking and storage systems to withstand the scrutiny of a 3rd party audit for a GHG emission reduction investment. These performance records and monitoring systems will be subject to annual verification by a Designated Operational Entity (DOE) as part of the verification and certification process. This process will confirm that the GHG reductions are real and credible to the buyers of the Certified Emission Reductions (CERs). This set of records and reports will be required to meet the evolving international reporting standards developed by the UNFCCC.

The new methodology describes the procedures and equations used to calculate project and baseline emissions from the monitored data. For the project activity, the methodology is applied in the format of a spreadsheet model. The staff responsible for monitoring the project activity must complete the electronic worksheets on a monthly basis. Moreover, the staff will also check with the South African Department of Environmental Affairs and Tourism (DEAT) and the Free State Province Department of Tourism, Environmental and Economic Affairs (DTEE) to identify any changes the applicable nitrous oxide (N_2O) emissions regulations. Formulas imbedded within the worksheets will automatically test particular components of the data collected against historical limits, and applicable regulations and subsequently calculate the resultant GHG reduction achieved by the project activity.

The plan contains a series of worksheets having different functions as follows:

1. Data sheets (ammonia input to the AOR, operating temperatures and pressure at the AOR and in the tail gas, tail gas flow and N_2O concentration upstream and downstream of the N_2O destruction facility and both ammonia and natural gas input to the N_2O destruction facility)
2. Calculation sheets (natural gas, ammonia, nitrous oxide)
3. Result sheet (emission reduction)

The user will be allowed to enter data in specific cells of the Data sheets which have been left unblocked. All of the other cells model fixed parameters, computed values and formulas that cannot be modified by staff. To facilitate data input, a color coded key is used as follows:

- **Input Fields** blue fields indicate cells where project operator is required to input the monitored data as needed to run the model
- **Results Fields** green fields display key result lines as calculated by the model

The last sheet shows the results, comparing year-by-year GHG emissions from the project with the baseline emissions in order to determine the annual emissions reductions shown in the last column.

All electronic data from the monitoring process and that inputted into the worksheets will be backed up on a monthly basis and two electronic copies of each document will be kept in different locations. One copy will be stored at a secure off-site data storage facility operated by a third party and the other will be stored at Omnia's Head Office.

All of the monitoring equipment will be calibrated and maintained according to the manufacturer's recommendations and international best practice standards. Omnia is scheduled to obtain ISO9001 registration by May 2006. The monitoring and data collection procedures will be integrated with Omnia's existing quality and environmental management system.

Annex 5 – Stakeholders Comments

+ Letter on Safe Disposal of Spent Catalyst, Letter of Exemption from EIA

& Public Forum Related Information

Telefax

SÜD-CHEMIE
Creating Performance Technology

BEE

SÜD-CHEMIE AG
Waldheimer Str. 15
83052 Bruckmühl-Heufeld
www.sud-chemie.com

TO: Eugene Muller
OMNIA
Fax: +27 (0) 16 976 2650
Phone: +27 (0) 16 970 7200
From: Dr. Roderik Althoff
Phone: +49 (0) 8061 4903-513
Fax: +49 (0) 8061 4903-519
e-mail: Roderik.Althoff@sud-chemie.com
Date: 17.8.2006
Total pages: 1

Catalyst for EnviNOx unit

Dear Sirs,

We herewith would like to confirm that the iron containing catalysts of the EnviCat NOx/N2O series will be taken back by the supplier and disposed safely and responsibly.
The supplier will, however, invoice the catalysts user for cost occurring through this exercise.

For further information please do not hesitate to contact us.

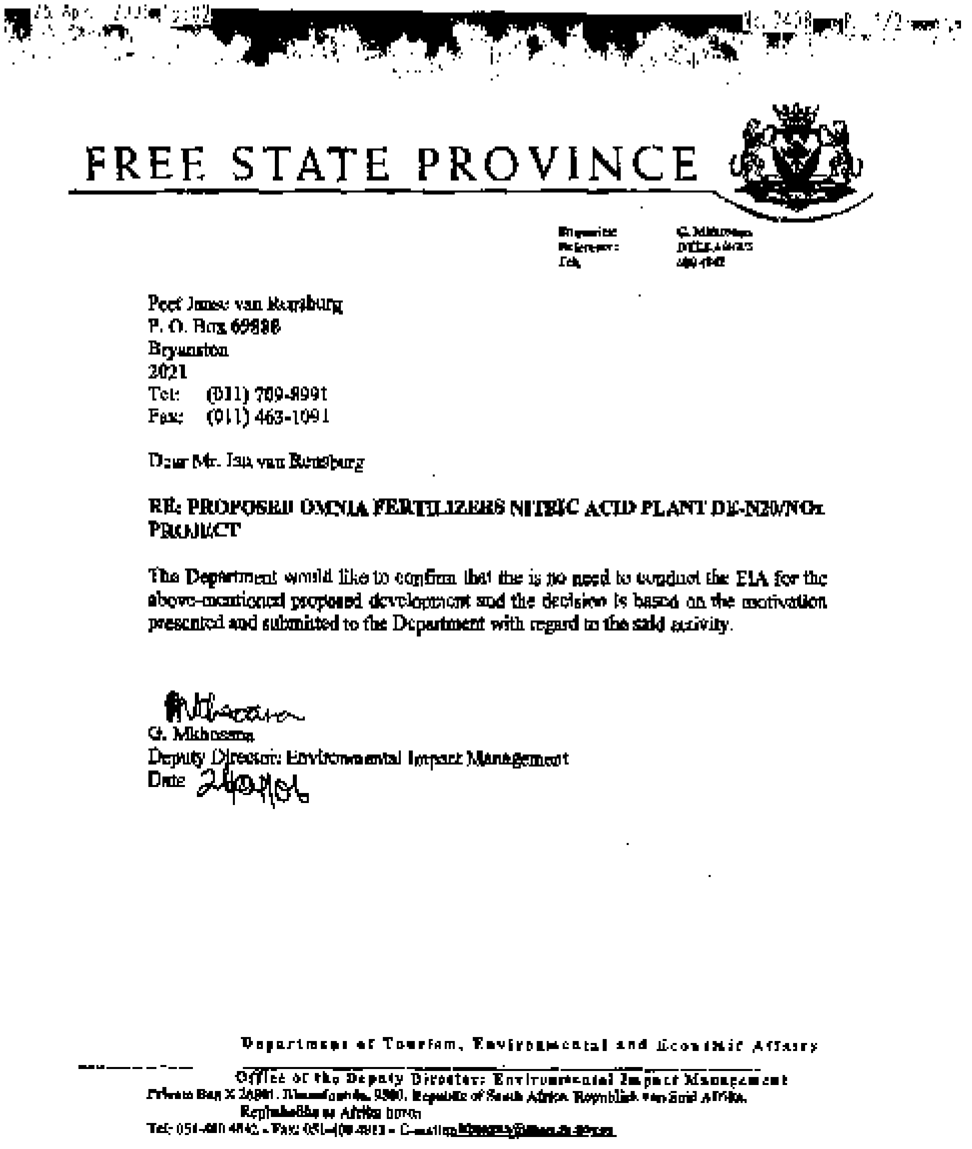
Best regards,

SÜD-CHEMIE AG

ppa. Stefan Fuss

i.V. Dr. Roderik Althoff

X:\Sites\Heufeld\BEE\vorlagen\MITARBEITER-VORLAGEN\RA\Fax-RA.doc



FREE STATE PROVINCE

Enquiries: G. Mkhosana
Reference: [illegible]
Tel: 400 4842

Peet Janse van Rensburg
P. O. Box 69886
Bryanston
2021
Tel: (011) 709-8991
Fax: (011) 463-1091

Dear Mr. Jan van Rensburg

RE: PROPOSED OMNIA FERTILIZERS NITRIC ACID PLANT DE-N2O/NOx PROJECT

The Department would like to confirm that the is no need to conduct the EIA for the above-mentioned proposed development and the decision is based on the motivation presented and submitted to the Department with regard to the said activity.

G. Mkhosana
Deputy Director: Environmental Impact Management
Date 24/04/06

Department of Tourism, Environmental and Economic Affairs
Office of the Deputy Director: Environmental Impact Management
Private Bag X 20801, Bloemfontein, 9300, Republic of South Africa. Republiek van Suid Afrika.
Rephaboliki ya Afrika Borwa
Tel: 051-400 4842 - Fax: 051-400 4813 - E-mail: [illegible]

Fabriek/Factory
Eugene Houdrystr./St.
Posbus/PO Box 384
SASOLBURG 1947
Rep. of South Africa
Rep. van Suid Afrika

Tel.: +27 16 970-7200
Telefax/ +27 16 976-1924
Telefaks: +27 16 976-2650

omnia
NUTRIOLOGY • NUTRILOGIE

20 September 2005

INVITATION TO PARTICIPATE IN AN OPEN FORUM REGARDING OMNIA'S PROPOSED N2O REDUCTION PROJECT

Dear Stakeholder

Omnia Fertilizer Limited is proposing to install equipment at its Sasolburg nitric acid plant to reduce its Nitrous Oxide (N2O) stack emissions by 80 to 90%.

While N2O emission levels are not presently regulated under the country's air quality bill, nitrous oxide gas is one of the greenhouse gases identified under the Kyoto Protocol. Omnia proposes to construct this project in accordance with the regulatory requirements of the Clean Development Mechanism (CDM) as stipulated by the Kyoto Protocol and the South Africa Designated National Authority (DNA). The company has already prepared and submitted a Project Idea Note (PIN) to the DNA and received a letter of non-objection from the DNA. While this letter is non-binding on the DNA, it is a good indication that the project is generally in compliance with the sustainability criteria established by the DNA.

In general, the project entails installing a catalyst either in the reactor or in the 'tail gas' downstream. The company has retained a consultant to review the various technologies available and make recommendations as to which technology and technology provider it should select. The report has been submitted and the company is presently reviewing it with the consultant and an independent advisor in an effort to decide on the best option.

The company has been advised by DEAT representatives that, as this project will result in reducing air emissions, it is exempted from conducting an environmental impact assessment (EIA). This public forum is being called therefore to present the project to our neighbors and stakeholders and to solicit your comments on the project.

This public forum will be held on October 5 at our Sasolburg factory starting at 10 am.

We trust you will be able to join us and look forward to receiving your comments to make this a successful CDM project for Omnia and South Africa. We have attached a comment sheet and would appreciate you filling it out and either mailing it back to us or bringing it with you to the public forum. Should you be unable to attend personally, please feel free to send one of your representatives.

Sincerely,

pp **R. KRIESE,**
GENERAL MANAGER
encl.

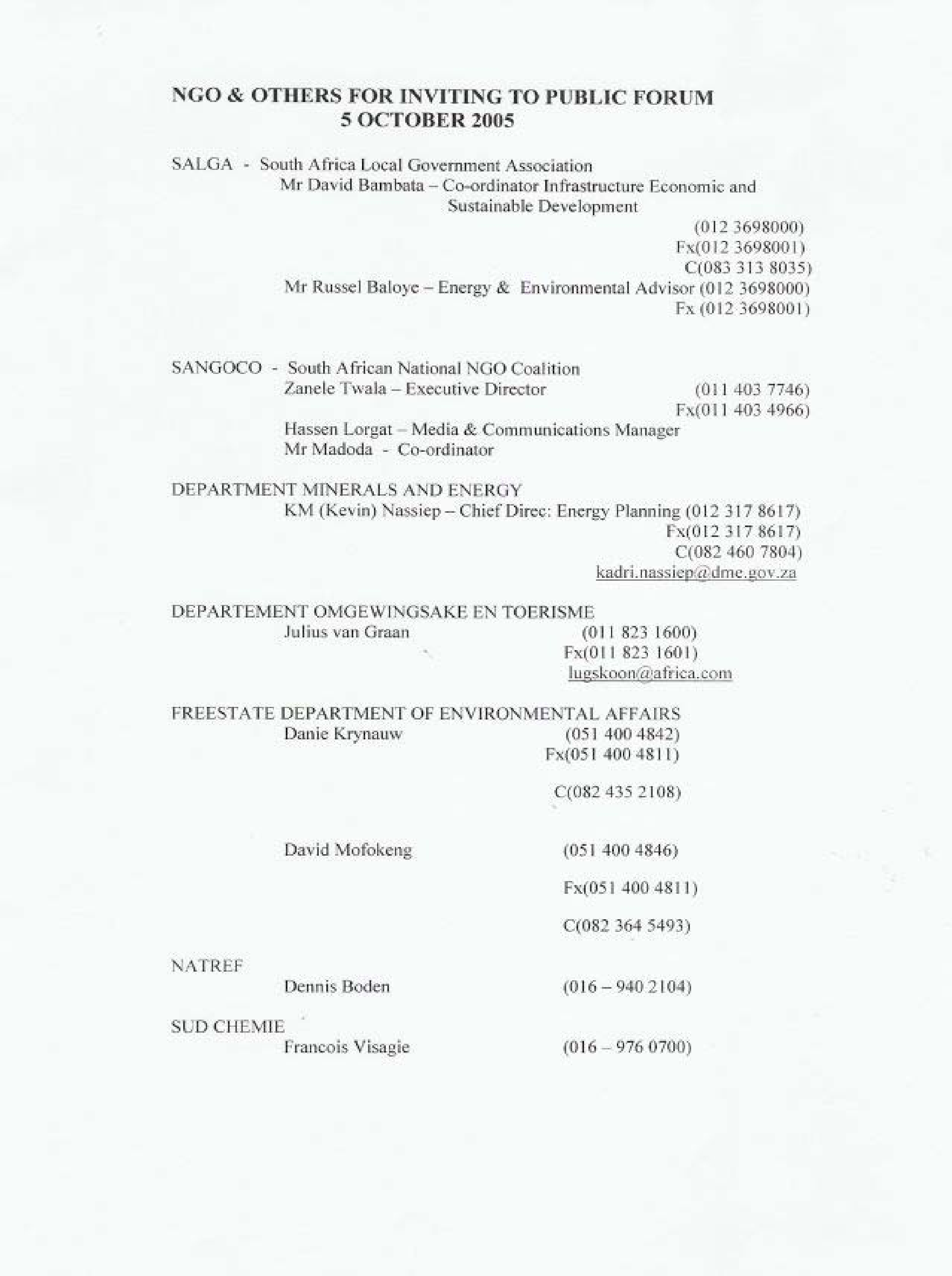
the science of growing • wetenskap vir groei

Omnia Fertilizer Limited
Omnia Kunsmis Beperk
Reg No. • Reg Nr. 1975/000759/06

Omnia House • Huis
13 Sloane Street • Sloanestraat 13
Epsom Downs
Bryanston 2021
South Africa • Suid-Afrika

PO Box • Posbus 69888
Bryanston
2021
South Africa • Suid-Afrika

T +27 11 709 8888
F +27 11 463 3020
www.omnia.co.za
fertilizer@omnia.co.za



NGO & OTHERS FOR INVITING TO PUBLIC FORUM
5 OCTOBER 2005

SALGA - South Africa Local Government Association
Mr David Bambata – Co-ordinator Infrastructure Economic and Sustainable Development
(012 3698000)
Fx(012 3698001)
C(083 313 8035)
Mr Russel Baloye – Energy & Environmental Advisor (012 3698000)
Fx (012 3698001)

SANGOCO - South African National NGO Coalition
Zanele Twala – Executive Director (011 403 7746)
Fx(011 403 4966)
Hassen Lorgat – Media & Communications Manager
Mr Madoda - Co-ordinator

DEPARTMENT MINERALS AND ENERGY
KM (Kevin) Nassiep – Chief Direc: Energy Planning (012 317 8617)
Fx(012 317 8617)
C(082 460 7804)
kadri.nassiep@dme.gov.za

DEPARTEMENT OMGEWINGSAKE EN TOERISME
Julius van Graan (011 823 1600)
Fx(011 823 1601)
lugskoon@africa.com

FREESTATE DEPARTMENT OF ENVIRONMENTAL AFFAIRS
Danie Krynauw (051 400 4842)
Fx(051 400 4811)

C(082 435 2108)

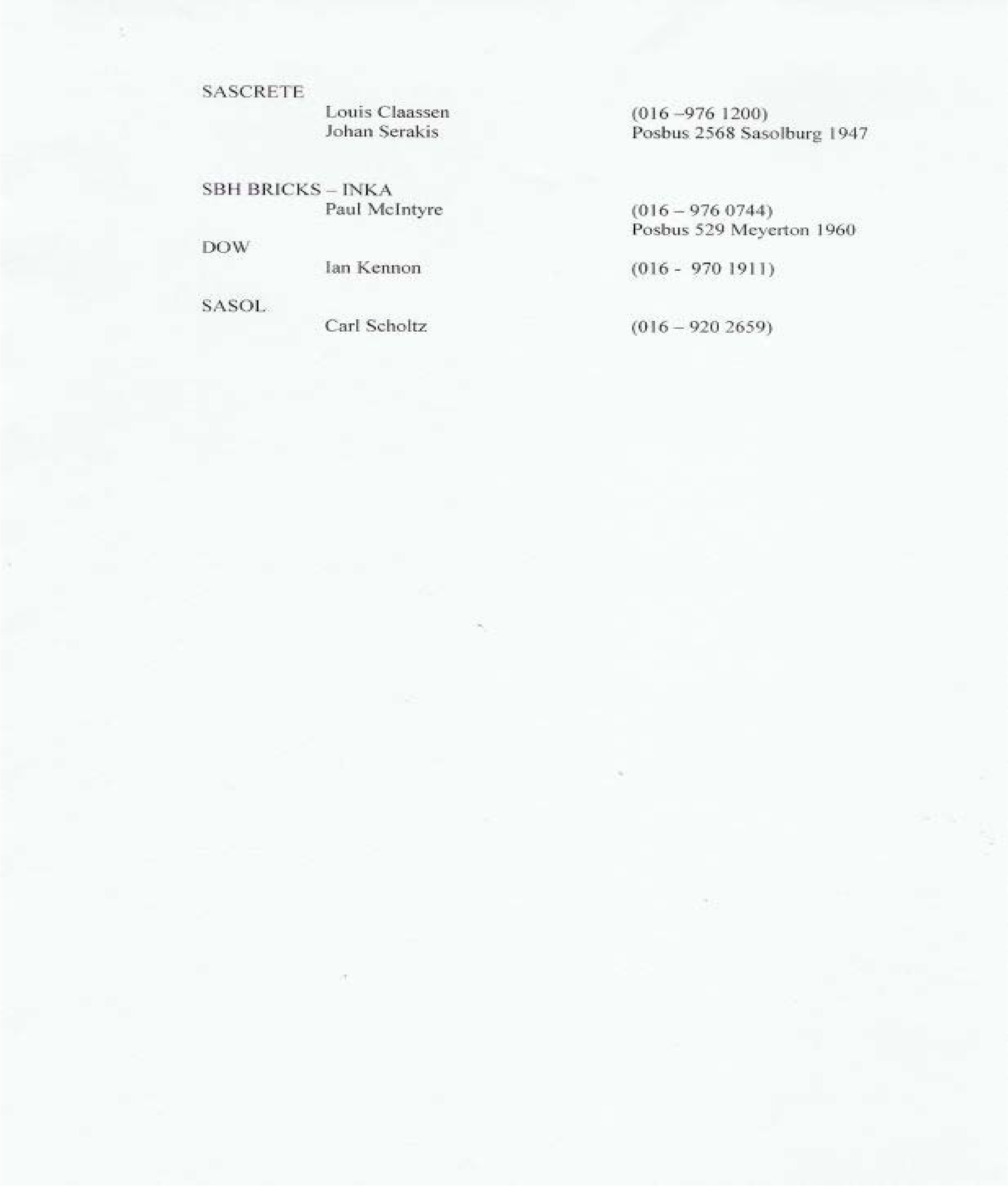
David Mofokeng (051 400 4846)

Fx(051 400 4811)

C(082 364 5493)

NATREF
Dennis Boden (016 – 940 2104)

SUD CHEMIE
Francois Visagie (016 – 976 0700)



SASCRETE		
	Louis Claassen	(016 –976 1200)
	Johan Serakis	Posbus 2568 Sasolburg 1947
SBH BRICKS – INKA		
	Paul McIntyre	(016 – 976 0744) Posbus 529 Meyerton 1960
DOW		
	Ian Kennon	(016 - 970 1911)
SASOL		
	Carl Scholtz	(016 – 920 2659)

27/09/2005 16:08

cc:

Subject: Invitation to Forum on deduction of N20 at OMNIA

Mr Nassiep

I am experiencing difficulty to get hold of you since September, 20. Once I got hold of a secretary she told me that you were away overseas till 27 September. Your telephone mailbox is full, and I can not get hold of anybody to leave messages.

We faxed an invitation for you attention to 012 317 8617.

Omnia Fertilzer Limited is holding a public forum at our Sasolburg plant whereby proposing to install equipment at its nitric acid plant to reduce the Nitrous Oxide (N20) stack emissions by 80 to 90 %. We would really appreciate your input and comments to make this a successful CDM project for Omnia and South Africa.

Could you please acknowledge our fax because we attached a comment sheet.

The forum will be held on: 5 October 10:00 at our Omnia site. Eugene Houdry Street, Southern Industries SASOLBURG.

More information can be obtained from Mr Rudi Kriese (General Manager) from 29 September (016 970 7214 or
083 601 5663). For more informal detail about the day you are more than welcome to contact me at 016 970 7293.

We hope to hear from you.

Riki Branford

Belinda Kotzé

☎ 016 970-7293

🖷 016 970-7212

✉ bkotze@omnia.co.za

04/10/2005 12:37
Subject: Fw: Rudi Kriese - N2O reduction forum

Rudi Kriese
CONTACT DETAILS:
Tel: +27 16 970 7200
Fax: +27 16 976 2650
Cell: +27 83 601 5663
E-mail: rkriese@omnia.co.za
Website: www.omnia.co.za

----- Forwarded by Rudi Kriese/Sasolburg/Fertilizer/Omnia Group on 2005/10/04 12:37 PM -----

Kleintjie de Lange
2005/10/03 12:40 PM
To: Rudi Kriese/Sasolburg/Fertilizer/Omnia Group@Omnia Group
cc: krynauwd@dteea.fs.gov.za
Subject: Fw: Rudi Kriese - N2O reduction forum

Rudi, inligting vir jou aandag.
Groete

Kleintjie De Lange

☎ +27 11 709 8860 🖷 +27 11 463 3020

✉ kdelange@omnia.co.za http://www.omnia.co.za

----- Forwarded by Kleintjie de Lange/Marketing/Fertilizer/Omnia Group on 10/03/2005 12:39 PM -----

"Danie Krynauw" <krynauwd@dteea.fs.gov.za>
10/03/2005 10:29 AM
To: <fertilizer@omnia.co.za>
cc:
Subject: Rudi Kriese - N2O reduction forum

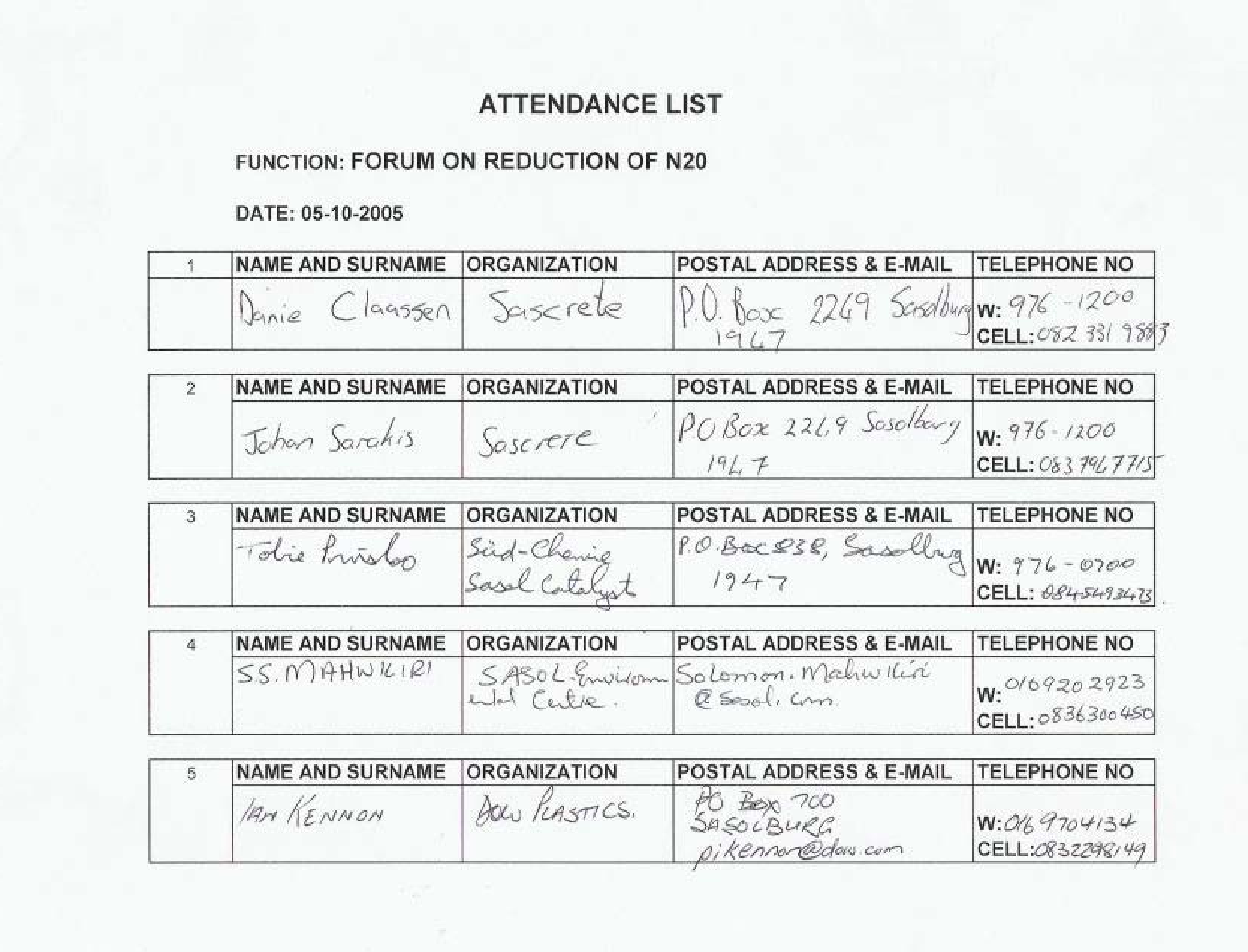
Dear R. Kriese

We have received your invitation for the open forum scheduled for the 05th of October. David Mofokeng indicated that he will be available and will attend the form meeting.

His contacts: 051-4004846

Regards
Danie

Danie Krynauw
Principal Environmental Officer:
Environmental Management
☎ 051-400 4814
🖷 051-400 4811
✉ krynauwd@dteea.fs.gov.za



ATTENDANCE LIST

FUNCTION: FORUM ON REDUCTION OF N20

DATE: 05-10-2005

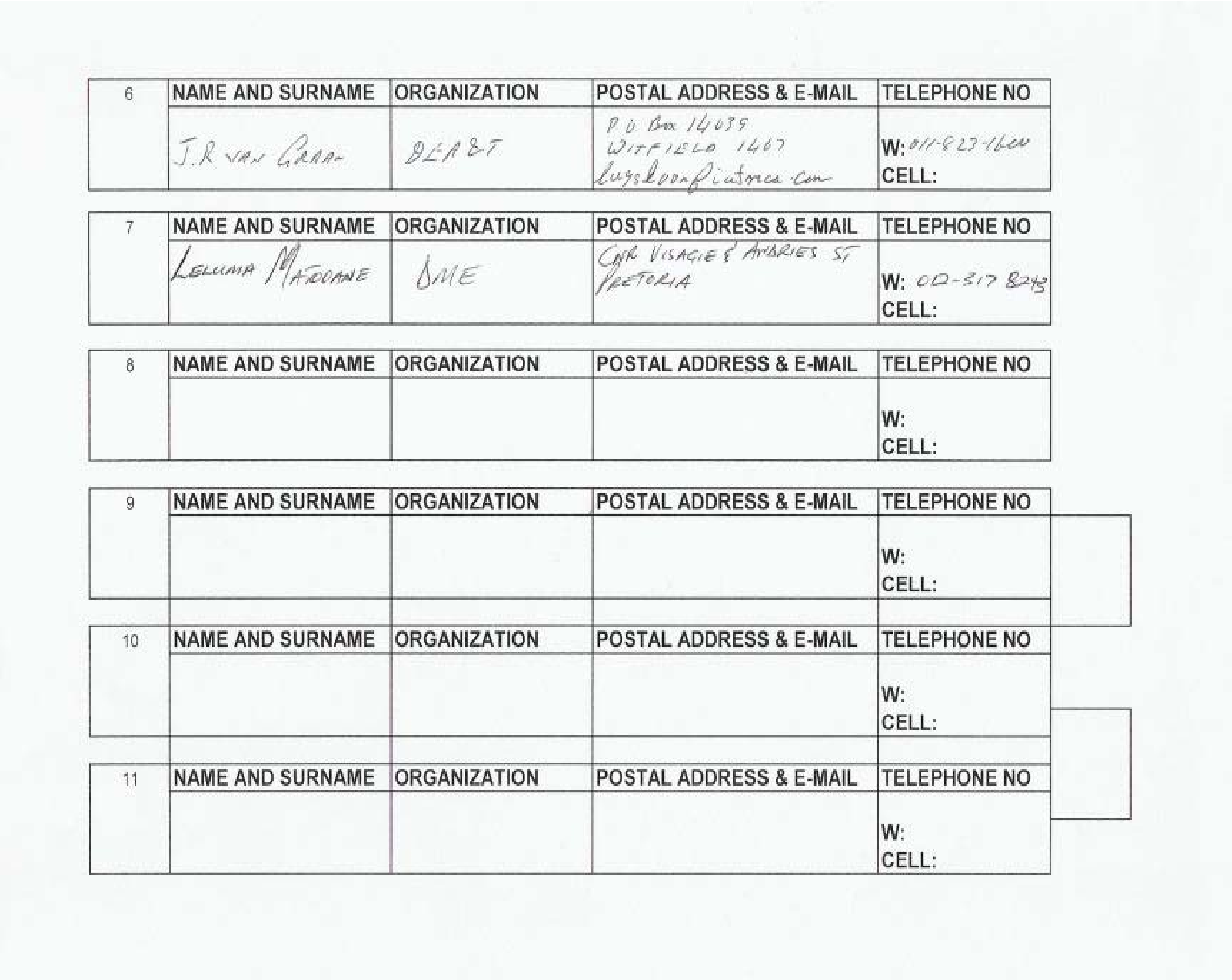
1	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
	Danie Claassen	Sascrete	P.O. Box 2269 Sasolburg 1947	W: 976-1200 CELL: 082 331 9883

2	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
	Johan Sarakis	Sascrete	P.O Box 2269 Sasolburg 1947	W: 976-1200 CELL: 083 796 7715

3	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
	Tobie Prinsloo	Süd-Chemie Sasol Catalyst	P.O. Box 838, Sasolburg 1947	W: 976-0700 CELL: 0845493473

4	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
	S.S. MAHWIKIRI	SASOL Environmental Centre.	Solomon.Mahwikiri @sasol.com	W: 0169202923 CELL: 0836300450

5	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
	IAN KENNON	DOW PLASTICS.	PO Box 700 SASOLBURG pikennon@dow.com	W: 016 9704134 CELL: 0832298149



6	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
	J.R van Graan	DEA&T	P O Box 14039 WITFIELD 1467 luyskoon@iafrica.com	W: 011-823-1600 CELL:

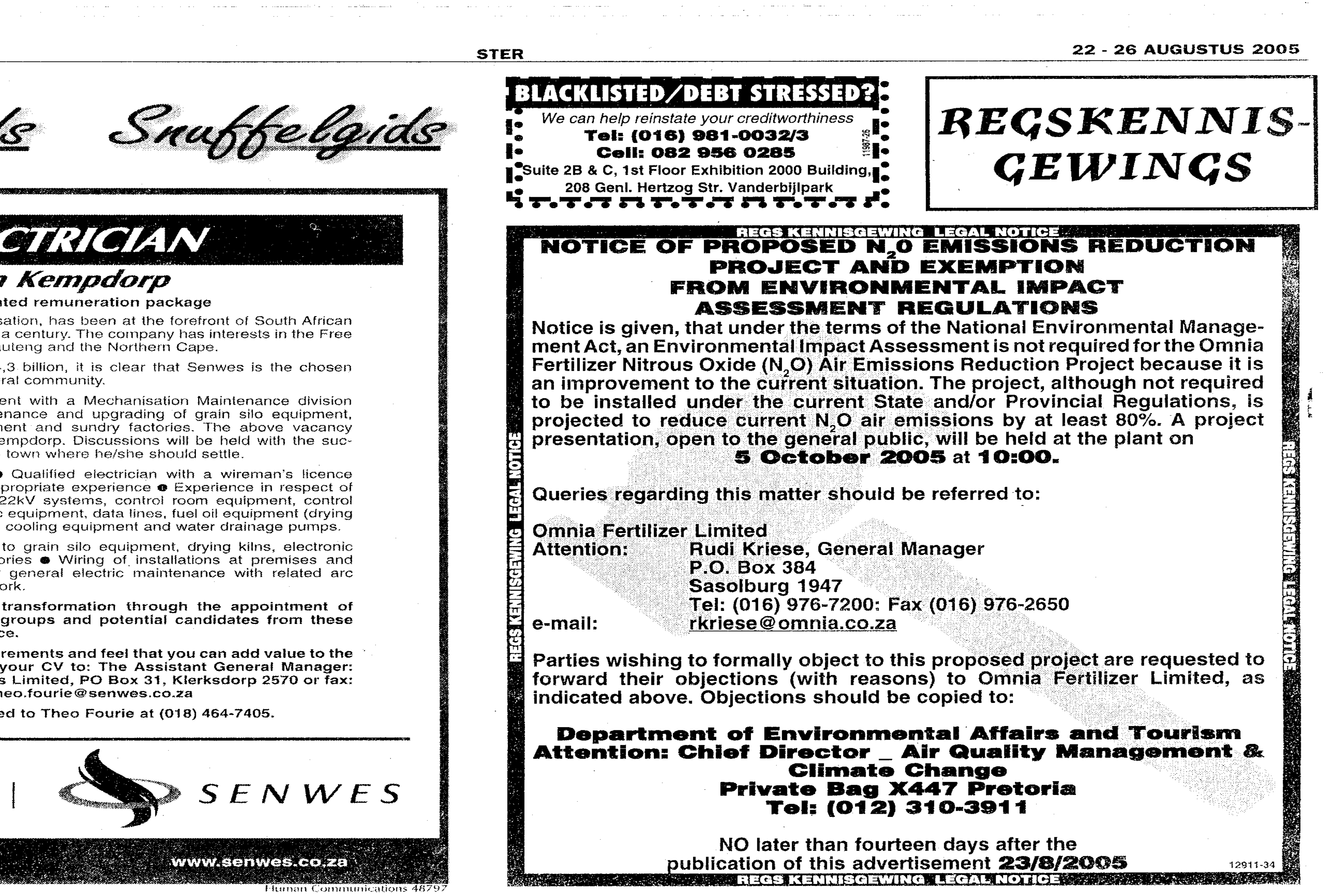
7	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
	Leluma Mafodane	DME	Cnr Visagie & Andries St Pretoria	W: 012-317 8243 CELL:

8	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
				W: CELL:

9	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
				W: CELL:

10	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
				W: CELL:

11	NAME AND SURNAME	ORGANIZATION	POSTAL ADDRESS & E-MAIL	TELEPHONE NO
				W: CELL:



STER 22 - 26 AUGUSTUS 2005

REGSKENNIS-GEWINGS

REGS KENNISGEWING LEGAL NOTICE

NOTICE OF PROPOSED N_2O EMISSIONS REDUCTION PROJECT AND EXEMPTION FROM ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS

Notice is given, that under the terms of the National Environmental Management Act, an Environmental Impact Assessment is not required for the Omnia Fertilizer Nitrous Oxide (N_2O) Air Emissions Reduction Project because it is an improvement to the current situation. The project, although not required to be installed under the current State and/or Provincial Regulations, is projected to reduce current N_2O air emissions by at least 80%. A project presentation, open to the general public, will be held at the plant on **5 October 2005** at **10:00.**

Queries regarding this matter should be referred to:

Omnia Fertilizer Limited
Attention: Rudi Kriese, General Manager
P.O. Box 384
Sasolburg 1947
Tel: (016) 976-7200: Fax (016) 976-2650
e-mail: rkriese@omnia.co.za

Parties wishing to formally object to this proposed project are requested to forward their objections (with reasons) to Omnia Fertilizer Limited, as indicated above. Objections should be copied to:

Department of Environmental Affairs and Tourism
Attention: Chief Director _ Air Quality Management & Climate Change
Private Bag X447 Pretoria
Tel: (012) 310-3911

NO later than fourteen days after the publication of this advertisement **23/8/2005**

12911-34

REGS KENNISGEWING LEGAL NOTICE

OMNIA Fertilizer – N_2O Reduction Project

Survey

Your opinion is important for us.

Please answer the following questions and include the comments that you consider pertinent in the right column.

Questions	Answer/Comment/Opinion
In relation with the information that you have and your knowledge about Environmental issues, Climate Change, Kyoto Protocol, Clean Development Mechanism, and Global Carbon Market; please express your opinion on the Omnia Fertilizer N_2O Reduction Project.	Very good project
Would you recommend to private companies, government authorities or another organization to develop this kind of projects (N2O Reduction under the Clean Development Mechanism)?	yes
Do you consider that the Omnia N_2O Reduction Project will contribute to sustainable development of the region and South Africa?	yes
Any additional comment that you want to express.	

- Name: Tobie Prinsloo
- Company/Organization: Süd-Chemie Sasol Catalysts
- Title: mr.
- E-mail: Tobie.Prinsloo@sc-world.co.za.
- telephone: (016) 976-0700
- Signature:

Thank you for your co-operation.

Please send this survey to the following address.
Rudie Kriese, General Manger
e-mail: rkriese@omnia.co.za
Fax: +27 (0)16 976 2650
Mailing address: Rudie Kriese, Omnia Fertilizer Limited, P.O. Box 384, Sasolburg 1947, South Africa

This questionnaire was shared in our leaders meeting of 26 September 2005.

Omnia Fertilizer Limited - Nitrous Oxide (N2O) Reduction Project

Your opinion is important for us

Please take a few minutes to answer the following questions and include the comments that you consider pertinent in the right column.	
Questions	Answer/Comment/Opinion
In relation with the information that you have and your knowledge about Environmental issues, Climate Change, Kyoto Protocol, Clean Development Mechanism, and Global Carbon Market; please express your opinion on the Omnia N2O Reduction Project.	This is a responsible, pro-active step aligns well with the SA focus on Responsible Care and internal requirements of continuous improvement to the triple bottom-line
Would you recommend to other private companies, to develop this kind of projects under the Clean Development Mechanism?	Yes, internal focus needs to be the driver on environmental improvements, not awaiting Government regulation intervention.
Do you consider that Omnia's N2O Reduction Project will contribute to sustainable development of the region and South Africa?	Yes.
Any additional comment that you want to express.	Would this have a detrimental effect on water or ground quality? How will the spent catalyst be disposed?

Name and Last Name: IAN KENNON

Institution/Organization where you work: DOW PLASTICS SA.

Title: SITE LEADER

e-mail: pikennon@dow.com

Signature:

Please send this survey to the following address:

Mr. R. Kriese, General Manager
Omnia Fertilizer Limited
P.O. Box 384
Sasolburg 1947
South Africa

Omnia Fertilizer Limited - Nitrous Oxide (N2O) Reduction Project

Your opinion is important for us

Please take a few minutes to answer the following questions and include the comments that you consider pertinent in the right column.

Questions	Answer/Comment/Opinion
In relation with the information that you have and your knowledge about Environmental issues, Climate Change, Kyoto Protocol, Clean Development Mechanism, and Global Carbon Market; please express your opinion on the Omnia N2O Reduction Project.	Good
Would you recommend to other private companies, to develop this kind of projects under the Clean Development Mechanism?	[redacted] Yes
Do you consider that Omnia's N2O Reduction Project will contribute to sustainable development of the region and South Africa?	Yes
Any additional comment that you want to express.	-

Name and Last Name: Johan Sarakis

Institution/Organization where you work: Sascrete

Title: Manager

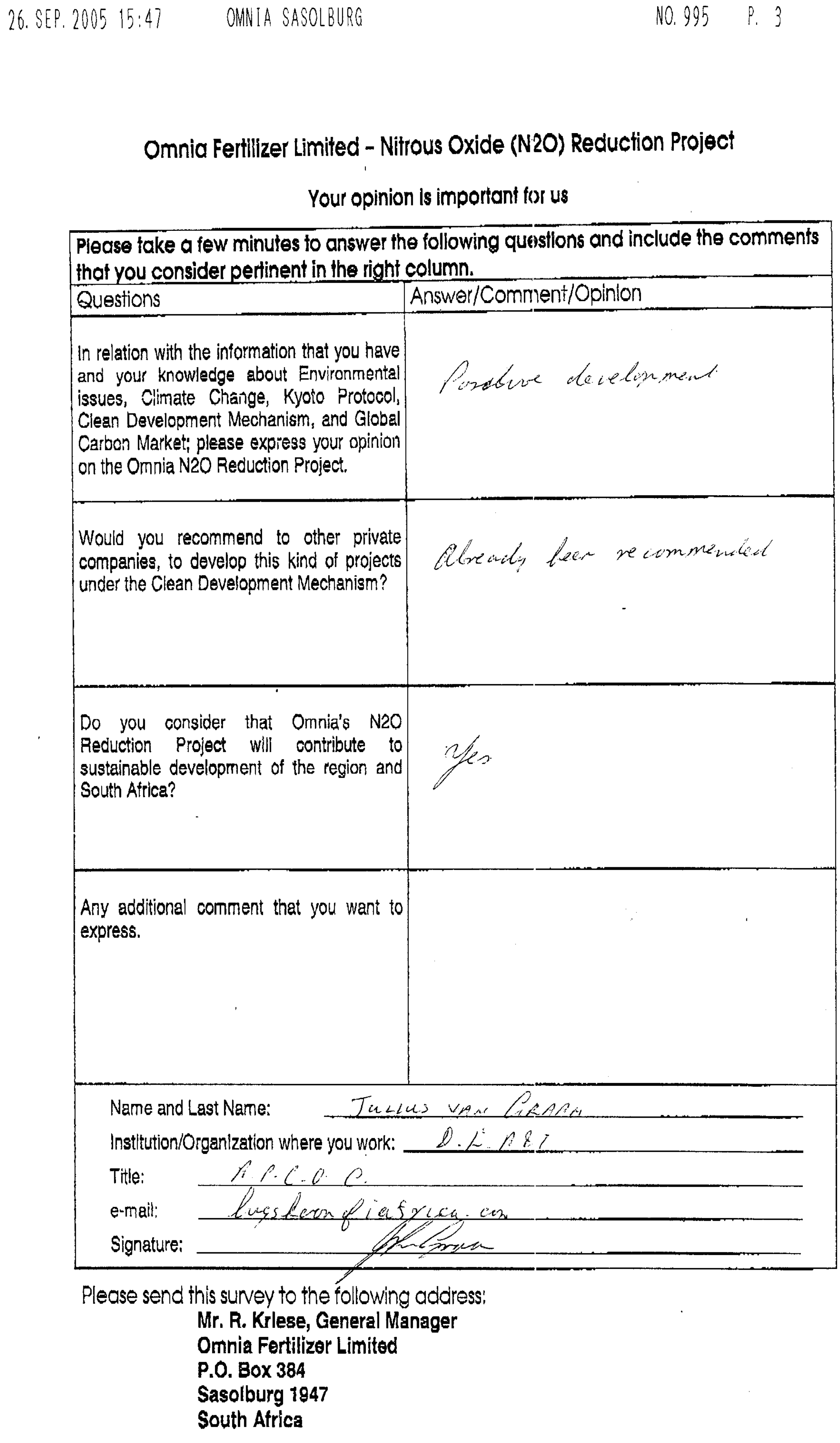
e-mail:

Signature:

Please send this survey to the following address:

Mr. R. Kriese, General Manager
Omnia Fertilizer Limited
P.O. Box 384
Sasolburg 1947
South Africa

Thank you very much.
Omnia Fertilizer Limited



26. SEP. 2005 15:47 OMNIA SASOLBURG NO. 995 P. 3

Omnia Fertilizer Limited – Nitrous Oxide (N2O) Reduction Project

Your opinion is important for us

Please take a few minutes to answer the following questions and include the comments that you consider pertinent in the right column.

Questions	Answer/Comment/Opinion
In relation with the information that you have and your knowledge about Environmental issues, Climate Change, Kyoto Protocol, Clean Development Mechanism, and Global Carbon Market; please express your opinion on the Omnia N2O Reduction Project.	Positive development
Would you recommend to other private companies, to develop this kind of projects under the Clean Development Mechanism?	Already been recommended
Do you consider that Omnia's N2O Reduction Project will contribute to sustainable development of the region and South Africa?	Yes
Any additional comment that you want to express.	

Name and Last Name: JULIUS VAN GRAAN

Institution/Organization where you work: D.L. AEI

Title: A.P.C.O.C.

e-mail: lugsleon@iafrica.com

Signature:

Please send this survey to the following address:

Mr. R. Kriese, General Manager
Omnia Fertilizer Limited
P.O. Box 384
Sasolburg 1947
South Africa

OMNIA Fertilizer – N_2O Reduction Project

Survey

Your opinion is important for us.

Please answer the following questions and include the comments that you consider pertinent in the right column.

Questions	Answer/Comment/Opinion
In relation with the information that you have and your knowledge about Environmental issues, Climate Change, Kyoto Protocol, Clean Development Mechanism, and Global Carbon Market; please express your opinion on the Omnia Fertilizer N_2O Reduction Project.	This is a very important project as it going to contribute in the development of cleaner production.
Would you recommend to private companies, government authorities or another organization to develop this kind of projects (N2O Reduction under the Clean Development Mechanism)?	Yes, the benefits are great – sustaining our environment is very important
Do you consider that the Omnia N_2O Reduction Project will contribute to sustainable development of the region and South Africa?	Yes – this message must be spread to other industries
Any additional comment that you want to express.	To maintain the ozone layer etc all producers of green house gases must do the best to contain the harmful waste.

- Name: S. S. Mahwili
- Company/Organization: Sasol Environmental Centre.
- Title: Environmental Specialist
- E-mail: Solomon.Mahwillai@sasol.com
- telephone: 016 9202923 0836300450
- Signature:

Thank you for your co-operation.

Please send this survey to the following address.

Rudie Kriese, General Manger

e-mail: rkriese@omnia.co.za

Fax: +27 (0)16 976 2650

Mailing address: Rudie Kriese, Omnia Fertilizer Limited, P.O. Box 384, Sasolburg 1947,
South Africa

Annex 6: Response to South Africa's DNA Sustainable Development Criteria

SOUTH AFRICAN DNA: SUSTAINABLE DEVELOPMENT CRITERIA

OMNIA N_2O Reduction PROJECT

	CRITERIA	INDICATOR	PROJECT CONTRIBUTION TO SUSTAINABLE DEVELOPMENT
Environmental	Impact on local environment quality	▪ Impact of the project on air quality. ▪ Impact of the project on water pollution. ▪ Impact of the project on the generation or disposal of solid waste. ▪ Any other positive or negative environmental impacts of the project (such as impacts on noise, safety, visual impacts, or traffic).	▪ The project will reduce gaseous emissions of nitrous oxide (N_2O) by 94% and NOx from the tail gas to less than 30 ppmv and will therefore improve local air quality. ▪ There will be no water pollution as there is no water required or used by the project activity. ▪ The catalyst will require replacement at 3 to 4 year intervals and the spent catalyst will either be returned to the original supplier for regeneration or disposed locally in accordance with current regulations. Catalyst is acceptable for disposal a local landfill sites (refer to letter from catalyst supplier in Annex 5)

	Change in usage of natural resources	▪ Impact of the project on community access to natural resources. ▪ Impact of the project on the sustainability of use of water, minerals or other non renewable natural resources. ▪ Impact of the project on the efficiency of resource utilization.	▪ The project does not impact on the community's access to natural resources. If anything, given that this project will reduce air emissions, it will in effect improve community access to a cleaner natural environment. ▪ The project will not impact on the sustainability of use of water as there is no additional water requirement. In effect, the N_2O removed which is converted to nitrogen and water vapour and will use minimally less water in the absorption process. This is due to the additional water vapour which will condense and the reduced molecular weight of nitrogen of 14 vs 44 for N_2O which will evaporate slightly less water ▪ The project will use the existing resources and not require any additional resources.
	Impacts on biodiversity and ecosystems	▪ Changes in local or regional biodiversity arising from the project.	▪ The project will have no negative impact on local or regional biodiversity as the nitric acid plant is located in an industrial designated zone. If anything, the local and regional biodiversity should be impacted positively due to the highly reduced levels of nitrous oxide emissions in the tail gas.

	Economic impacts	▪ Impact of the project on foreign exchange requirements. ▪ Impact of the project on existing economic activity in the area. ▪ Impact of the project on the cost of energy. ▪ Impact of the project on foreign direct investment.	▪ The project will have a positive contribution to FDI through the sale of CERs to Annex 1 countries (Western Europe, Canada, Japan, etc.) generated by the project. This revenue, part of which will be shared with the local community, will lead to the creation of a substantial number of additional jobs through its spin off effect. This is due to the fact that Omnia will either invest any profit it makes from this project or pay it out in dividends to its share – holders. If Omnia spends the money, the investment will create jobs in South Africa. If it is paid to its shareholders, they will in turn spend some, if not all of the extra cash, thereby growing the economy and creating jobs. ▪ This project should encourage other South African fertilizer companies to install similar technologies and thereby result in improved economic activity in the area from the work required to retrofit the other facilities. ▪ Omnia will contribute 5% of the net revenue from the sale of CERs on agricultural related projects in consultation with and for the local community. These projects will be focused on education, poverty reduction and job creation. The exact f projects will be decided in consultation with the local community representatives to best meet its needs. ▪ The cost of energy will not be impacted in any way by the project.

	Appropriate technology transfer	▪ Positive or negative implications for the transfer of technology to South Africa arising from the project. ▪ Impacts of the project on local skills development. ▪ Demonstration and replication potential of the project.	Technology Transfer ▪ The project paves the way for a potential transfer of the technology to producing the catalyst in South Africa, thereby contributing to the sustainable development of the country through industrial technology transfer. ▪ The project provides an opportunity for local catalyst manufacturers such as Sud Chemi to consider manufacturing the catalyst locally for domestic use as well as export and contribute towards sustainable development. ▪ The project encourages other companies operating nitric acid plants to look at applying similar technology. ▪ The project will act as a catalyst to encourage non nitric acid production plants to also consider greenhouse reduction projects. This will further stimulate both skills and technology transfer. Stimulating more CDM projects will also lead to a greater level of poverty alleviation through job creation. Skills Development ▪ The project has contributed to new skills development on CDM opportunities to Omnia's employees. Demonstration & Replication Potential of Project: ▪ Project will introduce the new technology to reduce N_2O emissions from nitric acid plants which could in turn be used by the other two nitric acid plant operators (Sasol & AECI) in South Africa. ▪ This project CDM process activity has the potential to be replicated by other Omnia facilities for such projects as energy efficiency, cogeneration and renewable energy projects.

Social	Alignment with national provincial and local development priorities	▪ How the project is aligned with provincial and national government objectives. ▪ How the project is aligned with local development objectives. ▪ Impact of the project on the provision of, or access to, basic services to the area. ▪ Impact of the project on the relocation of communities if applicable. ▪ Contribution of the project to any specific sectoral objectives (for example, renewable energy targets).	▪ The provincial and national governments are committed to the air quality as evidenced by the new Clean Air Quality Bill promulgated in 2005. This project will contribute to providing cleaner air in the area. ▪ The project does not impact on the local provision or access of services in the area or the relocation of communities. ▪ The project will contribute to the Government's Energy Efficiency Strategy indirectly by encouraging the company to proceed with the implementation of energy efficiency opportunities identified in the recently conducted energy audits. Overall, this project should provide a significant boost to Omnia's management to implement the energy efficiency opportunities as a CDM project and thereby contribute towards DME's target of reducing industrial energy consumption 12% by 2015.
	Social equity and poverty alleviation	▪ Impact of the project on employment levels? (specify the number of jobs created/lost; the duration of time employed, distribution of employment opportunities, types of employment, categories of employment changes in terms of skill levels and gender and racial equity). ▪ Impact of the project on community social structures. ▪ Impact of the project on social heritage. ▪ Impact of the project on the provision of social amenities to the community in which the project is situated. ▪ Contribution of the project to the development of previously underdeveloped areas or specially designated development nodes.	▪ The project will improve the labour and health conditions of Omnia's employees' onsite. ▪ Transboundary pollution will also be reduced in the area ▪ There will be no job losses at the plant. ▪ The project activity will not impact on the community social structures and social amenities. ▪ Through the revenue contribution from the sale of CERs, the project will contribute to the further development of previously underdeveloped local areas.

General	General project acceptability	▪ Is the distribution of project benefits reasonable and fair?	▪ The project is balanced and fair. It clearly promotes economic prosperity, social equity and environmental improvements thereby contributing to the sustainable development objectives of the South African Government, in accordance with the National Environmental Management Act No. 107 of 1998. ▪ The benefits of reduced air emissions will be the enjoyment of cleaner air by Omnia employees and the local community. ▪ The financial benefits from the sale of CERs will be used by Omnia as follows: a) to offset the capital and operating cost of installing this project; b) provide a fund for the long term continuation of the project activity beyond the period for which CER will be received; c) offset the cost of developing this project and getting it approved. d) to fund local initiatives in agricultural related projects aimed at education, job creation and poverty alleviation. The type of projects to be funded will be selected in consultation with representatives from the local community.