Secunda Synfuels Operations, Secunda Chemicals Operations and Sasol Oil:

Motivation for the postponement of compliance timeframes in terms of Regulation 11 of the Listed Activities and associated Minimum Emission Standards identified in terms of Section 21 National Environmental Management: Air Quality Act 39 of 2004 as amended

Motivation report prepared by

February 2019

Motivation for the postponement of compliance timeframes in terms of Regulation 11 of the Listed Activities and associated Minimum Emission Standards identified in terms of Section 21 National Environmental Management: Air Quality Act 39 of 2004 as amended

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Executive Summary

Sasol South Africa Limited (Sasol) was established in 1950 and started producing synthetic fuels and chemicals in 1955. Today Sasol is a multinational organisation with key activities in South Africa. In 2005 the National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM: AQA) came into effect. A list of activities was published in 2010 (Government Notice (GN) 248) and revised in 2013 (GN 893) and 2018 (GN 1207) for a range of activities that result in atmospheric emissions, obliging emitters to obtain Atmospheric Emission Licences and comply with Minimum Emission Standards (MES) within specified timeframes.

Critics of Sasol's inability to meet the MES timeframes argue that Sasol was a key stakeholder in the consultation that underpinned the formulation of the MES and thus should have known what was expected and planned for compliance accordingly. However, when the MES was finally published, there were some inclusions that Sasol opposed and disputed during the consultation process. Perhaps the most telling of the inclusions was the obligation for existing plants to comply with the new MES within a period of 5 years. Sasol's argument was that some abatement projects of this nature require at least a 10 to 15-year implementation period. Industry has consistently argued that this extended timeframe is reasonable based on both Sasol's own experience and international benchmarks to safely retrofit such technologies on brownfield sites. With postponements being the only recognised mechanism available Sasol was therefore left with no alternative but to apply for a postponement of compliance timeframes. Sasol's previous postponement applications extended across much of their South African operations including Sasolburg, Secunda, Natref and Ekandustria.

While Sasol has achieved significant successes in meeting the MES, there remain a number of sources at the Secunda facility that will require postponement of the timeframe to comply with the MES by 2020 as indicated in Sasol's previous postponement applications. These include:

- The steam stations, Synfuels Catalytic Cracker (SCC) and the incinerators at Secunda Synfuels Operations (SSO).
- The ammonium nitrate plant at Secunda Chemicals Operations (SCO).
- The storage tanks that form part of SSO, SCO and Sasol Oil.

In the past 8 years, Sasol have identified and tested options to achieve compliance, some that where successful and some less so. Based on these investigations and trials Sasol have identified technology or alternatives to meet the MES but require a postponement of the timeframe to implement and optimise them as follows:

- Install improved power supply to the electrostatic precipitators to reduce particulate matter emissions from the steam stations within the general overhaul schedule, should this option prove to be effective.
- Install low oxides of nitrogen (NO_x) burners to reduce Nitrogen Dioxide (NO_2) emissions from the steam stations within the general overhaul schedule.
- Develop wet gas scrubber technology as a possible technology solution to abate Particulate Matter (PM) emission from the SCC unit.
- Installation of a new High Organic Waste (HOW) incinerator should an option to integrate with the bio-sludge waste be unsuccessful.
- Refurbish and fit abatement to existing bio-sludge incinerators to reduce emissions of multiple pollutants from the incinerators.
- Replace the ammonium nitrate plant.
- Installation of emission abatement technologies to storage tanks subject to tank abatement approach and investigation.

During the postponement period Sasol commits to operating in terms of alternative emission limits that are detailed in Section 6 of the motivation.

As required by the MES, as part of the postponement application an Atmospheric Impact Report (AIR) was prepared by Airshed Planning Professionals to determine the impact of:

- Sasol's current emissions (baseline scenario).
- Theoretical emissions assuming compliance with the MES (compliance scenario).
- Theoretical emissions assuming Sasol operated at the proposed alternative emission limits (alternative scenario). It is critical to note that Sasol will not increase emissions, but this scenario aims to illustrate the impact to ambient air quality if they were to operate continuously at the proposed alternative emission limits, which they will not.

The AIR concluded that for all criteria pollutants, for all scenarios, the modelled concentrations of pollutants are below the National Ambient Air Quality Standards (NAAQS) (a limit at which the risk to health should be considered tolerable). Further for all criteria pollutants, barring PM and NO_2, the monitored ambient concentrations are below the NAAQS demonstrating the contribution to ambient concentrations of PM and NO_2 and from other sources. For PM and NO_2, even if Sasol complies with the MES, the NAAQS will still be exceeded as a result of the other sources.

In terms of the MES, application for postponement must be subjected to a public participation process. The requirements of which are detailed in Chapter 6 of the Environmental Impact Assessment Regulations (GN 982, 04 December 2014). As part of the public participation process the draft motivation report and AIR were made available for public comment. Due to safety concerns stemming from protest action at previous meetings, a public open day instead of a public meeting was held on 22 January 2019 to facilitate comments on the documents.

In conclusion, Sasol is applying for postponement of the MES to allow for sufficient time to complete the necessary compliance project activities already underway to meet the new plant standards. This motivation document serves to detail the basis of, and reasons for, the request for postponement. The table below and following paragraphs summarise the request detailed in the rest of the postponement application.

Table 1: Summary of Sasol Secunda's requests

Plant area	Emission component	Emission standard for new plants	Alternative emission limit requested (ceiling limit)a	Compliance averaging period	Postponement period
		All values specified at 10% O_2, 273 K and 101,3 kPa, mg/Nm^3			
Steam plant	Oxides of nitrogen	750	1 100	Daily average	Effective 01 April 2020 for 5 years until 31 March 2025
	Particulate matter	50	120		
SCC unit	Particulate matter	100	300	Daily average	
HOW incinerators	Particulate matter	10	900	Daily average Monthly average Note 1	Effective from decision for 5 years
	Carbon monoxide	50	1 300		
	Oxides of sulphur	50	423[1]		
	Oxides of nitrogen	200	4 215		
	Hydrogen chloride	10	64		
	Hydrogen fluoride	1	3		
	Total organic compounds	10	113		
	Sum of lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	0.5	21	Daily average	
	Mercury	0.05	0.43		
	Cadmium + thallium	0.05	0.13		
	Ammonia	10	14.5		
	Dioxins and furans	0.1 Note 2	4.2		
	n/a	Exit gas temperatures must be maintained below 200ºC	400 ºC	Not applicable	
Bio-sludge incinerators	Particulate matter	10	850	Daily average Monthly average Note 1	Effective from decision for 5 years
	Carbon monoxide	50	4 490		
	Oxides of sulphur	50	240		
	Oxides of nitrogen	200	630		
	Hydrogen chloride	10	23		
	Hydrogen fluoride	1	20		
	Total organic compounds	10	3 673		
	Sum of lead, arsenic, antimony, chromium, cobalt, copper,	0.5	8.77	Daily average	

[1] The alternative emission limit requested was incorrectly indicated as "23" in the draft motivation. This was a typing error in the draft motivation only and the modelling and impact assessment detailed in the AIR are correct. To address the typing error attention will be drawn to the error in the letter notifying interested and affected parties of the submission of the final motivation.

Plant area	Emission component	Emission standard for new plants	Alternative emission limit requested (ceiling limit)a	Compliance averaging period	Postponement period
		All values specified at 10% O_2, 273 K and 101,3 kPa, mg/Nm^3			
	manganese, nickel, vanadium				
	Mercury	0.05	2.46		
	Cadmium + thallium	0.05	0.12		
	Ammonia	10	104		
	Dioxins and furans	0.1[Note 2]	0.43		
Ammonium nitrate plant	Particulate matter	50	50 (on a wet basis)	Daily average	Effective 01 April 2020 for 5 years until 31 March 2025
	Ammonia	50	180 (on a wet basis)		
Tanks	Total volatile organic carbon	Identified tanks according to the approach detailed in section 4.8 to be fitted with abatement		Fugitive management plan	Effective 01 April 2020 for 5 years until 31 March 2025

Note 1: Monthly average where continuous online monitoring is done.

Note 2: ng I-TEQ/Nm3 under normal conditions of 10% oxygen, 273 Kelvin and 101.3 kPa.

Currently, continuous emission monitoring (online analysers) are installed on one HOW and one bio-sludge incinerator. The compliance solution under consideration may limit the long-term use of some of the analysers if these were to be installed on all of the remaining incinerators. Sasol requests that, in addition to the installed analysers serving as proxy measurements for the other incinerators, compliance and/or validation through the continued application of periodic third party sampling, is acceptable for monitoring purposes on the remaining incinerators until the completion of the incinerator abatement project towards compliance with the new plant standards. These measurement results will be recorded, processed and presented in a quarterly emissions monitoring report. This will be for the extended compliance period that is the subject of this postponement application.

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Glossary

Definitions in terms of National Environmental Management: Air Quality Act (Act No. 39 of 2004) (NEM:AQA) and the List of Activities and associated Minimum Emission Standards identified in terms of Section 21 of NEM:AQA (GN 893, as amended by GN 551 and 1207) that have relevance to this application:

Existing plant – Any plant or process that was legally authorised to operate before 1 April 2010 or any plant where an application for authorisation in terms of the National Environmental Management Act (Act No.107 of 1998) was made before 1 April 2010.

Fugitive emissions - emissions to the air from a facility, other than those emitted from a point source.

Licencing authority – refers to an authority responsible for implementing the licensing system.

Listed activity – In terms of Section 21 of the NEM:AQA, the Minister of Environmental Affairs has listed activities that require an AEL. Listed activities must comply with prescribed emission standards. The standards are predominantly based on 'point sources', which are single identifiable sources of emissions, with fixed location, including industrial emission stacks, called a "point of compliance".

Minister – The Minister of Environmental Affairs.

New plant – Any plant or process where the application for authorisation in terms of the National Environmental Management Act (Act No.107 of 1998) was made on or after 1 April 2010.

Point source – A single identifiable source and fixed location of atmospheric emission and includes smoke stacks.

Priority area - means an area declared as such in terms of Section 18.

Priority area air quality management plan - means a plan referred to in Section 19.

Total volatile organic compounds (VOCs or TVOCs) – means organic compounds listed under United State Environmental Protection Agency Compendium Method TO-14.

Additional definitions provided for the purpose of clarity:

Alternative emissions limits – the emissions limit proposed by Sasol based on what is considered reasonable and achievable as a consequence of the various technical and environmental assessments conducted and which Sasol proposes as an alternative standard to be incorporated as a licence condition with which it must comply during the period of postponement. The alternative emissions limits are specified as ceiling emissions limits or maximum emission concentrations, as defined in this glossary. In all instances, these alternative emissions limits seek either to maintain emission levels under stable and normal operating conditions as per current plant operations, or to reduce current emission levels, but to some limit which is not identical to the promulgated MES (as defined). Specifically, these alternative emissions limits do not propose an increase in current average baseline emissions.

Alternative special arrangements – An arrangement different to that contained in Part 3 of GN 893 and proposed by Sasol based on what is considered reasonable and achievable as a consequence of the assessments conducted and which Sasol proposes as an alternative special arrangement to be incorporated as a licence condition with which it must comply during the period of postponement.

Ambient standard - The maximum tolerable concentration of any outdoor air pollutant as set out in the National Ambient Air Quality Standards in terms of Section 9(1) of the NEM:AQA.

Atmospheric Emission License (AEL) – the following Atmospheric Emission Licenses are applicable:

- Govan Mbeki Sasol South Africa Limited Sasol Synfuels 0016/2018/F03 04 May 2018 issued to Sasol in respect of Secunda Synfuels Operations, formerly Sasol Synfuels.
- Govan Mbeki Sasol Chemical Industries (Pty) Ltd 0017/2014/F01 27 March 2014 issued to Sasol in respect of Secunda Chemicals Operations.
- Govan Mbeki Sasol Chemical Industries Pty (Ltd) Sasol Oil 0019/2015/F02 31 March 2015 issued to Sasol in respect of Sasol Oil.
- Govan Mbeki/ Sasol South Africa (Pty) Ltd Polymers/0021/2015/F02 31 March 2015 issued to Sasol in respect of Sasol Polymers.
- Govan Mbeki / Sasol South Africa (Pty) Ltd / 0018/2015/F02 31 March 2015 issued to Sasol in respect of Sasol Group Services.
- Govan Mbeki / Sasol South Africa (Pty) Ltd Govan Mbeki Sasol Nitro/0020/2015/F02 21 March 2015 issued to Sasol in respect of Sasol Nitro.

Atmospheric Impact Report (AIR) - in terms of the Minimum Emission Standards an application for postponement must be accompanied by an AIR as per Section 30 of NEM:AQA. Regulations prescribing the format of the AIR were published in Government Notice 747 of 2013 as amended by GN 284.

Ceiling emissions limit – Synonymous with “maximum emission concentrations”. The administrative basis of the MES is to require compliance with the prescribed emission limits specified under normal operating conditions, excluding shut down, start up and upset conditions. Whereas average emission values reflect the arithmetic mean value of emissions measurements for a given process under all operational conditions, the ceiling emission would be the about 95th percentile value of emissions measurements obtained. Hence, ceiling emission values would be higher than average emission values, with the extent of difference between ceiling and average values being dependent on the range of emission levels seen under different operational conditions. Since the MES specify emissions limits as ceiling emissions limits or maximum emission concentrations, Secunda Synfuels Operations and Secunda Chemicals Operations has aligned its proposed alternative emissions limits with this format, to indicate what the about 95th percentile emissions measurement value would be under any operational condition (excluding shut down, start up and upset conditions). It is reiterated that Sasol does not seek to increase emission levels relative to its current emissions baseline through its postponement applications and proposed alternative emissions limits (specified as ceiling emission limits), but rather proposes these limits to conform to the administrative basis of the MES.

Criteria pollutants – Section 9 of NEM:AQA provides a mandate to the Minister to identify a national list of pollutants in the ambient environment which present a risk to human health, well-being or the environment, which are referred to in the National Framework for Air Quality Management as “criteria pollutants”. In terms of Section 9, the Minister must establish national standards for ambient air quality in respect of these criteria pollutants. Presently, eight criteria pollutants have been identified, including sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), lead (Pb), particulate matter (PM_{10}), particulate matter ($PM_{2.5}$) and benzene (C_6H_6). In this document, any pollutant not specified in the National Ambient Air Quality Standards (NAAQS) is called a “non-criteria pollutant”.

Existing plant standards - The emission standards which existing plants are required to meet. Emission parameters are set for various substances which may be emitted, including but not limited to, for example, PM_{10}, nitrogen oxides (NO_x) and SO_2.

Fugitive emission monitoring plan – The plan detailing monitoring of fugitive emissions from equipment, pumps, tanks and other non-point sources on the Secunda site and the associated corrective actions to manage these emissions.

GN 551 – Government Notice 551, Gazette No. 38863 dated 15 June 2016, published in terms of Section 21 of the NEM:AQA and entitled '*Amendments to the list of Activities which result in Atmospheric Emission which have or may have a Significant Detrimental Effect on the Environment, including Health, Social Conditions, Economic Conditions, Ecological Conditions or Cultural Heritage'*.

GN 893 – Government Notice 893, Gazette No. 37054 dated 22 November 2013, published in terms of Section 21 of the NEM:AQA and entitled '*List of Activities which Result in Atmospheric Emissions which have or may have a Significant Detrimental Effect on the Environment, Including Health and Social Conditions, Economic Conditions, Ecological Conditions or Cultural Heritage'*. GN 893 repeals the prior List of Activities published in terms of Section 21, namely GN 248, Gazette No. 33064 dated 31 March 2010. GN 893 deal with aspects including: the identification of activities which result in atmospheric emissions; establishing minimum emissions standards for listed activities; prescribing compliance timeframes by which minimum emissions standards must be achieved; and detailing the requirements for applications for postponement of stipulated compliance timeframes. Amendments to GN 893 have been made in 2015 (GN 551) and in 2018 (GN1207).

GN 1207 - Government Notice 2017, Gazette No. 42013 dated 31 October 2018, published in terms of Section 21 of the NEM:AQA and entitled '*Amendments to the Listed Activities and Associated Minimum Emission Standards Identified in Terms of Section 21 of the National Environment Management: Air Quality Act, 2004 (Act No.39 of 2004)*.

Maximum emission concentrations – Synonymous with "ceiling emissions limits". Refer to glossary definition specific to this application for ceiling emissions limits.

Minimum Emissions Standards (MES) – Prescribed maximum emission limits and the manner in which they must be measured, for specified pollutants. These standards are published in Part 3 of GN 893, as amended by GN551 and GN1207. These standards are referred to herein as MES.

New plant standards - The emission standards which existing plants are required to meet, by April 2020, and which new plants had to meet since 2015. MES are set for various substances which may be emitted, including, for example, PM_{10}, NO_x and SO_2.

Postponement – A postponement of compliance timeframes for new plant standards and their associated special arrangements, in terms of regulation 11 of GN 893, as amended by GN1207.

Sasol – refers generally to Sasol South Africa Limited and its various operations and operating entities.

SCO - the applicant in this postponement application, Sasol South Africa Limited operating through Secunda Chemicals Operations.

Shutdown schedule - A programme for the scheduled period for which a plant, or a portion thereof or piece of equipment, such as a tank, is out of commission for maintenance for an extended period of time.

Special arrangements – Any specific compliance requirements associated with a listed activity's prescribed emissions limits in Part 3 of GN 893, as amended by GN 551. These include, amongst others, reference conditions applicable to the prescribed emission limits of the listed activity, abatement technology prescriptions and transitional arrangements.

SSO – the applicant in this postponement application, refers to Sasol South Africa Limited operating through Secunda Synfuels Operations.

Total volatile organic compounds (TVOCs) means organic compounds listed under US-EPA compendium method TO-14.

2014 postponement application - Postponement application submitted ahead of the 1 April 2015 compliance timeframe for existing plant standards, for various sources at the Secunda facility and incorporated into the Atmospheric Emission Licence.

2016 postponement application - Postponement application submitted by SSO to extend the initial two year compliance extension granted ahead of the 1 April 2015 compliance timeframe for existing plant standards, for three pitch tanks.

2017 postponement application – Postponement application submitted by SSO to extend the initial three year compliance extension granted for the 1 April 2015 compliance timeframe, for the Phensolvan plant and high organic waste and bio-sludge incinerators.

2019 postponement application - This postponement application submitted by SSO and SCO ahead of the 1 April 2020 compliance timeframe for new plant standards relating to tanks at the Secunda facility, the ammonium nitrate plant at SCO and the steam plants, Synfuels catalytic cracker and incinerators at SSO.

List of Abbreviations

AEL	Atmospheric Emission Licence
AIR	Atmospheric Impact Report
API	American Petroleum Institute
AQMS	Ambient air quality monitoring stations
BO	Beneficial operation
CTL	Coal-to-liquid
CO	Carbon Monoxide
CRR	Comments and Response Report
C_6H_6	Benzene
DEA	Department of Environmental Affairs
DEBITS	Deposition of Biogeochemically Important Trace Species
EIA	Environmental Impact Assessment
ESPs	Electrostatic Precipitators
FT	Fischer-Tropsch
FCC	Fluidised Catalytic Cracking
GN	Government Notice
GO	General Overhaul
HCL	Hydrogen Chloride
HF	Hydrogen Fluoride
HOW	High Organic Waste
H_2S	Hydrogen sulfide
IFRs	Internal Floating Roofs
I&APs	Interested and Affected Parties
LEA	Low excess air
LNB	Low NO_x burner
MES	Minimum Emission Standards
NAQO	National Air Quality Officer
NAAQS	National Ambient Air Quality Standards
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (Act No. 39 of 2004)
NH_3	Ammonia
NO_x	Oxides of Nitrogen
OFA	Overfire air
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter with radius of less than 2.5 µm
PM_{10}	Particulate Matter with radius of less than 10 µm
ppb	parts per billion
PPP	Public Participation Process
RFC	Ready for commissioning
RFO	Ready for operation
SANS	South African National Standards
SCC	Synfuels Catalytic Cracker
SCO	Secunda Chemicals Operations
SSO	Secunda Synfuels Operations
SO	Sasolburg Operations
SO_2	Sulfur dioxide
t/h	Tons per hour

TOC	Total Organic Compounds
US EPA	United State Environmental Protection Agency
VOC	Volatile Organic Compound; equivalent to TVOC (Total Volatile Organic Compounds)
VRU	Vapour Recovery Units
WHO	World Health Organisation

1 Introduction

Sasol was established in 1950 and started producing synthetic fuels and chemicals in 1955, from the world's first commercial Coal-To-Liquids (CTL) complex in Sasolburg. Today Sasol is a multinational organisation with key activities in South Africa in Secunda (mining, coal and gas to liquids and chemicals operations) and Sasolburg (mining, provision of utilities, chemicals operations and petroleum refining) together with other smaller operations at various locations in the country. As with any large petroleum and chemicals manufacturing activities, Sasol's activities result in environmental and social aspects including employment, spending, skills transfer, resource use (such as coal, water, natural gas and land), waste and pollution (solid waste, effluent and atmospheric emissions).

In 2004 the National Environmental Management: Air Quality Act (NEM:AQA) was promulgated and stemming from that Act, National Ambient Air Quality Standards (NAAQS) were published in 2009. Commensurate emission limits were promulgated in the form of Minimum Emission Standards (MES) in 2010 and amended in 2013 and 2018. The MES identifies a list of activities that result in atmospheric emissions and obliging such emitters to obtain Atmospheric Emission Licences (AELs) for the listed activities. Given the nature of Sasol's activities, the MES is applicable to Sasol's South African operations.

For various reasons, Sasol is unable to meet some of the MES new plant standards by 2020. Sasol is therefore using a provision in the MES that allows for an existing plant to apply for a once off postponement of compliance timeframes with new plant standards and to also propose alternative emission limits for the postponement period. Such postponement applications require a detailed justification and reasons for the application together with an independent Atmospheric Impact Report (AIR) and a concluded public participation process. This document serves as justification for the application for postponement of certain compliance timeframes as stipulated in the MES for Sasol's Secunda Synfuels Operations (SSO), Secunda Chemicals Operations (SCO) and Sasol Oil operations based in the Sasol Secunda industrial complex. The justification is structured to present the major activities at the Secunda site and the associated atmospheric emissions, followed by a description of which emissions comply currently or will comply timeously, and which require postponement. The specific reasons for requiring postponement are then presented together with proposed alternative emission limits.

2 Sasol Secunda Operation

2.1 Overview

The Sasol Secunda plant was built in the late 1970s (initially referred to as Sasol 2) and then an almost identical plant (Sasol 3) constructed in the early 1980s. Today the combined operations of the two plants are called SSO and the additional chemical manufacturing plants that have also since been added to the complex are called SCO. In broad terms the activities at Secunda see coal being mined at various mines around Secunda (as part of the Sasol Mining Limited), transported to SSO and then converted into synthetic gas (essentially Carbon Monoxide (CO)) by passing the coal through 'gasifiers'. Hydrogen is sourced from water and later combined with the CO to form hydrocarbon chains in the Fischer-Tropsch process. The hydrocarbon chains are then used principally in the manufacturing of liquid fuels. During the gasification process, tars and other components are formed which also have to be removed from the raw gas. Instead of treating these components as waste, Sasol's industrial process converts these components to other chemical products, which have commercial value.

SSO produces synthetic fuel components, along with a range of intermediate streams that serve as chemical feedstocks for the manufacture of *inter alia*, ethylene, propylene, detergent alcohols, phenols, alcohols and ketones. SSO also produces the oxygen and steam required for the various industrial activities at Secunda and also supplies some 40% to 45% of the complex's total electricity demand. In the early 2000's natural gas was introduced to the complex via a pipeline from the Temane gas field in Mozambique that provides approximately 10% of the feedstock for SSO. SCO manufactures a diverse range of products including industrial explosives, fertilisers and a range of other hydrocarbon based chemical products. SCO also provides sites services, infrastructure maintenance and product logistics services for the Secunda site.

Sasol's fuel and chemical production processes are highly integrated, not only among different entities within the Secunda complex but also between the Secunda complex, Sasol's Sasolburg Operations (SO) and Natref, the petroleum refinery that is operated as a joint venture between Sasol and Total. That integration is crucial to the technical and commercial success of the various SSO and SCO products. At the same time the high degree of integration means that decisions to retrofit or modify components of the process have to consider all possible upstream and downstream knock-on effects. These knock-on effects, if not properly assessed and managed, could result in significant process disruptions for a whole range of other Sasol activities.

2.2 The Sasol Secunda industrial complex

Secunda is located in the Govan Mbeki Local Municipality, which is part of the Gert Sibande District Municipality in the Mpumalanga Province. The Sasol industrial complex lies to the south-southwest of the town Secunda (Figure 2-1), with the associated coal mining activities occurring in various directions from the town. The Secunda complex as depicted in Figure 2-2 includes activities undertaken by:

a) Sasol South Africa Limited, operating through SSO and SCO.
b) Sasol Oil Pty Ltd., which markets fuels blended at Secunda (as well as those produced at Natref, in Sasolburg).
c) Sasol Mining Pty Ltd., which mines the coal used at the Secunda complex.

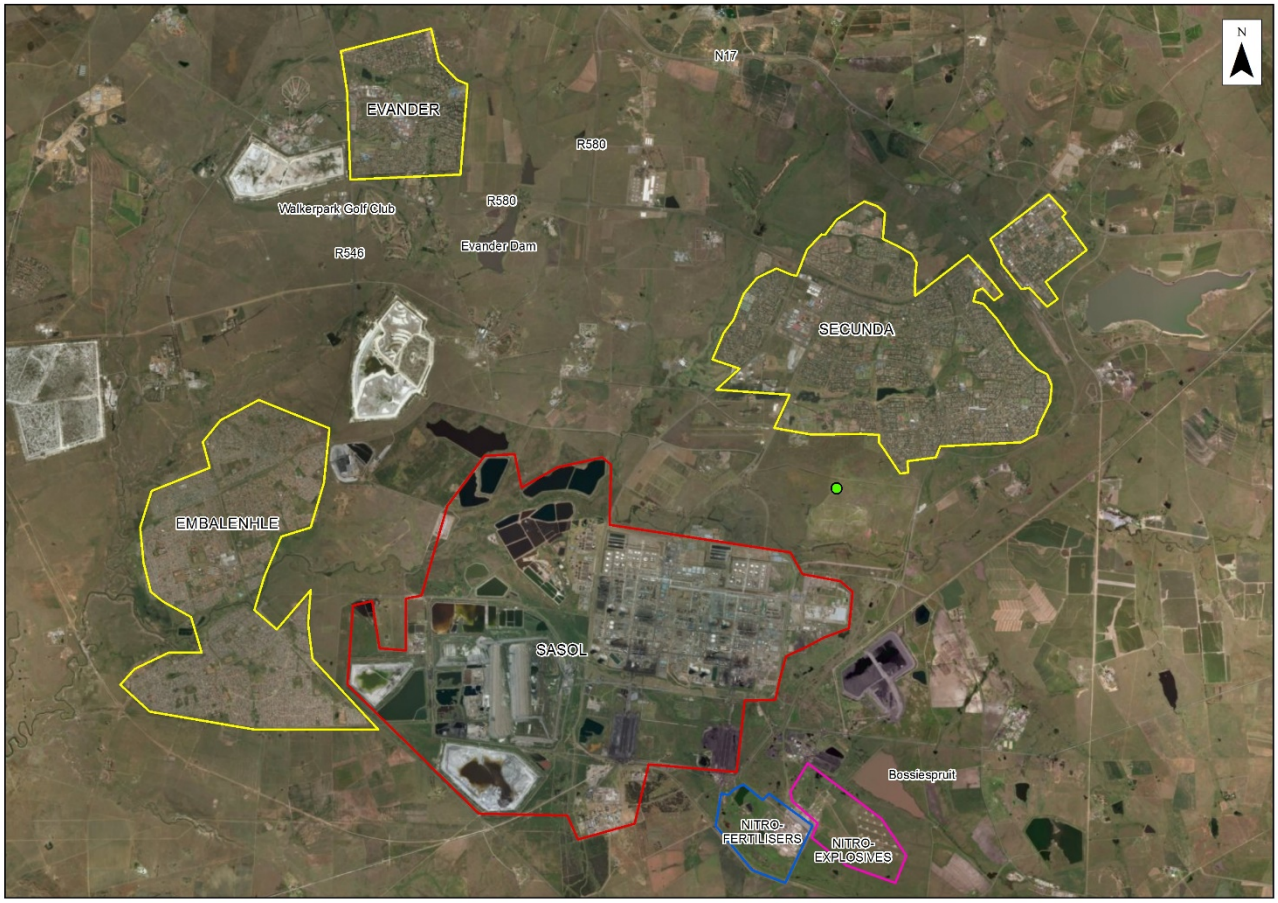

Figure 2-1: Map showing the relative positions of SSO and SCO both of which occur on the Sasol site, and the residential areas of Embalenhle, Evander and Secunda itself

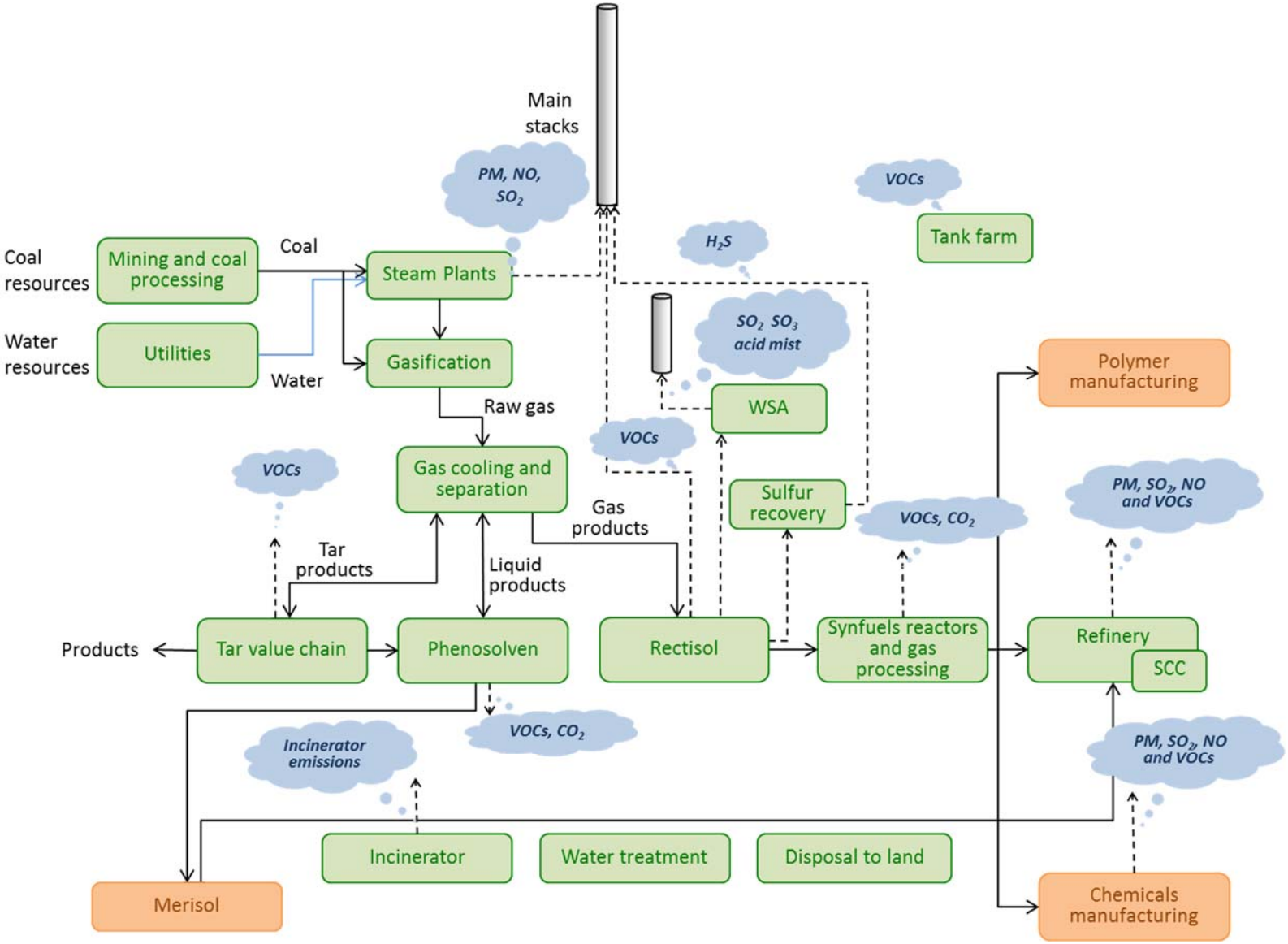

Figure 2-2: Conceptual presentation of the various industrial activities at Sasol Secunda operations highlighting the integration between the different activities

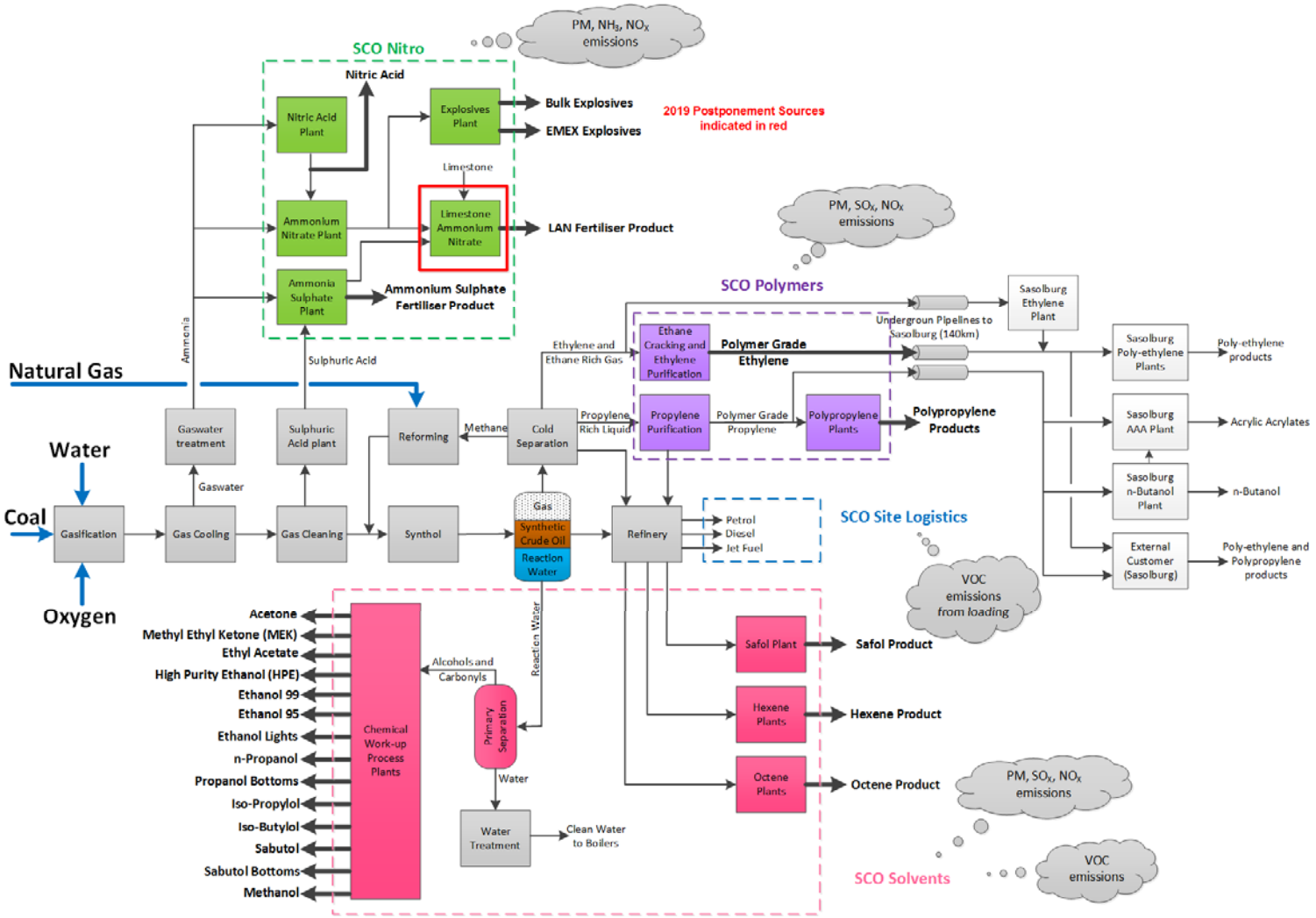

Figure 2-3: Schematised illustration of the industrial process at SCO, highlighting sources of atmospheric emissions

2.3 Atmospheric emissions from the Secunda complex

SSO, SCO and Sasol Oil are holders of AELs for certain activities it conducts at the Secunda facility and which are listed activities in terms of the MES. This application relates to only those for which postponement is requested namely, the steam plant boilers, the Synfuels Catalytic Cracker (SCC) and bio-sludge and high organic waste (HOW) incinerators (all at SSO), the ammonium nitrate plant (at SCO) and petroleum and chemical storage tanks.

2.3.1 Steam plant boilers

Steam is a critical industrial process requirement across both SSO and SCO. Process steam must be available at the right temperature and pressure, and in the right quantity at all processes where steam is required, at all times. To meet these exacting steam requirements SSO operates a large fleet of small boilers rather than a small fleet of large boilers. The fleet of boilers allows both planned and unplanned disruptions to steam generation to be managed without compromising the supply of steam to users across the complex. SSO has a fleet of 17 pulverised coal fired boilers, each with a maximum production capacity of 540 tons per hour (t/h) of 40 bar superheated steam. The layout of the entire facility is based on minimising the distance over which the steam has to be moved with the largest steam users placed closest to the steam plants, to minimise the loss of heat from the system. In addition to process demands, steam is supplied to generate 'critical power' which is needed in the event of a loss of power from the national grid. That critical power allows for safe, damage-free plant shutdown in the event of an emergency.

Excess steam is used to generate additional electricity, which offsets some of the facility's electricity demand from the national grid. Importantly, the steam plants are integrated with the Rectisol and sulfur recovery plants. Two tall stacks (301 m and 250 m) serve to co-disperse emissions from the steam plant boilers and the sulfur recovery plant. The high boiler outlet temperature from the steam plants provides essential buoyancy to the much cooler off-gas stream from the sulfur recovery plant, significantly improving atmospheric dispersion of these emissions. The requirement for high emissions temperatures is so important that it constrains boiler operations, most notably improved efficiencies through additional heat recovery. Atmospheric emissions from the boilers directly regulated by the MES are Particulate matter (PM), Sulfur dioxide (SO_2) and Oxides of nitrogen (NO_x) as shown in Table 2-1.

Table 2-1: The minimum emission standards that will apply to the SSO steam stations (Category 1: Subcategory 1.1)

Emission Component	New plant standards (in mg/Nm^3)
PM	50
SO_2	1 000
NO_x	750

The current boiler fleet has Electrostatic Precipitators (ESPs) combined with flue gas conditioning through ammonia dosing, to abate PM emissions but no direct NO_x or SO_2 emissions abatement. Sasol is now applying for postponement of the new plant PM and NO_x MES for emissions from the steam plant boilers from 2020 until 2025.

Given that Sasol was able to meet the existing plant standards for SO_2 but was challenged to meet the new plant standards, Sasol applied for and was granted in 2015 a postponement to the new plant standards until 2025.

2.3.2 Synfuels Catalytic Cracker (SCC)

The SCC facility was established in 2006 to enable compliance with the then-Department of Minerals and Energy's Clean Fuels 1 fuel specification. The SCC is a Fluidised Catalytic Cracking (FCC) process incorporating a reactor and regenerator that converts low molecular weight molecules to feedstock for petrol and olefinic gases used for manufacturing polymers. The SCC is integral to the refinery operations. Due to the unique nature of the SSO fuels manufacturing process the SCC is the only commercial catalytic cracker unit in the world to use this particular technology. Although petroleum refineries generally have catalytic crackers, the SCC at Secunda must process low-to-medium molecular weight, low-to-medium boiling point and metal-free hydrocarbons contained in the synthetic gas produced from coal. Atmospheric emissions from the SCC directly regulated by the MES are PM, SO_2 and NO_x as shown in Table 2-2 below.

Table 2-2: The minimum emission standards that will apply to the SCC (Category 2: Subcategory 2.2)

Emission Component	New plant standards (in mg/Nm^3)
PM	100
SO_2	400
NO_x	1 500

Typically FCCs in petroleum refineries process high-boiling, high-molecular weight, metal-containing hydrocarbons derived from crude oil. The Secunda SCC thus requires a different catalyst with different chemical reactions to a typical FCC. The unique nature of the SCC means that any abatement equipment has to be customised specifically for the Secunda operation. The SCC contains a three stage PM abatement technology. An initial set of five cyclones removes PM (catalyst particles) before the flue gas enters the stack. Then a number of small cyclones removes more of the remaining PM. This abatement equipment was installed as part of the original plant when it was established. Furthermore, an online opacity meter is installed to monitor PM emissions from the SCC stack.

Sasol is now applying for postponement of the MES standard for PM emissions from the SCC from 2020 until 2025.

2.3.3 Bio-sludge and high organic waste incinerators

A) High organic waste incinerators

Two High Organic Waste (HOW) incinerators are used to incinerate effluent streams from the SSO Phenosolvan (ammonia recovery) and SCO carbonyl recovery production facilities. The HOW is combusted in the presence of fuel gas and air for safe disposal.

B) Bio-sludge incinerators

Process effluent streams including reaction water and stripped gas liquor, along with oily water sewer and storm water streams, are treated in an aerobic activated sludge wastewater treatment process, and an anaerobic digester. The treatment process generates excess activated sludge (bio-sludge) which, together with a smaller stream of Secunda's domestic sewage sludge (which Sasol treats on behalf of the municipality) is then de-watered and pumped to four Lurgi multiple-hearth incinerators for incineration.

Atmospheric emissions from the incinerators regulated by the MES are PM, SO_2, NO_x, Carbon monoxide (CO), Hydrogen chloride (HCl), Total organic compounds (TOCs), dioxins and furans, metals, mercury (Hg), cadmium and thallium (Cd + Tl), hydrogen fluoride (HF) and ammonia (NH_3) as shown in Table 2-3 below. The nature of atmospheric emissions from incinerators is one of high

concentrations (of the various pollutants listed above) but with limited flows implying a generally small emissions mass (load) and corresponding limited ambient impact.

Table 2-3: The minimum emission standards that will apply to the SSO incinerators (Category 8: Subcategory 8.1)

Emission Component	New plant standards (in mg/Nm3)
PM	10
CO	50
SO_2	50
NO_x	200
HCl	10
HF	1
Sum of lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	0.5
Hg	0.05
Cd + Tl	0.05
TOC's	10
NH_3	10
Dioxins and furans	0.1
Exit gas temperatures must be maintained below 200ºC	

Note: Subcategory 8.1 also requires that continuous online measurement of particulate matter and gaseous emissions and operating parameters is implemented.

There is currently no direct emissions abatement on the HOW incinerators while the bio-sludge incinerators are fitted with scrubbers. Sasol is now applying for postponement of the new plant PM, SO_2, NO_x, CO, HCl, TOCs, dioxins and furans, metals, mercury (Hg), cadmium and thallium (Cd + Tl), hydrogen fluoride (HF) and ammonia (NH_3) and exit gas temperature MES for emissions from the HOW and bio-sludge incinerators for a period of 5 years from date of decision.

2.3.4 Ammonium nitrate plant at Secunda Chemicals Operations

Ammonia vapour and nitric acid (60%) are reacted to form ammonia nitrate and water. That mixture is released into a flash vessel. The water flashes to steam while ammonium nitrate (88%) solution collects at the bottom of the flash vessel and is then pumped to storage. Atmospheric emissions from the ammonium nitrate plant are regulated in the MES under subcategory 7.3 for the following substances: PM, hydrogen fluoride and ammonia as shown in Table 2-4 below.

Table 2-4: The minimum emission standards that apply to the SCO ammonium nitrate plant (Category 7: Subcategory 7.3)

Emission Component	New plant standards (in mg/Nm^3)
PM	50
Total fluoride measured as HF	5
NH_3	50

The steam from the flash reactor vapour and the off gas from the ammonium nitrate concentrator are treated in the scrubber section of the neutraliser to remove ammonium nitrate particulates and unreacted ammonia (NH_3). The residual ammonia and PM is removed by a second scrubber section consisting of the Kimre and Monsanto mist eliminator scrubber. The steam is then partially condensed,

and the uncondensed steam vented to atmosphere at a height of 45 meters above ground level. Sasol is now applying for postponement of the MES new plant standards applicable to PM and ammonia for emissions from the ammonium nitrate plant for a period of 5 years from date of decision.

2.3.5 Petroleum and chemical storage tanks

SSO and SCO produce a range of different fuel and chemical products. These intermediate and final products are stored in tanks, mainly at the "tank farm" area or adjacent to the production plants where they are manufactured. Intermediate products are then sent to downstream production units for further processing, while final products are dispatched to the customer. Although all product storage meets good practice requirements, fugitive emissions of volatile organic compounds (VOCs) may occur (namely emissions that 'escape' to atmosphere rather than being deliberately released). Atmospheric emissions from the storage tanks are regulated in the MES under subcategory 2.4 and Category 6 as shown in Table 2-5 below.

Table 2-5: The minimum emission standards that apply to the SSO, SCO and Sasol Oil storage tanks (Category 2: Subcategory 2.4 and Category 6)

Category	Requirement	SSO, SCO and Sasol Oil applicability
Category 2: Subcategory 2.4	Type 3 storage vessels shall be of the following type: - External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20m, or - Fixed-roof tank with internal floating deck/roof fitted with primary seal, or - Fixed roof tank with vapour recovery system	Storage tanks at tankfarm
	Type 1, 2 and 4 tanks comply. Some type 3 storage tanks comply	
	All installations with a throughput of greater than 50 000 m^3 per annum of products with a vapour pressure greater than 14 kPa, must be fitted with vapour recovery or vapour destruction units Emission limits for vapour recovery/destruction using non-thermal treatment: New plant standard: 40 000 mg/Nm^3	Loading stations
Category 6	Type 3 storage vessels shall be of the following type: - External floating-roof tank with primary rim seal and secondary rim seal for tank with a diameter greater than 20m, or - Fixed-roof tank with internal floating deck/roof fitted with primary seal, or - Fixed roof tank with vapour recovery system	Storage tanks

Sasol is now applying for postponement of the MES VOC emissions abatement requirements for petroleum and chemical storage tanks as identified through assessment (section 4.8) from 2020 until 2025.

3 Sasol's atmospheric emissions abatement

3.1 General

Over the past decade, Sasol has spent in excess of R20 billion on various projects that have delivered significant environmental improvements. This expenditure excludes very significant regulatory-driven investments in the Department of Energy's Clean Fuels 1 programme and Clean Fuels 2 programme, which has resulted in, and will further result in reduced motor vehicle emissions. Further, Sasol made commitments to certain emissions abatement interventions as part of the Highveld Priority Area Air Quality Management Plan and has made significant progress towards achieving these commitments. Sasol's emissions abatement has traditionally been focussed on control of particulate matter (PM)

because PM was deemed to pose the greatest risk of adverse health and/or environmental impacts. Material sources of PM were equipped accordingly with electrostatic precipitators (ESPs).

In an ESP, fly ash (PM) in the exhaust stream is given an electrical charge and then removed from the exhaust stream by magnetic plates that attract the charged PM particles. Elsewhere Sasol has focussed intensely on the abatement of VOC emissions, again considering such to pose the greatest risk of adverse health effects, especially to Sasol employees. Finally, Sasol has invested significantly in reducing hydrogen sulfide (H_2S) emissions from the Secunda operation.

3.2 Participation in the formulation of the MES

Sasol participated actively in the process of developing the MES, repeatedly highlighting that there were severe impediments to the installation of the abatement technologies needed to comply with the MES, at Sasol's operations. In addition, Sasol also campaigned for the MES to be expressed as a load (mass of pollutant emitted) rather than as a concentration, because ambient air quality is only indirectly a function of an emissions concentration and more directly a function of the load. Despite highlighting the difficulties that would be faced in complying with the MES that were mooted during the consultation process, these were included in the final version of the MES that was promulgated.

3.3 Planning for MES compliance

Critics of Sasol's inability to meet the MES timeframes argue that Sasol was a key stakeholder in the consultation that underpinned the formulation of the MES and thus should have known what was expected and planned for compliance accordingly. When the MES were published, however, there were some inclusions that were opposed in the consultation process. Perhaps the most telling of these inclusions was the obligation for existing plants to comply, within a period of 5 years from the implementation of the existing plant standards, with the new plant standards. In response Sasol then opted to do a once off installation of abatement technology that would result in compliance with the new plant MES. There was simply no logic in retrofitting to comply with the existing plant standards, and then five years later, retrofitting again to comply with the new plant standards. The once-off abatement approach meant having to operate for a period after the implementation date outside of the existing plant MES. The net effect was that Sasol was compelled to apply for postponements of the compliance timeframes for the existing plant standards in 2014.

3.4 Previous postponement applications

Sasol's previous postponement applications (for the 2015 existing plant standards) extended across much of their South African operations including Sasolburg, Secunda, Natref and Ekandustria. For SSO, Sasol applied for postponement of the compliance timeframes for SO_2, PM and NO_x for emissions from the steam stations and for PM, SO_2, NO_x, CO, HCl, TOCs, dioxins and furans, metals, mercury (Hg), cadmium and thallium (Cd + Tl), hydrogen fluoride (HF) and ammonia (NH_3) for the incinerators. The application for postponement was granted for the steam stations for the requested five years for NO_x and PM. Given that Sasol was able to meet the existing plant standards for SO_2 but was challenged to meet the new plant standards for the steam stations, Sasol was granted a postponement to the new plant standards until 2025. For the incinerators Sasol had limited emissions information at the time of the postponement application and so the NAQO allowed only a three year postponement during which time Sasol was instructed to develop a more comprehensive emissions baseline. On the back of the new baseline, Sasol then reapplied for postponement in 2017 and was granted the remaining two years of the five-year postponement period until 2020.

3.5 Reasons for previous postponement applications

The reasons cited by Sasol in the 2014 postponement applications included:

- Limited abatement technology options that could be retrofitted to the existing Sasol infrastructure.
- Lack of space within the existing site to install the abatement equipment.
- High levels of integration between the various Sasol operations and so changes to one part of the operation inevitably would have knock-on effects for other parts of the operation.
- The General Overhaul (GO) maintenance schedule.

4 Sasol Secunda atmospheric emissions abatement technologies

4.1 General

Given the above and the new plant MES that will come into effect on 1 April 2020, SSO, SCO and Sasol Oil are required to reduce emissions concentrations of:

- PM and NOx from all the steam plant boilers.
- PM from the SCC.
- A range of emissions from the bio-sludge and HOW incinerators.
- PM and ammonia emissions from the ammonium nitrate plant.
- VOCs from petroleum and chemical storage tanks.

The feasibility of an abatement technology requires a holistic assessment of at least:

- The viability of a technology to achieve the desired emission reductions.
- The unintended consequences of the abatement technology, including upstream and downstream impacts.
- Operability of the technology in the context of the often unique Sasol technology.
- Process safety, construction, and production risks and planned maintenance scheduling implications.
- Financial implications, including upfront capital expenditure and lifecycle operating costs.
- Environmental cross-media impacts.
- Ambient air quality benefits.

4.2 PM emissions from the steam plant boilers

SSO has investigated and implemented as appropriate, interventions to meet the MES new plant standard for PM from the steam plant boilers. Such interventions are a combination of operational improvements and different abatement technologies.

4.2.1 Operational improvements

A range of operational improvements has been found to improve the efficacy of the ESPs. Such improvements include more reliable de-ashing of the ESPs, optimising and maintaining the ESP mechanical components, ammonia dosing to improve the PM charge and agglomerate fine particles and optimising the air flow to ensure adequate residence time in the ESP. Such operational improvements will reduce PM emissions but will be insufficient to meet the MES new plant standard.

4.2.2 Abatement technology options

Improved power supply to the ESPs through high or medium frequency transformers or high frequency short pulse transformers technology are being evaluated as potential abatement technologies for MES compliance provided that the ESP internals are in good condition. Replacing the ESP internals can

only be done, however, during boiler shutdown as part of the GO schedule. Ammonia and sulfur trioxide injection are also being further investigated.

4.3 NO_x emissions from the steam plant boilers

In a similar vein to that for PM, SSO has investigated and implemented as appropriate, operational improvements and different abatement technologies to meet MES new plant standards for NO_x.

4.3.1 Operational improvements

The only feasible operational improvement for reducing NO_x emissions is low excess air (LEA). LEA sees a reduction in excess air in the furnace, which then limits the oxygen available for combustion, and resultant reductions in NO_x formation. Such operational improvement will reduce NO_x formation but will be insufficient to meet the MES new plant standard.

4.3.2 Abatement technology options

A broad suite of NOx abatement technologies have been investigated but only low NO_x burner (LNB) technology is feasible for SSO. LNB technology reduces the flame temperature, which reduces the formation of NO_x. LNB comes at a cost, as more coal needs to be combusted to maintain the desired boiler performance with concomitant increases in especially greenhouse gases. The use of over-fire air (OFA), which also serves to reduce flame temperature, may also be considered if the LNBs do not achieve MES compliance.

4.4 PM emissions from the SCC

4.4.1 Operational improvements

Operational improvements investigated to reduce the PM emissions from the SCC were largely focussed on reducing the breakup of the catalyst and improving the efficacy of the existing cyclone system. Again, the operational improvements are important but not sufficient for compliance to MES new plant standards.

4.4.2 Abatement technology options

Wet gas scrubber technology is being developed as a possible technology solution to abate PM emission from the SCC unit. ESP technology is precluded due to the presence of hydrocarbon gasses in the exhaust stream that could cause an explosion. SSO is currently assessing the feasibility of the wet gas scrubber option.

4.5 HOW incinerator emissions

4.5.1 Alternative treatment of waste streams

The first possible intervention investigated was alternative treatment of the waste streams that are incinerated and further application of the waste management hierarchy (viz. possible re-use in existing refinery units). The option of diverting the waste stream was investigated. The investigation has been concluded and found that this option is not technically feasible to manage the complete input stream. The possibility of diverting the high ketones waste from the stream is showing promise pending the mitigation of some associated risks.

4.5.2 Operational improvements

Operational improvement opportunities are limited but resulted in a better understanding of the waste stream variability and resultant optimisation of the combustion temperature and the use of fuel gas

that had the effect of marginally reducing PM, HF and HCl emissions. Again, the operational improvements are important but not sufficient for MES compliance.

4.5.3 Abatement technology options

The retrofitting of abatement technologies to the HOW incinerator was investigated and has proven not to be feasible when compared to the acquisition of a completely new incinerator that would ensure compliance with the MES. An option to include the HOW into the post-combustion chamber of the bio-sludge incinerators, is also being pursued to optimise the capital solution (as opposed to a new HOW incinerator) within the required timelines. Should it not be possible to divert the HOW waste stream a new incinerator will most likely need to be acquired.

All technology options investigated on the HOW incinerator to meet the 2020 MES standards are detailed in Annexure D: Details of the technology options investigated.

4.6 Bio-sludge incinerator emissions

4.6.1 Alternative treatment of waste streams

While there may be some options for alternative use of the waste stream these would see the need for a third-party operator and significant capital investment. Blending the waste with ash to allow for landfilling is technically feasible but logistically impractical due to the large volume and would furthermore require the identification and approval of a new landfill rendering this option not feasible.

4.6.2 Operational improvements

Some operational improvements have been made including optimising the temperature profile of the incinerator, improved dewatering of the sludge, improved availability of critical equipment, reducing the quantity of sludge and improved monitoring of the composition of the waste stream. Some reduction in emissions has been noted but not to the extent of compliance with the MES.

4.6.3 Abatement technology options

Refurbishment of existing equipment and retrofitting of abatement technology is the preferred solution for MES compliance and is the solution being pursued.

All technology options investigated on the bio-sludge incinerator to meet the 2020 MES standards are detailed in Annexure D: Details of the technology options investigated.

4.7 Ammonium nitrate plant emissions

4.7.1 Operational improvements

Several operational improvements have been investigated to reduce emissions from the ammonium nitrate plant. These include improved level control in the flash tank thereby stabilising the process, improved scrubbing efficiency and improving the efficiency of the flash reaction to reduce the amount of unreacted ammonia. Although these interventions will reduce emissions they will not in their own right ensure compliance.

4.7.2 Abatement technology options

The ammonium nitrate plant is reaching its end of life as the process is highly corrosive. As such, the entire plant will be replaced, and the new plant will be equipped with modern abatement equipment that will meet the MES.

4.8 VOC emissions from storage tanks

4.8.1 Tank classification

All SSO, SCO and Sasol Oil tanks have been classified according to the MES requirements namely TVOC, exceeding the 14 kPa vapour pressure limit as well as the throughput limit. The classification is currently being refined through further VOC and vapour pressure measurement and simulations.

Sasol, by way of screening, determined which tanks require further abatement. The approach was presented to and supported by the Department of Environmental Affairs in November 2017. The approach was subsequently further refined and can be summarised as follows:

- Determine which subcategory the tank falls under based on the process and the location of the tank.
- Confirm if the tank is regulated under the associated subcategory.
- Determine if the tank contains TVOC (if a tank contains no or traces of TVOC it was screened out at this point). Sasol has identified the following organic compounds applicable to the Sasol Secunda complex out of the organic compounds listed in the US- EPA Compendium Method TO-14: Benzene, toluene, ethyl-benzene and xylene.
- If the tank contains TVOCs, confirm the vapour pressure and throughput of the tank.
- Determine the tank type based on the vapour pressure and throughput of the tank and:
  - If type 1 tank and fitted with fixed-roof vented to atmosphere or as per type 2 and 3, no further abatement was considered.
  - If type 2 tank with fixed roof with pressure vacuum vents fitted as a minimum or as per type 3, no further abatement was considered.
  - If type 3 tank and:
    - Fitted with floating roof with primary rim seal and secondary rim seal for tank with a diameter greater than 20 meter no further abatement was considered.
    - Fitted with fixed roof with an internal floating deck / roof fitted with a primary seal, no further abatement was considered.
    - Fitted with fixed roof with vapour recovery system, no further abatement was considered.
    - If it was found that the above requirements were not in place on tanks identified as type 3, the emission concentration and load of each tank was determined according to American Petroleum Institute (API) 19.1 standards together with previous sample analysis. It was concluded that various factors impact the TVOC emission loads from the tanks and therefore the tanks were evaluated on this principle:
      - Tanks previously considered to have a material emission load were flagged and abatement projects initiated. Further sampling to confirm the emission concentration and load was also initiated.
      - Tanks deemed to have a moderate and low emission load were flagged and a sampling campaign started in April 2018 over a period of at least 18 months to confirm abatement requirements based on the following interpretation:
        - If the TVOC concentration is below emissions limits set for vapour recovery units using non-thermal treatment and the emission load (footprint) is deemed low, abatement is not considered as priority. If the concentration is above emissions limits set for vapour recovery units using non-thermal treatment and or the footprint is deemed moderate, installation of further abatement is considered as priority.

In order to achieve meaningful compliance it is recommended to install abatement technologies on the tanks with a higher impact as priority. Currently good progress has been made on the priority tanks.

Further baseline sampling is planned to confirm the need for abatement on the remaining tanks before they are due for their next statutory maintenance outage.

4.8.2 Abatement technology options

VOC emissions control is one circumstance where the MES prescribe the abatement technology and as such 'Type 3 tanks' (categorisation used in the MES) must have:

- External floating roof tanks, or
- Tanks retrofitted with internal floating decks or vapour recovery units, or
- Tanks retrofitted with alternative control measures that can achieve the same or better results.

Options for Internal Floating Roofs (IFRs) and Vapour Recovery Units (VRU) are limited and so floating (Evapostop) discs have accordingly been identified as a promising alternative abatement technology that could match the performance of IFR or VRU. Evapostop discs are stainless steel floating discs of some 200 mm in diameter that overlap to form an effective mass transfer barrier on the surface of especially volatile liquids such as petroleum products. VRUs are constrained by space, utility and waste management requirements, requirements and historical difficulties with VRUs for Sasol. Similarly, IFRs are constrained by capacity constraints, tank integrity and structure, loss of working volume and a resultant need for additional tanks.

Additional constraints are sludge build up (the roofs are buckled by the sludge and cleaning is prevented by IFRs), tanks containing internal structures such as partial separation plates cannot be fitted with IFRs and finally, but importantly, the time needed for IFR installation exceeds the period of availability of the tank for retrofitting, leading to serious capacity constraints and production losses. Sasol's approach to compliance will therefore be one of retrofitting IFR wherever possible and where not possible, VRUs or Evapostop discs. Sasol is also targeting the tanks with the highest VOC emissions as the immediate priority and are making good progress in that regard.

5 Justification for the postponement

5.1 Time needed

The primary reason for the application for postponement by SSO, SCO and Sasol Oil is to allow sufficient time for both the retrofitting of the abatement technology and the process optimisation that will follow to ensure that the abatement technology is effective in meeting the MES new plant standard. In the case of the steam plant boilers, these cannot be retrofitted in parallel but must be retrofitted as according to the scheduled downtime of the individual boilers. The steam provided by the boilers is critical to the various chemical production processes operated by SSO and SCO and as such, boiler downtime has to be very carefully scheduled and limited to a predefined duration. If the retrofit cannot be completed in the time available, then it has to stand over until the next opportunity or else there are severe knock on effects to other production units.

5.2 General overhaul schedule

This schedule is known as the General Overhaul (GO) schedule and sees each boiler shutdown for a period of up to three months once every four years. There are 17 boilers at SSO implying at least a 51 month cycle. Whatever maintenance needs to be done on the boiler has to be completed within the defined GO schedule and this therefore also includes the retrofitting of the abatement technology. The primary driver of the GO schedule is ensuring an uninterrupted steam supply of the required quantity and quality, but the GO schedule also accommodates other important limitations including adequate space, availability and management of contractors and worker health and safety and as such cannot be compromised. In the case of the steam plant boilers it is also anticipated there will need to be a suite of additional process modifications following the retrofit, which would only be possible in the following GO cycle.

The same principle holds true for the SCC and the storage tanks, whereby it will only be in the period that the SCC and storage tanks have scheduled maintenance downtime that the retrofits can be effected. Such maintenance schedules are also non-negotiable as Sasol is an important supplier of liquid fuels in South Africa. Downtime of production processes needs to be planned for by the authorities to assure that there are no liquid fuel shortages in the country as a result. The tank GO schedule varies between 6 to 10 years between GOs, depending on the service of the tank. Should design not be completed in time for installation during the GO, the tank will have to stand over to the next GO, which may only be in 6 to 10 years.

5.3 Confirmation of abatement technology

Throughout this application reference has been made to the fact that Sasol is unique in many respects and for that reason standard 'off-the-shelf' abatement technologies cannot simply be retrofitted and MES compliance assured. The peculiarities of the Sasol process means that there needs to be very detailed planning, process modifications prior to the retrofit and process optimisation after the retrofit, before compliance can be assured. A key part of that process is confirming the choice of abatement technology because, while it is relatively easy to disqualify a technology (as soon as such disqualification becomes evident), it is much more difficult and time consuming to confirm the choice of technology. An abatement technology may appear promising throughout the entire project development lifecycle but still fail to work as expected after the retrofit, or a disqualifier may only become apparent some way through the project development lifecycle, that means starting afresh with a new possible technology.

5.4 Sasol's project governance process

Despite the uniqueness of the SSO and SCO industrial processes, Sasol has the technical capacity (and track record) to customise the technology and will make use of the standard project governance process that has been developed by Sasol for all of its projects. The project governance process is one of a series of project stages with so-called 'gates' between each stage, not unlike stage-gate models that are used internationally in the construction industry. A gate cannot be passed until all the criteria for a particular stage has been met and this ensures that the project is effectively costed, planned and resourced so that it will be successfully implemented and operate as intended. Where the project is relatively straightforward and makes use of existing technology the project governance process can be completed relatively quickly, but where there are major uncertainties about the technology and its efficacy, the process takes a good deal longer to complete.

Sasol is fully committed to meeting the MES new plant standards for the activities at SSO, SCO and Sasol Oil, but will, for the reasons cited above, not be able to comply by the 1 April 2020 deadline. The roadmap for achieving the MES is detailed in Section 7.3.1. Initial planning was to meet the MES immediately following the retrofit of the abatement technologies. However, learnings from previous pilot retrofits has indicated that there will have to be a period of process optimisation after the installation of the abatement technology (e.g. LNBs) that will extend the period to meet the MES. Sasol would however ensure that the process optimisation activities are completed by no later than the 2025 deadline should the application for postponement be granted.

6 Proposed alternative emissions limits

6.1 Overview

In addition to providing an option for applying for postponement, the MES regulations also provide for emitters to apply for alternative emissions limits that would then apply during the period of the postponement. Before presenting the proposed alternative emissions limits it is necessary to briefly

describe the context that has framed Sasol's thinking in this regard. Perhaps one of the greatest challenges in meeting the MES is the very narrow definition of when in a given operational year the MES apply. With the best will in the world there will always be circumstances when the abatement technologies perform sub-optimally or stop working completely as a result of a breakdown. The MES recognises such abnormal operating conditions but allows for no more than 48 hours in which to bring the abatement control back into full operation.

6.2 Ceiling emission limits

For a large and complex industrial operation such as SSO and SCO, compliance with such a short duration provision for unplanned downtime is extremely difficult and, in some circumstances, impossible. Sasol has a plant, for example, which takes five days just to cool down enough to allow safe access. Recognising the limited allowable downtime, Sasol must then apply for ceiling emissions as limits that it will be able to meet under all operational circumstances. Such limits then become more of an administrative limit than necessarily a reflection of the real operating circumstances and in most instances the emissions that occur without the abatement equipment being fully operational. It is within that context that alternative emission limits are proposed to apply during the period of the postponement. Such proposed alternative limits are presented in Sections 6.3 to 6.8 below.

6.3 Alternative proposed limits for the steam stations

An additional complexity that must be managed at the steam stations is that there are four flues in the Western main stack and three flues in the eastern main stacks with two or three boilers feeding into one flue. Given that the compliance points are emissions from the stacks and not the individual boilers, it will only be at the end of the retrofit and optimisation programme that emissions from the stack will always be MES compliant. For these various reasons the proposed alternative emission limits requested during the postponement period are as shown in Table 6-1 below.

Table 6-1: Proposed alternative emission limits for the postponement period from 1 April 2020 until 31 March 2025 requested for the steam plant boilers

Emission	Emission standard for new plants	Alternative emission limit requested (ceiling limit)a	Compliance averaging period
NO_x	750	1 100	Daily average
PM	50	120	Daily average

All values specified at 10% O_2 273 K and 101,3 kPa, mg/Nm^3

6.4 Alternative proposed limits for the SCC

The proposed alternative emissions limits for emissions from the SCC are shown in Table 6-2.

Table 6-2: Proposed alternative emission limits for the postponement period from 1 April 2020 until 31 March 2025 requested for the SCC

Emission	Emission standard for new plants	Alternative emission limit requested (ceiling limit)a	Compliance averaging period
PM	100	300	Daily average

All values specified at 10% O_2 273 K and 101,3 kPa, mg/Nm^3

6.5 Alternative proposed limits for the HOW incinerators

The proposed alternative emissions limits for emissions from the incinerators are shown in Table 6-3.

Table 6-3: Proposed alternative emission limits for the postponement period of 5 years from date of decision requested for the HOW incinerators

Emission component	Emission standard for new plants	Alternative emission limit requested for a period of 5 years from date of decision	Averaging period for compliance monitoring
All values specified at 10% O_2 ,273 K and 101.3 kPa, mg/Nm^3			
PM	10	900	Daily average Monthly average Note 1
CO	50	1 300	
SO_2	50	423[2]	
NO_x	200	4 215	
HCl	10	64	
HF	1	3	
TOCs	10	113	
Sum of lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	0.5	21	Daily average
Hg	0.05	0.43	
Cd + Tl	0.05	0.13	
TOC's	10	14.5	
NH_3	0.1 Note 2	4.2	
n/a	Exit gas temperatures must be maintained below 200ºC	400 ºC	

Note 1: Monthly average where continuous online monitoring is done.
Note 2: ng I-TEQ/Nm3 under normal conditions of 10% oxygen, 273 Kelvin and 101.3 kPa.

Currently, continuous emission monitoring (online analyser) is installed on one HOW incinerator. The compliance solution under consideration may limit the long-term use of the analysers if these were to be installed on the remaining HOW incinerator as well.

Sasol requests that in addition to the above analyser serving as proxy measurements for the other incinerator, compliance and/or validation through the continued application of periodic third-party sampling, is acceptable for monitoring purposes on the incinerators until completion of the incinerator

[2] Please note that the alternative emission limit requested was incorrectly indicated as "23" in the draft motivation. This was a typo in the draft motivation only and the modelling and impact assessment detailed in the AIR are correct. To address the typo attention will be drawn to the error in the letter notifying I&APs of the submission of the final motivation.

abatement project towards compliance with MES new plant standards-. These measurement results will be recorded, processed and presented in a quarterly emissions monitoring report. This will be for the extended compliance period that is the subject of this postponement application.

6.6 Alternative proposed limits for the bio-sludge incinerators

The proposed alternative emissions limits for emissions from the bio-sludge incinerators for the postponement period are shown in Table 6-4.

Table 6-4: Proposed alternative emission limits for the postponement period of 5 years from date of decision requested for the bio-sludge incinerators

Emission component	Emission standard for new plants	Alternative emission limit requested for a period of 5 years from date of decision	Averaging period for compliance monitoring
All values specified at 10% O_2 ,273 K and 101.3 kPa, mg/Nm^3			
Particulate matter	10	850	Daily average Monthly average Note 1
Carbon monoxide	50	4 490	Daily average Monthly average Note 1
Sulfur dioxide	50	240	Daily average Monthly average Note 1
Oxides of nitrogen	200	630	Daily average Monthly average Note 1
Hydrogen chloride	10	23	Daily average Monthly average Note 1
Hydrogen fluoride	1	20	Daily average Monthly average Note 1
Sum of lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	0.5	8,77	Daily average
Mercury	0.05	2,46	Daily average
Cadmium + thallium	0.05	0.12	Daily average
Total organic compounds	10	3 673	Daily average Monthly average Note 1
Ammonia	10	104	Daily average
Dioxins and furans	0.1 Note 2	0.43	Daily average

Note 1: Monthly average where continuous online monitoring is done.
Note 2: ng I-TEQ/Nm3 under normal conditions of 10% oxygen, 273 Kelvin and 101.3 kPa

Currently, continuous emission monitoring (online analysers) are installed on one bio-sludge incinerator.

Sasol requests that in addition to the above analyser serving as proxy measurements for the other incinerators, that compliance and/or validation through the continued application of periodic third party sampling, is acceptable for monitoring purposes on the incinerators until completion of the incinerator abatement project towards compliance with MES new plant standards-. These measurement results will be recorded, processed and presented in a quarterly emissions monitoring report. This will essentially be for the extended compliance period that is the subject of this postponement application.

6.7 Alternative proposed limits for the ammonium nitrate plant

The proposed emissions alternative limits for emissions from the ammonium nitrate plant are shown in Table 6-5. The proposed limits are the same as those that were approved by the NAQO following the 2017 postponement application.

Table 6-5: Proposed alternative emission limits for the postponement period requested for the ammonium nitrate plant

Emission	Emission standard for new plants	Alternative Emission Limit Requested (*ceiling limit*)[a]	Compliance averaging period	Postponement Period
Particulate Matter	50	50 (on a wet basis)[3]	Daily average	Effective 01 April 2020 for 5 years until 31 March 2025
Ammonia	50	180 (on a wet basis) [4]	Daily average	

Please note that while the concentration of PM from the stack is 50 mg/Nm^3 the emission standard for new plants is on a dry basis and the alternative emission limit proposed is, as per the current AEL requirement, on a wet basis. This is due to the fact that the ammonium nitrate stack is an extremely wet stack. This does however significantly affect the g/s release rate hence the difference in ambient concentrations as detailed in the AIR.

6.8 Alternative proposed limits for the storage tanks

The postponement request for tanks relates to the extended period required for fitment of abatement technology until 2025 and not specifically an emission limit. An alternative emission limit for the tanks is therefore not required. However, VOC emissions from these units will be managed as part of the site fugitive emission monitoring plan.

[3] Please note that while the concentration of PM from the stack is 50 µg/m^3 the emission standard for new plants is on a dry basis and the alternative emission limit proposed is, as per the current AEL requirement, on a wet basis. This due to the fact that the ammonium nitrate stack is an extremely wet stack. This does however significantly affect the g/s release rate hence the difference in ambient concentrations as detailed in the AIR.

[4] Please note that while the concentration of Ammonia from the stack is 180 µg/m^3 the emission standard for new plants is on a dry basis and the alternative emission limit proposed is, as per the current AEL requirement, on a wet basis. This is because the ammonium nitrate stack is an extremely wet stack. This does however significantly affect the g/s release rate hence the difference in ambient concentrations as detailed in the AIR.

7 The Atmospheric Impact Report

7.1 Overview

As required by the Regulations and in support of the postponement applications, Sasol commissioned an independent AIR to assess the ambient air quality implications and associated environmental and human health risks of the postponement application and the proposed alternative emissions limits. Airshed Planning Professionals was appointed to conduct the atmospheric impact assessment independently and the methodology and datasets were independently peer reviewed by Exponent Inc. The AIR is submitted as a stand-alone document included in Annexure A, but a summary is included here to facilitate I&AP comments thereon.

7.2 Study approach and method

A dispersion model serves to simulate the way in which emissions will manifest as 'ground-level' or 'ambient' concentrations. The AIR prepared as part of the Secunda postponement application was compiled in accordance with the Regulations prescribing the format of the AIR of 2013. Further, the Regulations regarding air dispersion modelling determined the dispersion model selection.

As opposed to predicted ambient concentrations using a dispersion model, ambient air quality monitoring serves to provide direct physical measurements of selected key pollutants. Sasol operates three ambient air quality monitoring stations in and around Secunda, namely at the Secunda Club, Embalenhle and Bosjesspruit. In addition, DEA operates a quality monitoring station in Embalenthle called Secunda.

Data from the Sasol and DEA monitoring stations for 2015, 2016 and 2017 were included in this investigation. The Sasol monitoring stations are accredited (ISO/IEC17025) to ensure data quality and availability. Accreditation certificates from the DEA monitoring stations have not been provided and data availability was limited (49% (2015), 12% (2016) and 44% (2017).). These measured values are indicated as orange dots in all the AIR graphs.

In order to assess the impact of the postponements for which SSO and SCO are applying, three emissions scenarios were modelled:

1. **Current baseline emissions**, reflective of the impacts of present operations, which are modelled as *averages* of measurements taken from periodic emission monitoring. This scenario is represented by the first column in all AIR graphs.
2. **Compliance with the MES.** This is modelled as a ceiling emissions limit (i.e. maximum emission concentration as per MES) aligned with the prescribed standard and reflects a scenario where abatement equipment is introduced to theoretically reduce emissions to conform to the standards. This scenario is then represented by the second column in all AIR graphs.
3. **A worst-case scenario of operating constantly at the requested alternative emissions limits**, which have been specified as ceiling emissions limits (i.e. maximum emission concentrations). This scenario is then represented by the third column in the presentation of all AIR graphs. It is re-emphasised that Sasol will not physically increase its current baseline emissions (expressed as an average) rather this represents a theoretical scenario if SSO and SCO where to operate at the ceiling limit constantly.

Once ambient concentrations have been predicted using the dispersion model they are compared to the NAAQS. NAAQS have been set for criteria pollutants at limits deemed to uphold a permissible or tolerated level of health risk. The NAAQS are represented as an orange line in all the AIR graphs. This comparison provides an assessment of the potential for air quality to impact on human health.

Where no NAAQS exists for a relevant non-criteria pollutant, health screening effect levels based on international guidelines are used. In addition, the measured concentrations are also used to ascertain the representativeness of the modelling and to assess the extent to which the NAAQS are met as a function of all sources of emissions.

Fifty three receptors were identified in the vicinity of SSO and SCO (within the 50-by-50 km modelling domain). Sensitive receptors included residential areas, schools, hospitals and clinics, as well as monitoring stations. Ambient air quality monitoring stations (AQMS) were the first receptors identified because comparison of the predicted concentrations could be compared with measured concentrations for model validation. A full list of receptors is provided in Appendix K of the AIR.

The dispersion modelling methodology and datasets was reviewed by Exponent Inc., which was identified as the appropriate peer reviewer in light of its extensive international experience in the design, development, and application of research and regulatory air quality models. Airshed's Plan of Study, the peer reviewer's report and Airshed's comments on each of the findings are included as Annexure B.

7.3 Overall findings of the AIR

7.3.1 Meeting the NAAQS

The MES aims to achieve the intent of the NEM:AQA which means ensuring that ambient air quality does not threaten the health or well-being of people and the environment. As the NAAQS provide a limit at which the risk to health should be considered tolerable, postponement applications should be considered in terms of the extent to which ambient air quality meets the NAAQS.

For all criteria pollutants, barring PM and NO_2 (only for the DEA Secunda monitoring station where data availability was limited), both the simulated and observed ambient concentrations are below the NAAQS. For PM and NO_2, while the observed ambient concentrations are above the NAAQS, the simulated ambient concentrations emanating from SSO's sources are well below the NAAQS, demonstrating the contribution to ambient concentrations from other sources. To partially address these other sources, SSO is in the process of executing an Offset Implementation Plan that aims to achieve a reduction in PM and SO_2 emissions from some of the other sources.

7.3.2 The effect of the alternative emissions limits

The alternative emissions limits proposed by SSO are in some instances significantly higher than the MES (i.e. as reported on a concentration basis). It is reiterated that the administrative basis of the MES is to comply under all operational circumstances, with emissions exceeding the MES only being tolerated for a limited period such as for shut down, start up and upset conditions. That administrative requirement means that SSO must request ceiling emissions limits (i.e. maximum emission concentrations) rather than average emissions limits to ensure that it can comply under all operating conditions given the known variability of emissions under normal operational circumstances.

The predicted ambient concentrations for the alternative emissions limits are a worst-case depiction because they have been modelled as if the emission will be maintained at those levels continually, which they will not. Yet even under the worst-case emissions scenario full compliance with the NAAQS is predicted in all circumstances for SSO's emissions.

The key finding is that compliance with the MES will in most circumstances reduce ambient concentrations, but in circumstances where the NAAQS are already being met. In the case of PM and NO_2, compliance by SSO with the MES will not result in SSO meeting the NAAQS, hence the need for the Offset Implementation Plan being executed in terms of the 2015 MES postponement decision.

7.3.3 Health effects

The AIR Regulations prescribe an assessment of the health effects of the emissions for which relief is sought from the MES based on the degree to which there is compliance with the NAAQS. It cannot be argued that compliance with the NAAQS means no health risk. Indeed, the World Health Organisation indicates that there is no safe limit in respect of exposure to PM. However, the NAAQS are premised on a permissible or tolerable level of health risk. The overall findings of the AIR are that the alternative emissions limits requested by SSO and SCO in the interim will not result in an increase in ambient pollutant concentrations beyond the permissible health risk thresholds of the NAAQS.

7.3.4 Ecological effects

The impact of emissions on the environment is assessed in terms of Section 5.2 of the AIR. The analysis covers impacts to vegetation, of dustfall, potential corrosion, impacts associated with sulfur and nitrogen deposition and the environmental impact of benzene emissions. Formal benchmarks for assessment of ecological effects have not been set and therefore screening levels were identified by Airshed through literature review.

The simulated off-site annual concentrations of SO_2 and NO_2 are likely to be below the critical levels for all vegetation types. Estimated dustfall rates for the four simulation scenarios were less than 22 mg/m^2.day which is substantially below the target dustfall rate of 300 mg/m^2.day recommended in SANS 1929:2005 and the <600 mg/m^2.day acceptable dustfall rate for residential areas and 600 - 1200 mg/m^2.day acceptable dustfall rate for industrial areas . Corrosion rates were calculated using the ISOCORRAG method and are listed in Table 5-47 of the AIR. It is noted that corrosion rates for the baseline and alternative emissions scenario are generally the same as corrosion rates for the MES compliance scenarios.

Estimates of sulfur (S) and nitrogen (N) deposition rates for the Highveld are comparable with some of the industrialised regions of Europe and North America raising concern that the acidic loading of sulfur and nitrogen on the ecosystems of the Highveld could have implications for ecosystem functioning. While investigating the impact of S and N deposition rates as a result of SSO was beyond the scope of the AIR, Sasol supports long-term deposition quantification studies in South African under the DEBITS (Deposition of Biogeochemically Important Trace Species) programme, as part of the International Global Atmospheric Chemistry Project. Three DEBITS sites are maintained within South Africa, one located near Amersfoort, on the Mpumalanga Highveld, downwind from major industrial sources, including Secunda Operations.

Benzene (together with other VOCs) is a precursor pollutant involved in the formation of secondary atmospheric pollutants, such as smog (generally) and ozone (specifically). Ozone is a strong oxidant known to reduce crop plant yield, especially above a threshold of 40 ppb. An attempt to study ozone concentrations in a local area would require a comprehensive emissions inventory of NO_x and VOC sources beyond those emanating from Sasol and which is outside the scope of the AIR. Recent assessments of ozone concentrations on the Highveld, to which the SSO benzene emissions would contribute, show ambient concentrations below the AOT40 (WHO Ambient Ozone Threshold of 40 ppb):

- Ambient monthly ozone concentrations measured at Amersfoort during the 3-year period 2000 to 2002 ranged between 15 and 45 ppb (Zunckel 2004) where the highest concentrations were measured between July and November 2001.
- Ambient monthly ozone concentrations measured during a campaign between September 2005 and August 2007 showed across the Highveld rarely exceeded 20 ppb. The maximum monthly average (43 ppb) was measured near Thabazimbi (Josipovic et al. 2010).

More details regarding these investigations are provided in Section 5.2.5 of the AIR.

8 Roadmap to compliance for sources seeking postponement in 2019

8.1 Steam stations

Based on the technological investigations and the pilot installations the preferred technology to achieve compliance with the PM limits for the steam stations is improved power supply to the ESPs through high or medium frequency transformers or high frequency short pulse transformers technology. The preferred technology for abatement of NO_x is LNBs. The current view is that both these technologies can only be installed during GOs.

The roadmap as provided in Table 8-1 provides the timeframes for fitment of the proposed PM and NO_x abatement technologies.

Table 8-1: Compliance roadmap for steam stations

Task	SSO boiler PM reduction	SSO boiler NOx reduction demonstration	SSO boiler NOx reduction (remainder of boilers)
Start of feasibility	Jul-19	Completed	Apr-20
Gate 3 governance and start of basic engineering	Aug-19	Completed	Jun/Jul-20
Gate 4 governance and final investment decision	Jun-20	Completed	Jul-20 to Sep-24
Detailed design and construction	Aug 21 - Aug 25	Aug-19	Mar-21 to Jun-25
Ready for commissioning	Aug 21 - Sep 25	Sep-19	Mar-21 to Jul-25
Ready for operation	Sep 21 - Sep 25	Sep-19	Mar-21 to Aug-25
Beneficial operation	Sep 21 - Sep 25	Sep-19	Mar-21 to Aug-25
MES compliance*	Mar 22 - Sep 25	Mar-20	Sep-21 to Aug-25

* Process optimisation that must follow the installation of abatement technology before the installation is effective in meeting the MES.

It should be noted that fitment of the ESPs and LNBs in terms of the current GO schedule will extend beyond April 2025. However, the GO schedule will be amended to ensure that at least one boiler on each stack will be fitted with the abatement technology before April 2025. In so doing, all the stacks will meet the MES by April 2025.

8.2 Synfuels catalytic cracker

Wet gas scrubber technology is being developed as a possible technology solution to abate PM emission from the SCC unit. The roadmap as provided in Table 8-2 provides the timeframes for fitment of the wet gas scrubber.

Table 8-2: Compliance roadmap for SCC

Task	SCC PM abatement
Gate 2 governance and feasibility start	Complete
Gate 3 governance and start of basic engineering (define phase)	Jun-19
Gate 4 governance and final investment decision	Feb-21
Detail design and construction (implementation)	Jan-23

Task	SCC PM abatement
Ready for commissioning (RFC)	Feb-23
Ready for operation (RFO)	Mar-23
Beneficial operation (BO)	Apr-23
MES compliance*	Apr-24

** Process optimisation that must follow the installation of abatement technology before the installation is effective in meeting the MES.*

8.3 Incinerators

An option to include the HOW into the bio-sludge incinerators, is being pursued to optimise the overall capital solution within the required timelines. Should this option not prove feasible however the existing HOW incinerators would need to be decommissioned and replaced with new incinerators.

For the bio-sludge incinerator the preferred option is the refurbishment of existing equipment and retrofitting of abatement technology.

The roadmap as provided in Table 8-3 provides the timeframes for fitment of technology for the incinerators.

Table 8-3: Compliance roadmap for HOW and bio-sludge incinerators

Task	HOW new thermal treatment option	Bio-sludge (retrofit and abatement)
Gate 2 governance	Complete	Complete
Feasibility and to gate 3	Sep-19	Complete
Basic engineering to gate 4 and final investment decision	Nov-20	Mar-20
Detail design and construction	Aug-23	Jan-23
Ready for commissioning (RFC)	Sep-23	Feb-23
Ready for operation (RFO)	Dec-23	Apr-23
Beneficial operation (BO)	Apr-24	Jun-23
MES compliance*	Oct-24	Dec-24

* Process optimisation that must follow the installation of abatement technology before the installation is effective in meeting the MES

8.4 Ammonium nitrate

The ammonium nitrate plant is reaching its end of life. As such, the entire plant will be decommissioned, and a new plant designed to meet the MES will be installed to replace the existing plant.

The roadmap as provided in Table 8-4 provides the timeframes for replacement of the ammonium nitrate plant.

Table 8-4: Compliance roadmap for the ammonium nitrate plant

Task	Ammonium nitrate (AN) plant renewal
Gate 2 governance	Complete
Feasibility and to gate 3	Apr-19
Basic engineering to gate 4 + FID	Apr-20
Detail design and construction	Mar-21
Ready for commissioning (RFC)	Dec-23
Ready for operation (RFO)	Apr-24
Beneficial operation (BO)	Jun-24
MES compliance*	Oct-24

* Process optimisation that must follow the installation before the installation is effective in meeting the MES

8.5 Storage tanks

As for the rest of the Sasol Secunda facility, which operates for 365 days of the year, tanks are taken out of service according to a carefully planned GO schedule to avoid disruptions to production. Installation of abatement on the different identified tanks can only take place during the tank general overhaul (GO).

In order to achieve meaningful compliance, it is recommended abatement technologies be installed on the tanks with a higher impact as priority. Currently good progress has been made on the priority tanks. Further baseline sampling is planned to confirm the need for abatement on the remaining tanks before they are due for their next statutory maintenance outage. Current indications from the GO schedule are that the construction phase will go beyond 2025 if all tanks require abatement.

9 Postponement request

Sasol has consistently communicated its commitment to meeting its compliance obligations in the **air quality improvement** roadmaps which informed and supported its previous postponement applications towards compliance with the MES by 2025. To the extent necessary, further applications as provided for in the applicable regulatory dispensation will be made. Details of the postponement request as it relates to this application are included in detail below.

9.1 Secunda Synfuels Operations

Sasol, on behalf of Secunda Synfuels Operations, applies for a five-year postponement from the new plant standards, as detailed in Table 9-1 and Table 9-2.

Table 9-1: Alternative emission limits requested for the steam plants and Synfuels catalytic cracker

Activity	Source	Emission component	Emission standard for new plants	Alternative emission limit requested	Averaging period for compliance monitoring	Postponement Period
All values specified at 10% O_2 ,273 K and 101.3 kPa, mg/Nm^3						
Subcategory 1.1	Steam plants	PM	50	120	Daily average	01 April 2020 to 31 March 2025

		NOx	750	1 100	Daily average	01 April 2020 to 31 March 2025
Subcategory 2.2	Synfuels catalytic cracker	PM	100	300	Daily average	01 April 2020 to 31 March 2025

Table 9-2: Alternative emission limits requested for high organic waste (HOW) and bio-sludge incinerators

Activity	Source	Emission component	Emission standard for new plants	Alternative emission limit requested	Averaging period for compliance monitoring	Postponement period
All values specified at 10% O_2, 273 K and 101,3 kPa, mg/Nm^3						
Subcategory 8.1	HOW incinerators	Particulate matter	10	900	Daily average Monthly average Note 1	Effective from decision for 5 years
		Carbon monoxide	50	1 300		
		Oxides of sulphur	50	423[5]		
		Oxides of nitrogen	200	4 215		
		Hydrogen chloride	10	64		
		Hydrogen fluoride	1	3		
		Total organic compounds	10	113		
		Sum of lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	0.5	21	Daily average	
		Mercury	0.05	0.43		
		Cadmium + thallium	0.05	0.13		
		Ammonia	10	14.5		
		Dioxins and furans	0.1 Note 2	4.2		
		n/a	Exit gas temperatures must be maintained below 200ºC	400 ºC	Not applicable	
Subcategory 8.1	Bio-sludge incinerators	Particulate matter	10	850	Daily average Monthly average Note 1	Effective from decision for 5 years
		Carbon monoxide	50	4490		
		Oxides of sulphur	50	240		
		Oxides of nitrogen	200	630		
		Hydrogen chloride	10	23		
		Hydrogen fluoride	1	20		
		Total organic compounds	10	3 673		
		Sum of lead, arsenic, antimony, chromium, cobalt, copper, manganese, nickel, vanadium	0.5	8.77	Daily average	
		Mercury	0.05	2.46		
		Cadmium + thallium	0.05	0.12		

[5] The alternative emission limit requested was incorrectly indicated as "23" in the draft motivation. This was a typing error in the draft motivation only and the modelling and impact assessment detailed in the AIR are correct. To address the typing error attention will be drawn to the error in the letter notifying interested and affected parties of the submission of the final motivation.

Activity	Source	Emission component	Emission standard for new plants	Alternative emission limit requested	Averaging period for compliance monitoring	Postponement period
All values specified at 10% O_2, 273 K and 101,3 kPa, mg/Nm^3						
		Ammonia	10	104		
		Dioxins and furans	0.1[Note 2]	0.43		

Note 1: Monthly average where continuous online monitoring is done.

Note 2: ng I-TEQ/Nm3 under normal conditions of 10% oxygen, 273 Kelvin and 101.3 kPa.

Currently, continuous emission monitoring (online analysers) are installed on one HOW and one bio-sludge incinerator. The compliance solution under consideration may limit the long-term use of some of the analysers if these were to be installed on all of the remaining incinerators. Sasol requests that in addition to the installed analysers serving as proxy measurements for the other incinerators, compliance and/or validation through the continued application of periodic third-party sampling, is acceptable for monitoring purposes on the remaining incinerators until the completion of the incinerator abatement project towards compliance with the new plant standards. These measurement results will be recorded, processed and presented in a quarterly emissions monitoring report. This will be for the extended compliance period that is the subject of this postponement application.

9.2 Secunda Chemicals Operations

Sasol, on behalf of SCO, applies for a five-year postponement from the new plant standards, as detailed in Table 9-3.

Table 9-3: Alternative emission limits requested for the ammonium nitrate plant

Emission	Emission standard for new plants	Alternative Emission Limit Requested (*ceiling limit*)[a]	Compliance averaging period	Postponement Period
Particulate matter	50	50 (on a wet basis)[6]	Daily average	Effective 01 April 2020 for 5 years until 31 March 2025
Ammonia	50	180 (on a wet basis) [7]	Daily average	

9.3 Storage tanks

Sasol, on behalf of Secunda Synfuels Operations, Secunda Chemicals Operations and Sasol Oil applies for a five-year postponement from 1 April 2020 to 31 March 2025 for requirements specified in special arrangement of Category 2.4 (b) and Category 6(b)(i) for identified tanks according to the approach detailed in section 4.8 of this report.

In light of the project schedule to fit identified tanks with further abatement, the project may not be completed by April 2025 if the specific tanks' general overhaul schedule is taken into account. In the

[6] Please note that while the concentration of PM from the stack is 50 µg/m^3 the emission standard for new plants is on a dry basis and the alternative emission limit proposed is, as per the current AEL requirement, on a wet basis. This due to the fact that the ammonium nitrate stack is an extremely wet stack. This does however significantly affect the g/s release rate hence the difference in ambient concentrations as detailed in the AIR.

[7] Please note that while the concentration of Ammonia from the stack is 180 µg/m^3 the emission standard for new plants is on a dry basis and the alternative emission limit proposed is, as per the current AEL requirement, on a wet basis. This is because the ammonium nitrate stack is an extremely wet stack. This does however significantly affect the g/s release rate hence the difference in ambient concentrations as detailed in the AIR.

interim, the VOC emissions from these units will be managed as part of the site fugitive emission monitoring plan.

10 Public participation

In terms of the MES (Government Notice No. 893, 22 November 2013) a postponement application must include – "*a concluded public participation process undertaken as specified in the NEMA Environmental Impact Assessment Regulations.*"

As such, the Public Participation Process (PPP), undertaken as part of Sasol's application for postponement of the compliance timeframes, was structured to meet the requirements of Chapter 6 of the EIA Regulations Environmental Impact Assessment Regulations (Government Notice No. 982, 04 December 2014) published under the National Environmental Management Act (Act 107 of 1998) (NEMA), as specified in the MES.

A Public Participation Report, detailing the project Public Participation Process undertaken to date is attached in Annexure C.

The public participation process is an important component of the application process and is closely linked to the technical activities required for the preparation of the Motivation Report (Figure 10-1).

The proposed technical and public participation activities, as well as the broad timeframes for roll out of these processes are shown below.

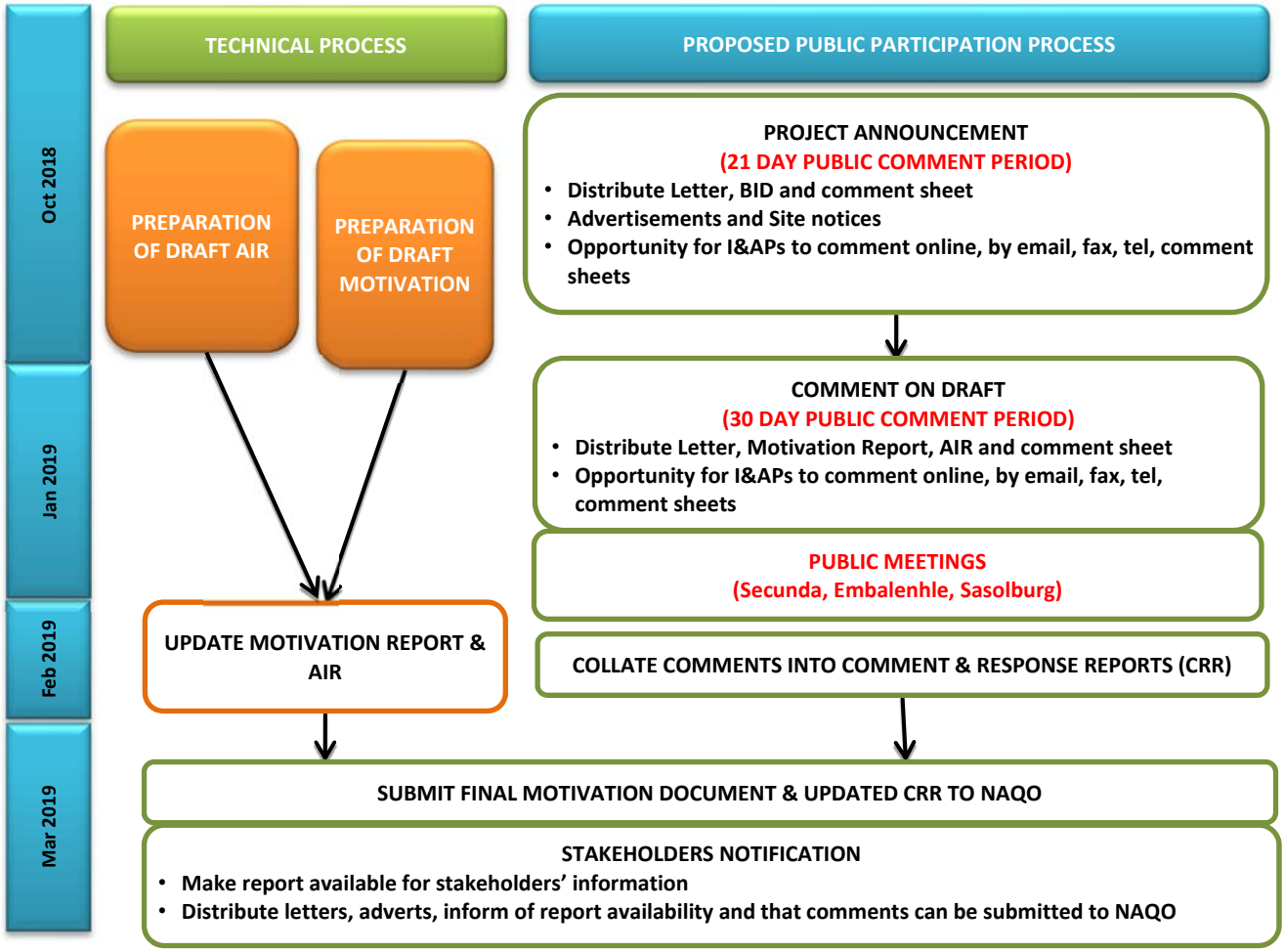

Figure 10-1: Technical and Public Participation Process

11 Conclusions and way forward

Sasol's SSO and SCO date back to the late 1970s when the country's second coal-to-liquids operation was started. The process has evolved over the years to the current situation where Sasol's primary commercial activities at Secunda are the production of synthetic fuels and the manufacture of various chemical products. The industrial activities at Secunda result in a variety of liquid fuel and chemical products but also in environmental aspects including resource use, waste and pollution. Included in these aspects are multiple sources of atmospheric emissions across the industrial complex.

In 2004, South Africa published a new air quality act known as National Environmental Management: Air Quality Act (NEM:AQA) and National Ambient Air Quality Standards (NAAQS) were published in 2009. Following the publication of the NAAQS, the DEA published regulations requiring an AEL for a range of industrial processes and also detailing minimum emission standards (MES) for the pollutants emitted from such processes. The MES regulations prescribed emissions standards for 'existing plants' and more onerous 'new plant' standards to be met by 2015. The regulations also contained a requirement for existing plants to comply with the new plant standards by 2020. Finally, but importantly, the regulations contained the option for emitters to apply for postponement of the compliance timeframes for the MES. For various reasons, as explained earlier in this report, Sasol has not been able to meet the compliance timeframes for several of its atmospheric emissions, and for SSO and SCO specifically, has had to apply in the past for postponement of the MES. Both operations are now applying again for postponement of the implementation of the new plant standards for emissions from the steam plant boilers, the SCC, the HOW and biosludge incinerators, liquid fuel and chemical storage tanks and the ammonium nitrate plant.

Sasol fully intends to meet the MES but has been hamstrung by the need to find abatement technologies that suit the age and design of the various facilities across the Secunda complex. Sasol is running a programme of process optimisation for the various activities to reduce atmospheric emissions, but these will not meet the MES. That means that Sasol will need to retrofit a variety of abatement technologies from low NO_x burners, transformers on ESPs, wet gas scrubbers, internal floating roofs (IFR), vapour recovery units (VRU) through to evapostop discs. In addition, in some circumstances the plants that emit will be replaced in the near future, such as the ammonium nitrate plant, with the replacement plants being fully compliant with the MES.

In all circumstances the retrofitting/replacement and the process optimisation that would be required after the retrofit needs more time than is available within the current compliance timeframes. The limited time is further exacerbated by the fact that the entire Secunda operation runs to a strict overhaul and maintenance schedule to ensure the uninterrupted supply of especially liquid fuels to the South Africa market. That maintenance schedule means that the retrofitting can only take place when the specific plant is shut down in accordance with the maintenance schedule. In some circumstance the full abatement (retrofitting and process optimisation) may result in two plant down times being needed. Sasol's project governance process, which ensure that projects are technically and commercially successful also place further time demands on the full implementation of the necessary abatement.

The net effect is that it is anticipated that the overall abatement process will take until 2025 to complete and postponement requested accordingly, to that date. Sasol has proposed alternative emissions limits that SSO and SCO could be held to in the postponement period.

Annexures

Annexure A: Atmospheric Impact Report

Annexure B: Independent peer review report

Annexure C: Public participation report

Annexure D: Comments and Response Report

Annexure E: Details of the technology options investigated

Annexure F: Redacted Atmospheric Emission Licence

Annexure G: Secunda Synfuels Operations annual emissions report