Air Products South Africa

Major Hazard Installation (MHI) Risk Assessment Report

Coega Plant (existing site)

GPS: 33°47'36.73"S, 25°37'37.35"E

Compiled and Approved by:

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Report Reference Number:

Ai03-REP-MHI-1

Revision 4 (Final)

Date of report: 27th November 2019

Site visit date: 26th June 2019

MMrisk

MMRisk (Pty) Ltd is an

Approved Inspection Authority for MHIs: CI MHI 0013 and MHI 0037

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Previous MHI Assessment(s):

Year	AIA Name	AIA Number	Reference Number
November 2015	Ishecon	MHI-0001	J1856M-1

REPORT REVISION HISTORY:

Document number:		Ai03-REP-MHI-1	
REVISION:	Rev 4 (Final)		
	NAME:	POSITION:	DATE:
COMPILED BY:	Mmotle Nkadimeng	Risk Assessor	25/11/2019
CHECKED AND APPROVED BY:	Motlatsi Mabaso	Technical Signatory	26/11/2019

REVISION HISTORY		
Rev 4 (Final)	27/11/2019	Inserted future oxygen storage options
Rev 3	19/11/2019	Final revision – amended diesel location and oxygen storage capacities
Rev 2	16/09/2019	Final revision – amended site meeting details
Rev 1	27/08/2019	Final revision with Rev 0 comments addressed
Rev 0 (Draft)	07/08/2019	First Draft to Client
REVISION	DATE	DESCRIPTION

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REPORT SIGNATURE PAGE

Report Number:	Ai03-REP-MHI-1			
Revision Number:	4 (Final)			
	Name:	Position:	Date:	Signature:
Compiled By:	Mmotle Nkadimeng	Risk Assessor	25/11/2019	
Checked and Approved By:	Motlatsi Mabaso	Technical Signatory	27/11/2019	

EXECUTIVE SUMMARY

INTRODUCTION

MMRisk (Pty) Ltd were contracted by Air Products South Africa (the 'Client' or 'AP') to conduct the Major Hazard Installation (MHI) Risk Assessment of their site in Coega, near Port Elizabeth in the Eastern Cape, South Africa. The assessment performed was a review of the previous assessment conducted in 2015.

The site runs an Air Separation Unit (ASU) and stores bulk quantities of nitrogen and oxygen; since the previous assessment the Client has started with plans to increase capacity of oxygen and nitrogen on-site as well as to add additional bulk storage vessels for diesel, argon and carbon dioxide and cylinders for various products. This MHI Risk Assessment considers current and future installations, considering all intended increases in capacity of stored materials.

MMRisk are accredited by the South African National Accreditation System (SANAS, number MHI 0037) and approved by the Department of Labour to conduct Major Hazard Installation (MHI) Risk Assessments (AIA approval Number CI MHI 0013, approval certificates attached in Appendix A).

SITE ACTIVITIES

The site runs an Air Separation Unit (ASU) with ambient air as the main raw material. Air enters the process through an air intake process (12-inch intake line), passes through an Inlet Air Filter, and onto a Main Air Compressor (MAC) where the air is compressed (increase in pressure) in preparation for refrigeration.

The air is then purified in a step involving molecular sieves which provide purification in 6-hour cycles before being fed into a main Heat Exchanger Cold Box as well as a 2 x Expanders in series, both processes represent the main parts of the process. The air is cooled to its bubble point (to its vapour / liquid equilibrium point) which occurs at -172°C at a pressure of 5 barg.

Following the Main Heat Exchange step, air, at its bubble point, is fed into a Column Cold Box (a Distillation Column) where various components of the air are separated out based on boiling point. The column is separated into two parts:

- A Low-Pressure portion (upper part of the column) at approximately 0.4 barg and -196°C consisting of approximately 20 stages, where the principal product is Oxygen; and
- A High-Pressure portion (lower part of the column) at approximately 5.5 to 10 barg and -183°C consisting of approximately 40 to 50 stages.

Bulk liquefied gas storage (currently present onsite)

Liquid Nitrogen (LIN) and Liquid Oxygen (LOX) are stored in bulk vessels onsite. LIN has a capacity of up to 310 tons while LOX has a current storage capacity of 77 tons.

The site is planning to either replace the current 77-ton oxygen storage vessel with a 200-ton vessel at the same location, or introduce a 122-ton storage vessel in addition, to achieve a cumulative capacity of 200 tons:

Option 1 – oxygen being increased to 200 tons with the addition of another bulk 122-ton LOX vessel.

Option 2 – replacing the existing LOX storage with a bulk 200-ton LOX vessel.

Future bulk liquefied gas storage

Further to the increase in LOX capacity described above, the following bulk liquefied gases will be stored onsite in future:

- Oxygen – 17.1-ton vessel;
- Nitrogen – 15-ton vessel;
- Argon – 25-ton vessel;
- Carbon Dioxide – 10-ton vessel.

Cylinder storage (future)

Cylinders will be stored and processed onsite, as follows:

- Megamix (mixture of gases with a 2 – 4% Oxygen content) = throughput 720 cylinders per month;
- Cogar (mixture of gases) = throughput 650 cylinders/month;
- Argon = 466 cylinders / month;
- CO2 = 60 cylinders / month;
- Nitrogen = 22 cylinders per month.

For filling, Filling Halls will be constructed, with each material having 4 manifolds for filling of cylinders, each manifold capable of handling a maximum of 15 cylinders at a time.

Cylinders containing other materials may also be stored onsite: Hydrogen, acetylene, propane, ammonia, helium and other chemicals.

Diesel storage (future)

In addition, the site will store diesel onsite in a 23,000-litre aboveground, bunded tank.

Dispatch of Material by Road

The site reports that there is always a road tanker onsite, at a proportion of four trucks of nitrogen (N_2) with about 27 tons to one truck of oxygen (O_2) of 20 ton are being dispatched per day.

METHODOLOGY

"Risk is a combination of consequence and likelihood of occurrence."

The MHI Risk Assessment was conducted using the methodology described in Figure 3.1. The SANS 1461:2018 standard (Major Hazard Installation – Risk Assessments) was used as a basis for calculation. The standard prescribes the methodology to be followed when conducting MHI Risk Assessments, including methods for identifying hazards, conducting consequence and frequency analysis, performing risk summation, assessing risk outcome (the standard provides risk tolerability criteria), demonstrating that risk is As Low As Reasonably Practicable (ALARP) and types of Risk to be communicated in the MHI Risk Assessment report.

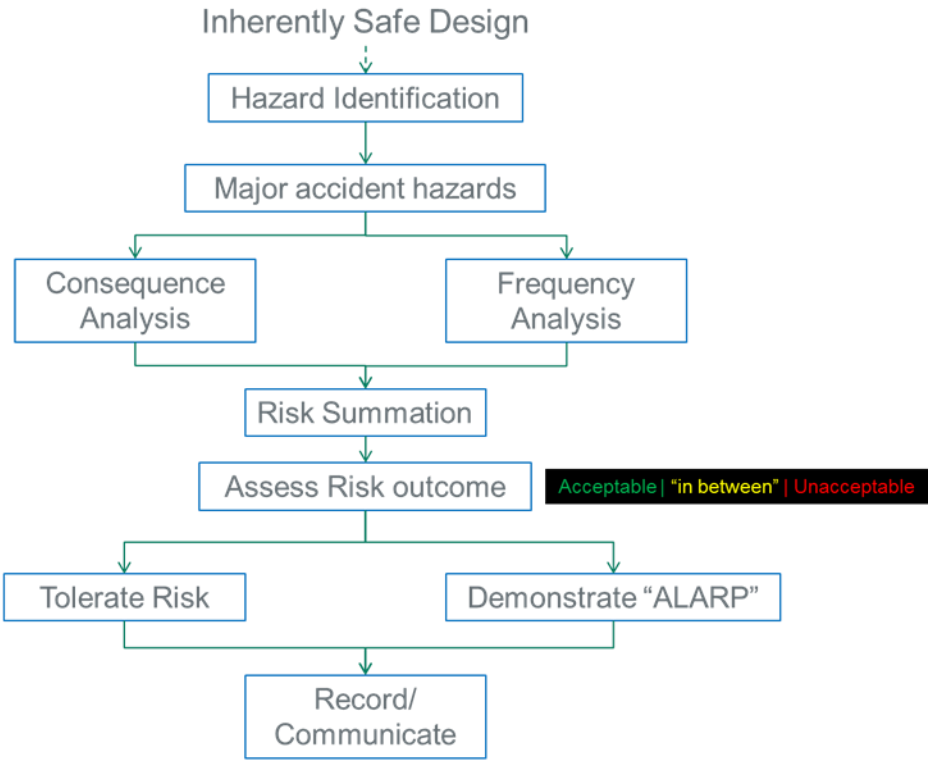

Figure 3.1 Risk Assessment Methodology

INDIVIDUAL RISK

The individual risk contours illustrated in the figures below are of the type 'Location Specific Individual Risk (LSIR)' contours. These show the chance of death of a theoretical person if they are positioned at a location 24 hours per day, 365 days per year. LSIR is an overstatement of risk which is widely accepted as sufficiently conservative. In reality, workers will spend the length of a shift per day and not the entire day. However, when a worker is off, another worker may replace her in doing her task, therefore, overall it can be considered that there is an individual at that point or area, all the time.

The risk acceptability criteria are described in Section 3.5.1 and the individual risk profiles for the site are illustrated in Figure 9.1.

Individual risk for those located outdoors

Figure 9.1 illustrates individual risk of death for those located outdoors; being located outdoors implies a lack of shielding for asphyxiating vapour as well as thermal radiation exposure, as would be the case for those located indoors. The contours extend as follows:

Individual Risk Contour	Associated tolerability	Observations
1 x 10-6 / year	Below this level, risk is broadly acceptable for members of the public. This is the indicator for whether or not the site is a Major Hazard Installation.	The contour does not extend beyond the site and is concentrated around the proposed diesel installations.
3 x 10-7 / year	At this level, risk is broadly acceptable, but an indicator of appropriateness of land-use (see Section 9.5)	This contour is limited to the site, around the diesel tank as well as around the distillation column.
1 x 10-8 and 1 x 10-9/ year	At these risk levels, risk is broadly acceptable.	These are limited to the site primarily over the bulk oxygen and nitrogen storage and diesel tank, for both Oxygen storage Options.

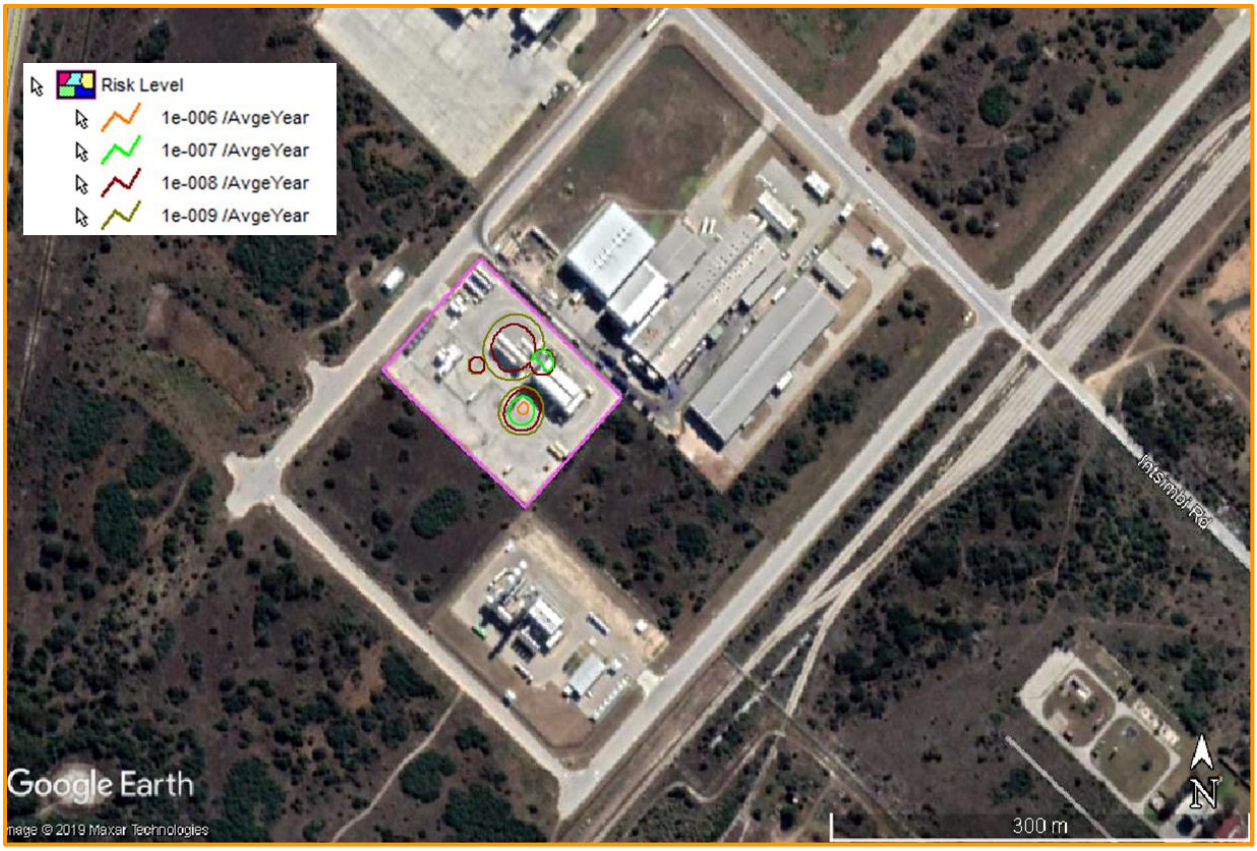

Figure 9.1: Individual Risk Contours for personnel located outdoors

SOCIETAL RISK

Societal risk considers populations around the site to determine risk tolerability. In this study, this is presented in the form of an FN-Curve, which illustrates scenarios with the potential to cause death, as well as considers the frequency of each scenario. The frequencies of the scenarios are then summed to show a cumulative risk of death, i.e. the frequency (F) of causing N or more fatalities against the number of fatalities, N.

As illustrated in Figure 9.2 there are tolerability limits as suggested by SANS 1461:2018 (see Section 3.5.2), as illustrated by the red and blue sloped lines. Above the red line is the region where societal risk is intolerable; below the blue line is the region where societal risk is broadly acceptable. Between these lines is the region where risk can be tolerated if it is proven to be ALARP (see Section 3.5.2).

Description of the site's FN Curve (societal risk results)

Day time societal risk is based upon activities onsite which take place only during the day and upon day-time population levels, and similarly nighttime risk is based upon activities taking place at night and on populations of people during the night. The FN Curve given below is a combination of daytime and nighttime risk.

As seen in Figure 9.2, risk is broadly acceptable, with the maximum number of fatalities for a single event expected to be = 1, and with that event having an associated frequency of approximately 2 x 10^{-8} events / year.

Societal risk was assessed to be low based on the nature of the products – consequences contributing to fatalities would be expected to extend a relatively small distance from the leak source(s) in the case of asphyxiants. Furthermore, the relatively low likelihood of occurrence of events due to the safety systems available onsite contributed to the low societal risk.

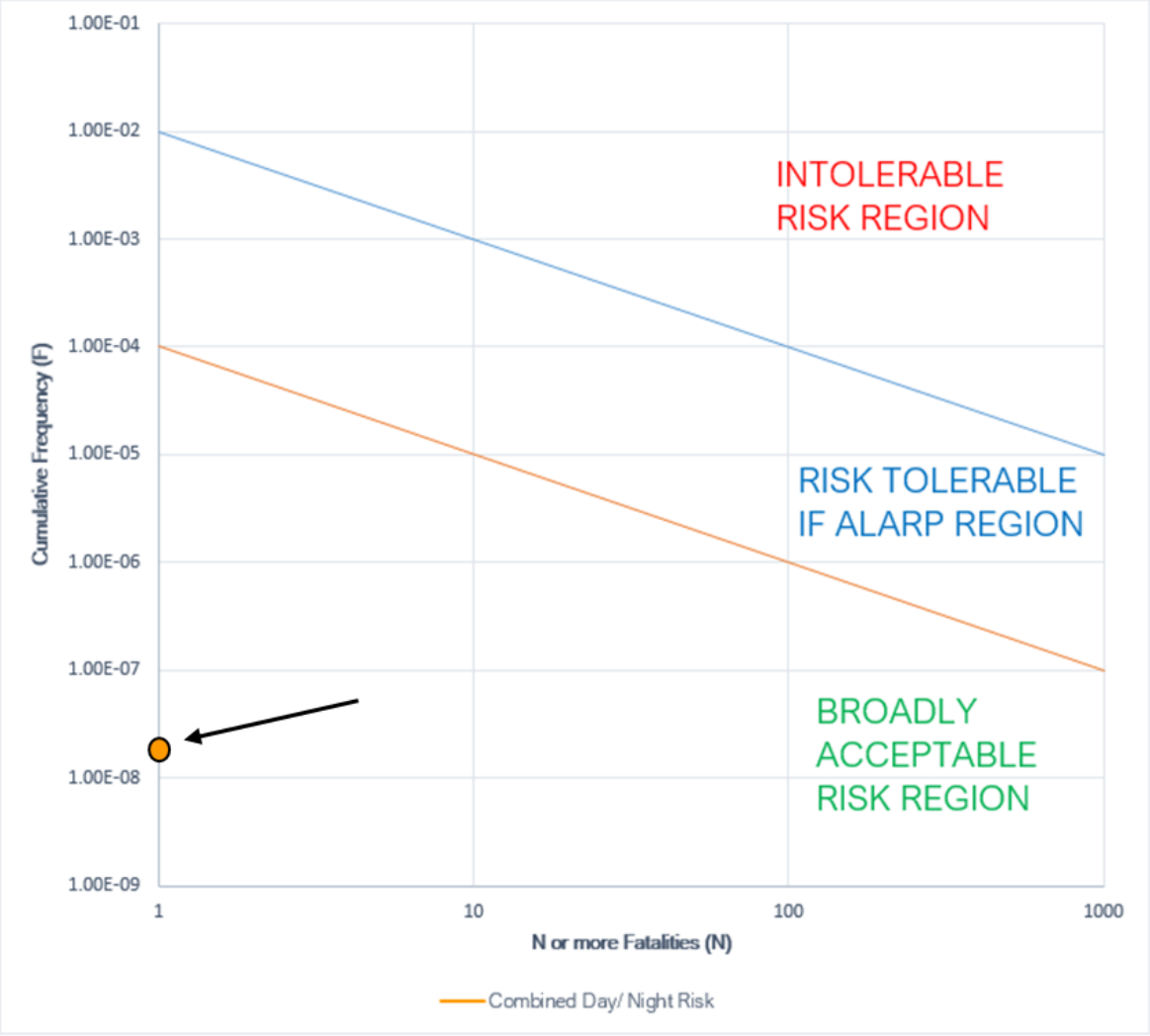

Figure 9.2: FN Curve illustrating societal risk level of the site

RECOMMENDATIONS / RISK REDUCTION MEASURES

Based on the risk analysis herein, the following recommendations are made:

Recommendation Number:	1
Recommendation wording:	Carry out advertisement and notification as required by provision 2(1) of the MHI Regulations.
Rationale:	MMRisk declares the site a Major Hazard Installation because the 1% fatality probability contours illustrated in Section 7: Consequence Analysis extended beyond the boundary of the site.
Priority:	High

Recommendation Number:	2
Recommendation wording:	Consider procuring and storing fire-fighting foam onsite (for future diesel installation).
Rationale:	Fire-fighting foam in this case may be in the form of portable foam-canon to be used during emergencies involving the diesel tank. In such cases, foam can be spread over the flammable pool to prevent generation of flammable vapour in case of a spill and to fight diesel fires should ignition take place. Other measures can be explored as required by SANS 10089-1.
Priority:	Medium

Recommendation Number:	3
Recommendation wording:	Update the Emergency Response Plan considering the future installations onsite
Rationale:	There are several installations being planned and an update of the site's Emergency Response Plan would be necessary to ensure emergency procedures are proportional to the risk onsite.
Priority:	Medium

Table of Contents

1 INTRODUCTION

1.1 Scope of Risk Assessment

MMRisk (Pty) Ltd were contracted by Air Products South Africa (the 'Client' or 'AP') to conduct the Major Hazard Installation (MHI) Risk Assessment of their site in Coega, near Port Elizabeth in the Eastern Cape, South Africa. The assessment performed was a review of the previous assessment conducted in 2015.

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1.2 The site visit and opening meeting

A site visit was conducted on 26th June 2019 for purposes of information gathering. MMRisk representative Motlatsi Mabaso met with several Air Products personnel for the purpose of exchanging technical information, and information on the surroundings, by way of a questionnaire and note-taking.

An opening meeting was held for the MHI Risk Assessment, with the following Air Products personnel in attendance:

- Nomcebo Gina;
- Vincent Ntuli; and
- Dumisa Gina.

A site walkabout was also conducted to familiarise MMRisk with the layout of the site, the equipment and processes taking place onsite. After the site visit, MMRisk staff drove around the site to familiarise themselves with the neighbours, paying attention to potential MHI sites.

1.3 Legal Aspects

The MHI Risk Assessment has been completed in line with the requirements of the Major Hazard Installation Regulations No. R 692 ('MHI Regulations') published in July 2001 and forming part of the Occupational Health and Safety Act No. 85 of 1993, Section 43 (1) (c).

Regulation 5 (5) (b) of the MHI Regulations requires that MHI reports contain at least the following information (all of which is fulfilled in this report):

i. A general process description of the facility;

ii. A description of the major incidents associated with that type of installation and the consequences of such incidents, which shall include potential incidents;
iii. An estimation of the probability of a major incident;
iv. A copy of the site emergency plan;
v. An estimation of the total result in the case of an explosion or fire;
vi. In the case of toxic release, an estimation of concentration effects of such release;
vii. The potential effect of an incident on a major hazard installation or part thereof on an adjacent major hazard installation or part thereof;
viii. the potential effect of a major incident on any other installation, members of the public and residential areas;
ix. Meteorological tendencies;
x. The suitability of existing emergency procedures for the risks identified (covered in the emergency plan); and
xi. Any organisational measures that may be required.

The following documentation was also consulted in the compilation of this study:

- The South African National Standard (SANS) 1461:2018 'Major Hazard Installation – Risk Assessments'; and
- South African National Accreditation System (SANAS) Technical Requirement document TR54.

1.4 Methodology of Risk Assessment

The assessment has been conducted in line with the requirements of South African National Standard (SANS) 1461:2018 Major Hazard Installation – Risk Assessments. The standard was published in June 2018; it is now the industry best practice for the compilation of MHI Risk Assessments. All MHI AIAs are now required to perform MHI Risk Assessments according to the requirements of the standard, and it is expected to become a legal requirement once the MHI Regulations are amended (amendment was underway at the time of writing).

The standard provides requirements for the following as part of MHI Risk Assessments:

- Defining the scope of work;
- Gathering relevant data;
- Hazard identification;
- Hazard analysis;
- Consequence analysis;
- Risk calculations (including individual and societal risk);
- Risk judgement criteria;
- Risk treatment;
- Land-use planning;
- Emergency response data (analysing information from the Client);
- Conclusions and recommendations.

1.5 Basis for declaring site an MHI or not an MHI

MMRisk uses two bases for declaring a site an MHI or not an MHI. If one of the following criteria are met then the site is declared an MHI, and if neither are met, the site would not be declared an MHI.

1.5.1 Using Individual Risk to declare an MHI

The basis for declaring the site an MHI or not an MHI shall be based on regulation 2. (1) of the MHI Regulations, which reads:

> *"Subject to the provisions of sub regulation (3) these regulations shall apply to employers, self-employed persons and users, who have on their premises, either permanently or temporarily, a major hazard installation or a quantity of a* ***substance which may pose a risk that could affect the health and safety of employees and the public****."*

This report shall consider "a risk" as contemplated in regulation 2(1) to be a quantity of risk which is higher than the level considered 'broadly acceptable' as described in SANS 1461:2018. Therefore, if the individual risk resulting from the site's operations results in off-site risk which is higher than 'broadly acceptable' level, then the site shall be declared an MHI.

Risk Tolerability is explained in detail in Section 3.5.

1.5.2 Using Consequence to declare an MHI

The MHI Regulations refer to a 'Major Incident' several times in the text. While the definition thereof is not provided in the regulations, this is typically considered as an incident with the potential to result in a 1% fatality probability for those exposed.

In this report, the worst case consequences are displayed in Section 7: Consequence Analysis. Results displayed include those relating to 1% fatality probability for those exposed.

Therefore, if a contour relating to 1% fatality for a worst-case event extends offsite, the site can be declared an MHI.

2 DESCRIPTIONS

2.1 Site location

The site is located on Bumba Road in the Coega Industrial Development Zone (IDZ) near Port Elizabeth in the Eastern Cape, South Africa. The GPS coordinates of the site are: 33°47'36.73"S, 25°37'37.35"E. The site is located in an area reserved for industrial developments, and is surrounded in its immediate vicinity, by industrial neighbours, described in Section 2.1.1. The nearest residential area is Motherwell located approximately 800 metres west of the site; the N2 national highway runs north-to south approximately 2.8 kilometres east of the site. Several empty plots of land exist close to the site and these are assumed to be future industrial neighbours.

The site falls under the Nelson Mandela Bay Metropolitan Municipality and its surrounds are shown in Figure 2.1; the location of the site is indicated and a description of the neighbours is given in the sections which follow.

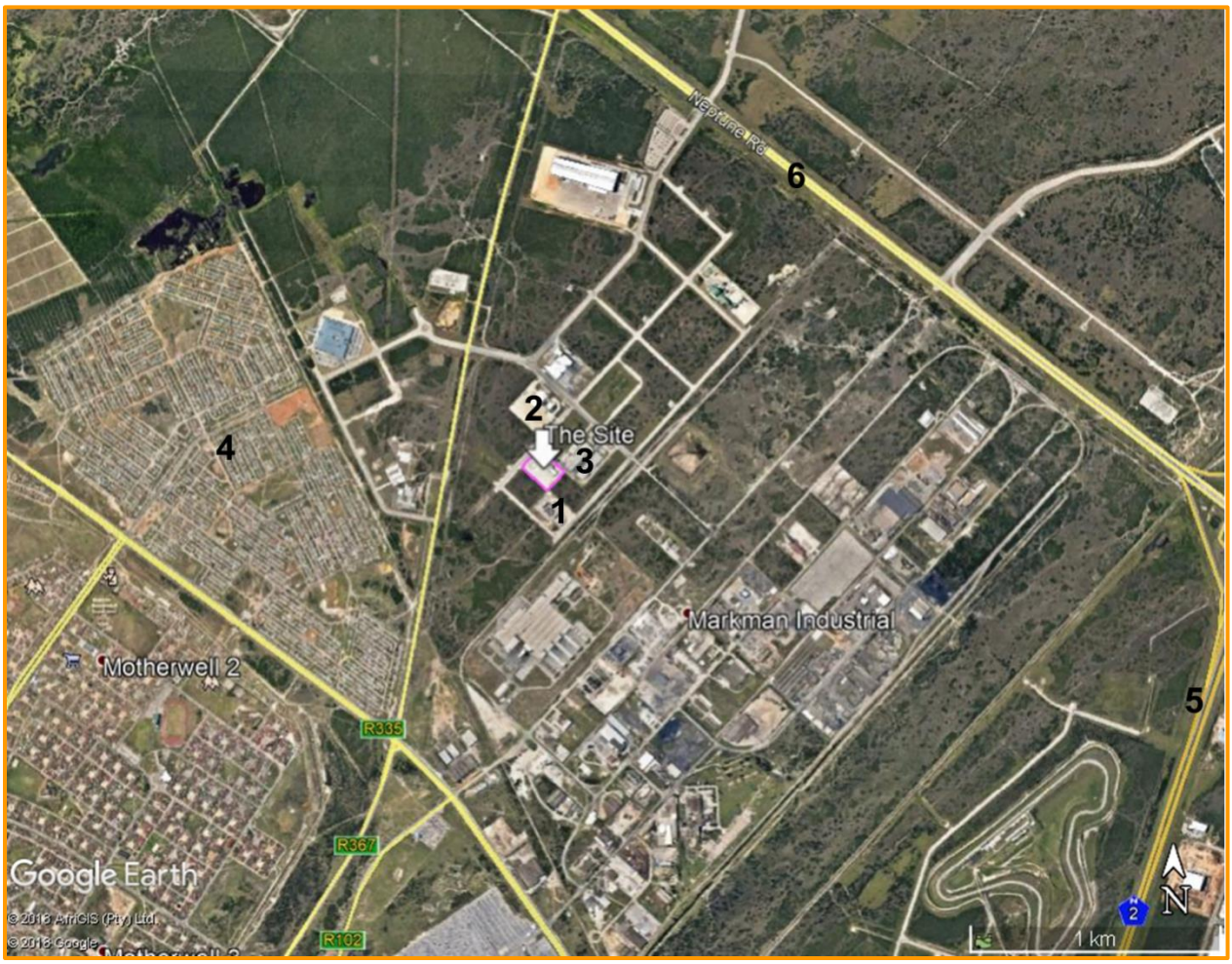

Figure 2.1 Air Products Coega site and Surroundings

2.1.1 Population estimates for surrounding areas

An important contributor to risk for a site is an estimate of populations both for the site itself, and for surrounding facilities and residential areas. MMRisk used estimates from a combination of sources such as from Statistics South Africa (StatsSA Living Conditions Survey 2014/15[1]) as well as from the TNO Green Book [2].

To illustrate where the various population estimates are applied, MMRisk uses code names, and these are described in Table 2.1.

Table 2.1: Population estimates for surrounding locations

Population Categories	People per hectare	MMrisk code
Industrial Areas[3]:		
Low density of personnel	5	IS
Medium density of personnel	40	IM
High density of personnel	80	IL
Remote area	1	R
Nature area	0	N
Shopping centres or shopping streets:		
Very small scattered	10 per shop	SV
Small	100	SS
Medium	500	SM
Large	≥1,000	SL
Office:		
Small	10 people	OS
Medium	100 people	OM
Large	1,000 people	OL
Hotel and Catering:		
Small	10 people	HS
Medium	50 people	HM
Large	250 people	HL
Important Auto Routes (50% outdoors day and night, assume 2 people per car)		
Normal circulation	20 cars/km/lane	RN
Heavy Traffic	100 cars/km/lane	RT
Residential Areas (StatsSA data)[4]		
Urban Informal	5.6 people per household	DI
Urban Formal	5.97 people per household	DF

[1] StatsSA, Statistics South Africa, Statistical Release P0310, Living Conditions of Households in South Africa, An analysis of household expenditure and income data using the LCS 2014/2015, January 2017.
[2] The Netherlands Organisation (TNO) of Applied Scientific Research, Methods for determination of possible damage to people and objects resulting from release of hazardous materials, CPR 16E, 1992.
[3] At nighttime MMRisk applied ½ the population density, except for "IL" facilities.
[4] Presence during the day based on SA's employment rate of 27%, as well as an assumption that 50% of residents would be children.

2.1.2 Nearby industrial facilities

The site is surrounded by several facilities, refer to Table 2.2 for details. For those facilities, the assumed population statistics are also provided in the table. It was assumed that at any given moment during the day, 93% of the population is located indoors and 7% outdoors. At night, it was assumed that 99% of the population is indoors and only 1% is outdoors.

Table 2.2: Potential MHIs located close to the site

Facility/ Area	Indicated by Number:	Distance from site (m)	Direction	MHI facility?	Population and MMrisk Code (see Table 2.1 for MMRisk Code)
Afrox	1	15	South-East	Probable MHI	IM
Coega Concentrate	2	60	North-West	Probable MHI	IM
Dynamic Commodities	3	20	North	Probable MHI	IM

2.1.3 Nearby residential areas, major roads and vacant land

The N2 national highway is located some distance from site, as is Neptune Road, a major road entering the Coega area. There are several vacant plots near the Site as shown in Figure 2.1, as well as the residential area of Motherwell. Details are provided in Table 2.3 below.

Table 2.3: Nearby residential areas and major roads

Facility/ Area	Illustrated by Number	Distance from site (m)	Direction	Population and MMrisk Code (see Table 2.1 for MMRisk Code)
Motherwell (residential)	4	800	West	DF
N2 highway	5	2.8 km	East	RN
Neptune Road	6	220	North	RN

2.2 Company's main activities / process description

The site runs an Air Separation Unit (ASU) with ambient air as the main raw material. Air enters the process through an air intake process (12-inch intake line), passes through an Inlet Air Filter, and onto a Main Air Compressor (MAC) where the air is compressed (increase in pressure) in preparation for refrigeration.

The air is then purified in a step involving molecular sieves which provide purification in 6-hour cycles before being fed into a main Heat Exchanger Cold Box as well as a 2 x Expanders in series, both processes represent the main parts of the process. The air is cooled to its bubble point (to its vapour / liquid equilibrium point) which occurs at -172°C at a pressure of 5 barg.

Following the Main Heat Exchange step, air, at its bubble point, is fed into a Column Cold Box (a Distillation Column) where various components of the air are separated out based on boiling point. The column is separated into two parts:

- A Low-Pressure portion (upper part of the column) at approximately 0.4 barg and -196°C consisting of approximately 20 stages, where the principal product is Oxygen; and
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Option 1 – oxygen being increased to 200 tons with the addition of another bulk 122-ton LOX vessel.

Option 2 – replacing the existing LOX storage with a bulk 200-ton LOX vessel.

Future bulk liquefied gas storage

Further to the increase in LOX capacity described above, the following bulk liquefied gases will be stored onsite in future:

- Oxygen – 17.1-ton vessel;
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Diesel storage (future)

In addition, the site will store diesel onsite in a 23,000-litre aboveground, bunded tank.

Dispatch of Material by Road

The site reports that there is always a road tanker onsite, at a proportion of four trucks of nitrogen (N_2) with about 27 tons to one truck of oxygen (O_2) of 20 ton are being dispatched per day.

Figure 2.2 shows a block flow diagram of the process, Figure 2.3 shows the configuration of LOX future storage Option 1 while Figure 2.4 shows the configuration of LOX future storage Option 2. Appendix F also contains the layout diagrams for the various LOX storage options.

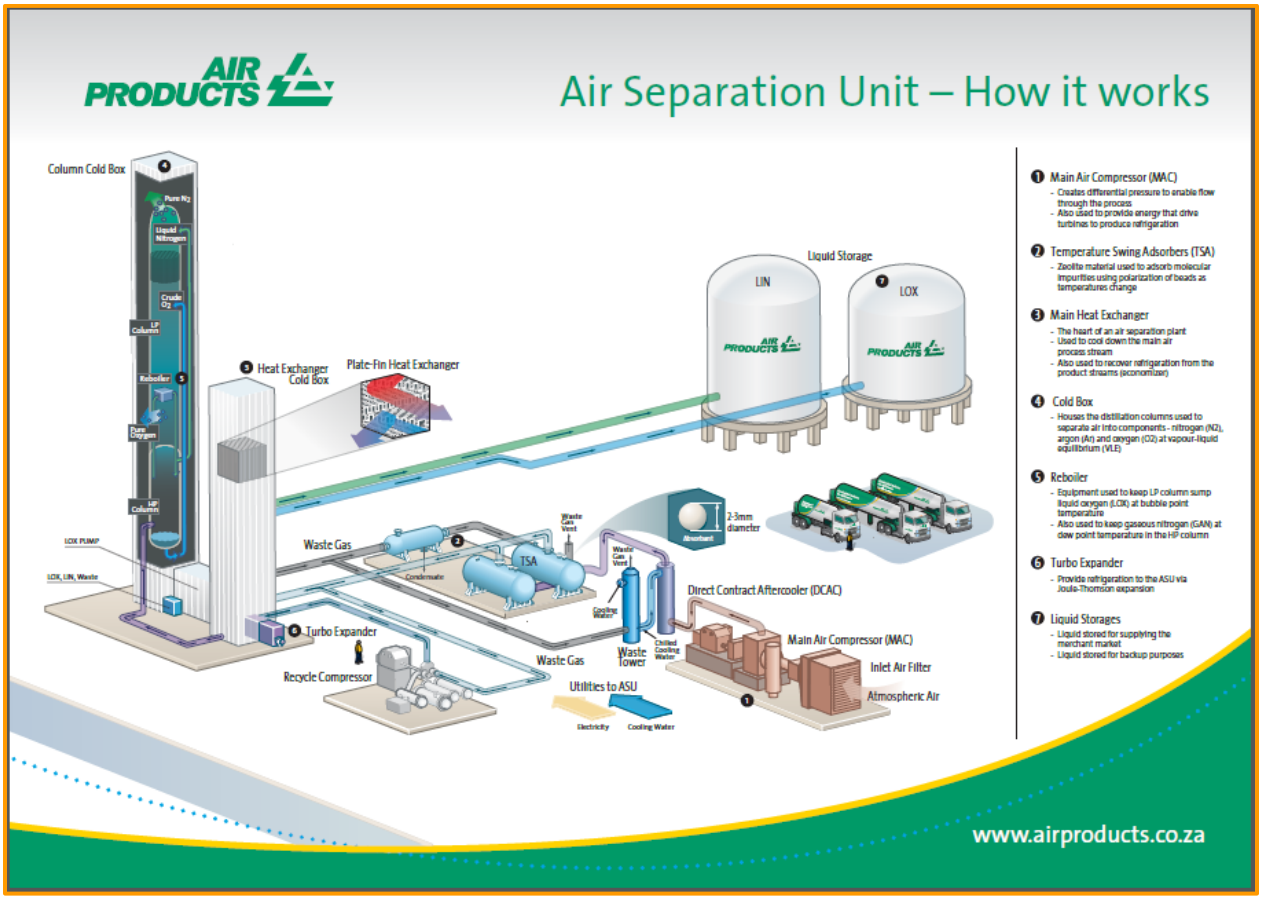

Figure 2.2: Process Block Flow Diagram

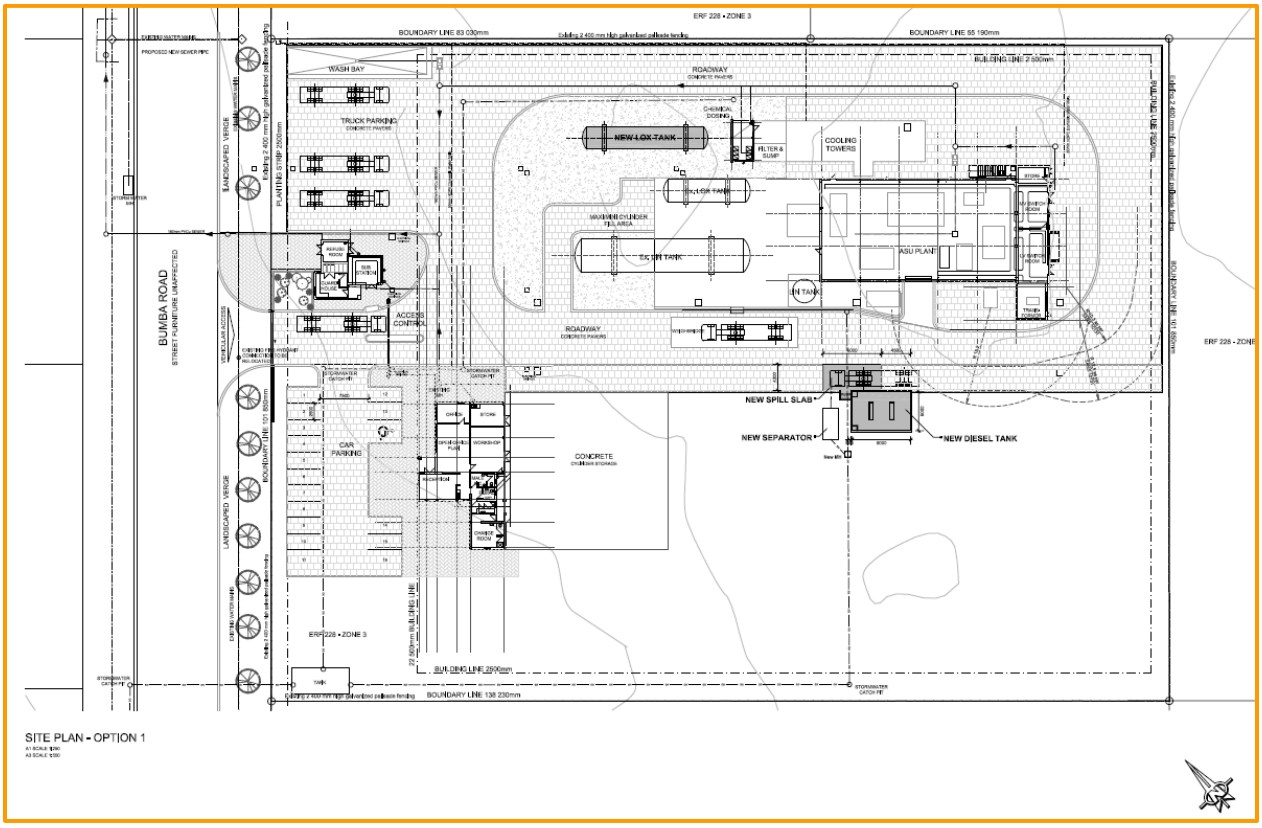

Figure 2.3: Proposed Layout Diagram (Option 1 LOX Storage – additional 122 tons of LOX storage)

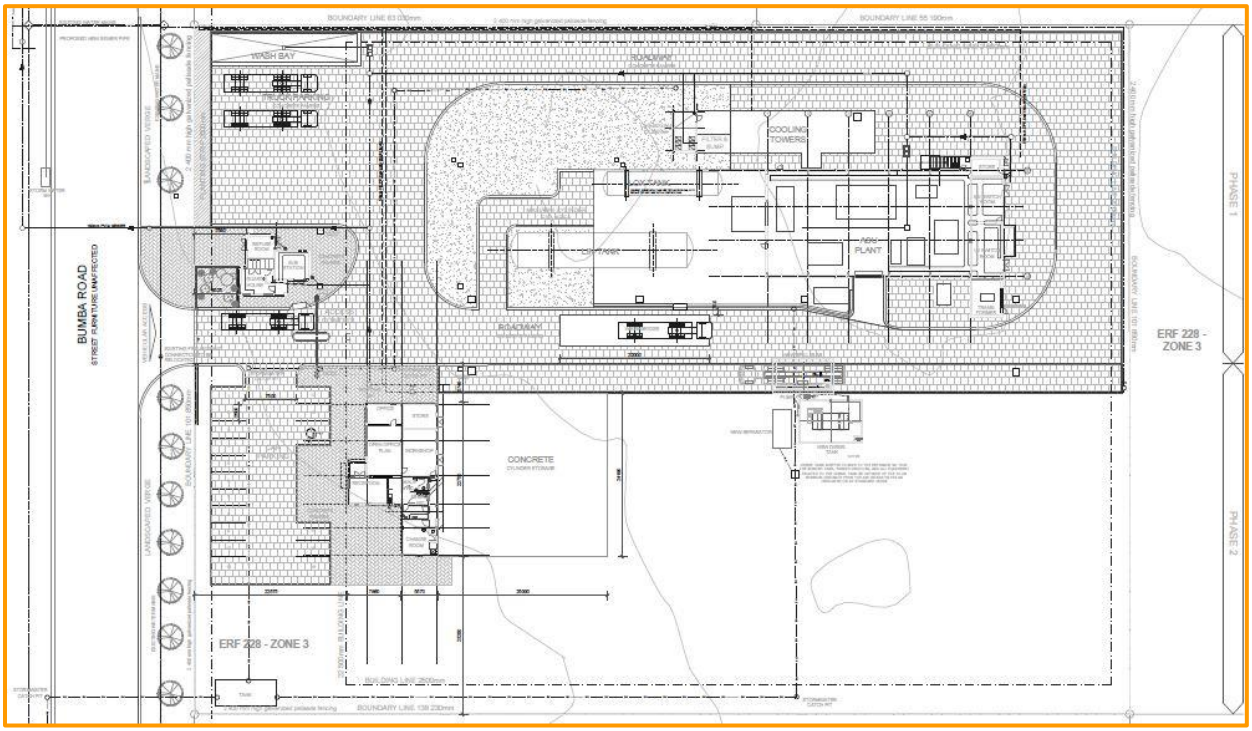

Figure 2.4: Proposed Site Layout Diagram (Option 2 LOX Storage – a new 200-ton LOX tank to replace existing tank)

2.3 Staff complement and shift patterns

The site operates as described in the table below.

Table 2.4: Site Shift Pattern

Operating Hours:	3-4 days in a week (Friday to Tuesday)
Shift 1:	8h00 – 16h30
Shift 2:	Remotely controlled from Springs
Total Staff Complement:	8

Staff are distributed as described in the table below.

Table 2.5: Location of staff onsite

Locations:	Shift 1	Shift 2
1. Security	2	2
2. Admin	2	
3. Plant (Control room)	2	
4. General Duty Man	1	
5. Drivers	1 driver at a time (there are 5 drivers in total)	
6. Office Cleaner	1	

2.4 Meteorological tendencies

The weather conditions around the site, which are used for risk analysis, were obtained from South African Weather Service data, as analysed and summarised in the website: weatherbase.com. The nearest SA Weather Service weather station to the site is at the Port of Ngqura (Coega) located 4 kilometres east of the site (SA Weather Service reference Ngqura (Coega) - 0035288 9).

The city of Port Elizabeth is located nearby, and the weather details below apply.

2.4.1 Ambient temperature, pressure, humidity and rainfall

Ambient Temperature and Pressure

- On average, the warmest months are January and February (24 °C average high temperature).
- On average, the coolest months are June and July (10 °C average low temperature).
- Average annual maximum: 21 °C.
- Average annual minimum: 14 °C.
- Average annual temperature: 17.5 °C.

Air Pressure was calculated based on the site's elevation above sea level, using the webpage: www.mide.com/pages/air-pressure-at-altitude-calculator.

- Based on the site's elevation of 52 m above sea level the ambient pressure was taken to be = 1 atmosphere.

Humidity

Humidity is of interest because it affects the rate at which thermal radiation transfers from a flame to a target, such as a person, building or piece of equipment. The more humid the conditions, the more radiation is absorbed by the water vapour and the less radiation is felt by the target.

In general, the site experiences a relatively consistent level of humidity between 70% and 80%. June and July tend to be the least humid (70%) while the rest of the year the humidity tends to vary between 75% and 80%. Average humidity at the site can therefore be taken as 77.5%.

Rainfall

Like humidity, the presence of rain is of interest because water droplets absorb some radiation. Precipitation at the site is as follows:

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	30	30	50	40	60	50	50	50	60	50	50	40

2.4.2 Wind statistics

Wind statistics were based on observations taken between December 2013 and June 2019, daily from 7am to 7pm local time, recorded at the Port of Ngqura. Wind statistics were obtained from https://www.windfinder.com/windstatistics/ngqura_coega.

Wind statistics were considered in the risk modelling. Considering the yearly average wind direction distribution, most of the wind tends blow to the south-west or to the east-south-east. The wind rose is shown in Figure 2.5.

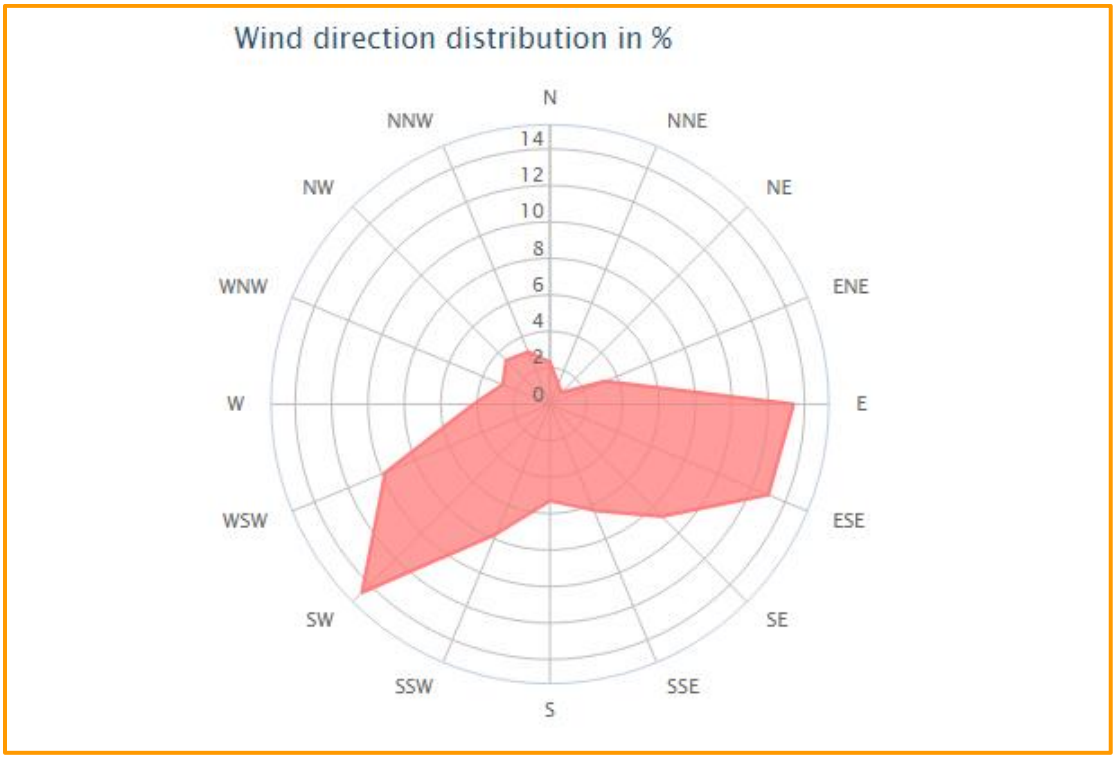

Figure 2.5: Wind Statistics at site

2.4.3 Weather conditions used for modelling in this assessment

2.4.3.1 Introduction to Weather Stability Classes

As required in SANS 1461:2018, several weather conditions have been used in the modelling of consequence and risk in this assessment. The choice of weather conditions is in the form of so-called 'Pasquill stabilities'; Pasquill stabilities are measures of 'the tendency of the atmosphere to resist or enhance vertical motion' [5].Stability is a function of the vertical change in temperature of the air, the wind speed and the type of surface over the area of interest. Stabilities are characterised into the following categories:

- Neutral: mechanical turbulence is neither enhanced nor inhibited;
- Unstable: Where turbulence is enhanced; and
- Stable: Where the atmosphere inhibits mechanical turbulence.

Stability classes (Pasquill classes) can be defined for various meteorological instances, as functions of wind speed and solar radiation. Commonly, six Pasquill stability classes are defined:

[5] AirWare Online Reference Manual: Pasquill Stability Classes, Release Date 2007 06, Revision Level 1.1. Retrieved from http://www.ess.co.at/MANUALS/AIRWARE/stability_class.html on 23 March 2018.

Table 2.6: Pasquill Stability Classes and descriptions

	Stability Class	Description of Stability
1.	A	Very Unstable
2.	B	Unstable
3.	C	Slightly unstable
4.	D	Neutral
5.	E	Stable
6.	F	Very stable

The stability classes can be related to several driving forces: wind speed, solar radiation and cloud cover as follows:

Table 2.7: Relating Stability Classes to wind speed, cloud cover and solar radiation

Wind speed (m/s)	DAY Incoming solar radiation			NIGHT	
	Strong	Moderate	Slight	> 4/8 cloud	< 3/8 cloud
< 2	A	A - B	B		
2 - 3	A - B	B	C	E	F
3 - 5	B	B - C	C	D	E
5 - 6	C	C - D	D	D	D
> 6	C	D	D	D	D

2.4.3.2 Stability Classes and wind speeds used in this Assessment

To represent a range of weather conditions possible at the site, and in accordance with SANS 1461:2018, the following stability classes and wind speeds were used in this assessment along with the corresponding time of day:

- F stability, 1.5 m/s wind (Night) @ 14 °C;
- B stability, 3 m/s wind (Day) @ 21 °C;
- D stability 5 m/s wind (Night) @ 14 °C;
- D stability 9 m/s wind (Day) @ 21 °C.

2.5 Special features around site

The site is located within an Industrial Development Zone (IDZ) and is therefore likely to be surrounded in future almost exclusively by industrial neighbours. It is possible for those future facilities to be MHIs and therefore have an impact on the site and vice versa.

2.6 Relevant topography of the area

No topographical features were noted around the site which would have an impact on the risk modelling.

3 METHODOLOGY FOR RISK ANALYSIS AND ASSESSMENT

"Risk is a combination of consequence and likelihood of occurrence."

The MHI Risk Assessment was conducted using the methodology described in Figure 3.1. The SANS 1461:2018 standard (Major Hazard Installation – Risk Assessments) was used as a basis for calculation. The standard prescribes the methodology to be followed when conducting MHI Risk Assessments, including methods for identifying hazards, conducting consequence and frequency analysis, performing risk summation, assessing risk outcome (the standard provides risk tolerability criteria), demonstrating that risk is As Low As Reasonably Practicable (ALARP) and types of Risk to be communicated in the MHI Risk Assessment report.

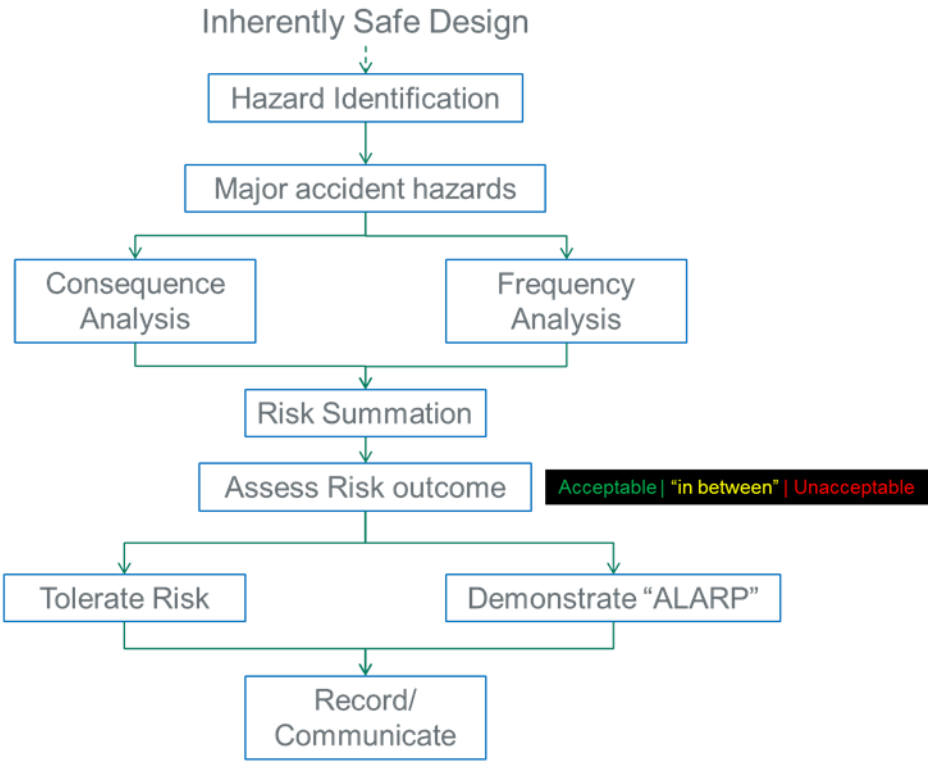

Figure 3.1 Risk Assessment Methodology

3.1 Methodology for Inherently Safer Operation

"Are there opportunities to make the process safer by design, free of hazards as much as possible?"

Using the concept of Inherently Safe Design and Operation, MMRisk observed operations, information and descriptions as given at the site visit and formed an opinion on possible areas of change which may lead to operations which are inherently safe. The Inherently Safer review included looking for opportunities to:

- **Minimise:** Finding opportunities to reduce inventories of hazardous materials;
- **Substitute:** Finding opportunities to substitute hazardous materials with less hazardous ones;
- **Moderate:** Where appropriate, finding opportunities to operate at less hazardous conditions which are far from equilibrium for the materials handled, e.g. less pressure, less temperature.
- **Simplify:** Simplify activities where possible to reduce the opportunities for failure.

This review of operations was performed by MMRisk remotely and outcomes communicated with the Site Manager where any were found.

3.2 Methodology for Hazard Identification

"What major hazards exist on site? What can go wrong?"

Hazard Identification (HAZID) followed the widely used methodology involving the segregation of the process into nodes or constituent parts or individual installations and investigating each node/ part/ installation to identify hazards which are inherent in the process as well as their causes, consequences and possible mitigation measures. This is a high-level review described in SANS 1461:2018 "Major Hazard Installation Risk Assessments".

A desktop HAZID was performed remotely by MMRisk and the results are communicated in Section 4 of this study.

3.3 Methodology for Consequence Analysis

"Were hazards to be realised, what would be effects of major incidents occurring?"

This section details the major incidents associated with the types of installations and/or hazardous materials present onsite, potential incidents and the consequences of those incidents.

3.3.1 Methodology for asphyxiant modelling

Several of the materials stored onsite were assessed as being asphyxiant gases based on their properties as per their material safety data sheets (MSDSs). These gases, when present in elevated concentrations in air, could result in oxygen depletion and reduced availability of oxygen could result in hypoxic effects including an increase in breathing rate, impaired judgement, fatigue and, at low concentrations of oxygen, loss of consciousness and possible death.

The UK HSE [6] describes four stages of asphyxiation, shown in the table below.

Table 3.1: Stages of asphyxiation (UK HSE)

Stage of Asphyxiation	Oxygen concentration (volume %)	Associated Effects
Stage 1	Reduction from 21% to 14%	Reducing: Increased pulse and breathing rate with disturbed muscular coordination
Stage 2	Reduction from 14% to 10%	Faulty judgement, rapid fatigue and insensitivity to pain
Stage 3	Reduction from 10% to 6%	Nausea and vomiting, collapse and permanent brain damage
Stage 4	Less than 6%	Convulsion, breathing stopped and death

Probit functions are useful in the modelling of asphyxiant and toxic materials, as they describe the relationship between the concentration and duration of exposure to toxic or asphyxiating substances (described collectively as dose) and the effect of such exposure, which can be related to a probability of fatal injury to those exposed.

SANS 1461:2018 describes the probit functions to use in the analysis of the effect of the materials onsite, and are summarised as follows:

For nitrogen and argon (future installation), the following probit relationship was used:
$Pr = -65.7 + 1 \times \ln (C^{5.2} \times t)$

For carbon dioxide (future installation), the following probit relationship was used:
$Pr = -90.78 + 1.01 \times \ln (C^{8} \times t)$;

Where C = concentration of asphyxiant (in ppm) and t = duration of exposure (in minutes).

3.3.2 Methodology for Oxygen enrichment modelling

At high concentration, oxygen increases fire hazard, increasing the probability of fire in the vicinity of a loss of containment of oxygen. Lethality related to oxygen can be analysed based on the concentration of oxygen in air in volume percentage. This is summarised in the table below.

Table 3.2: Effects of increased oxygen concentration in air (BEVI Publication) [7]

Oxygen concentration	Associated fatality probability
> 40 volume % in air	10%
Between 30 and 40 volume % in air	1%
Between 20 and 30 volume % in air	0%

[6] Health and Safety Executive (HSE), Methods of approximation and determination of human vulnerability for offshore major accident hazard assessment. Not dated.

3.3.3 Methodology for Pool Fire Modelling

Diesel, to be received and stored on-site in future, presents a pool fire hazard and as such modelling was performed to determine which of the installations present would a significant risk to members of the public and employees.

Pool fires occur when a pool of flammable liquid is formed on the ground and ignited. Bunded, drained or kerbed areas must be considered to determine the size of the pool and the effects. For diesel stored onsite, a significant amount of smoke is expected to be dispersed were a pool fire to occur, due to the high number of carbon atoms in the hydrocarbon materials.

https://iffmag.mdmpublishing.com/xtreme-fire-training-with-the-best-in-the-business-2/

Figure 3.2: Illustration of pool fire (also showing smoke dispersion)

The following endpoints were modelled in line with SANS 1461:2018:

- 37.5 kW/m^2 representing a 100% fatality probability for those exposed and ignition of wood, textiles, fibreboard, hardboard and plastics. This also corresponds with severe damage to process equipment, possible domino effects and large numbers of fatalities.
- 12.5 kW/m^2 representing minor damage to process equipment and less than 1 % fatalities; and

- 6.3 kW/m^2 representing a radiation level useful for emergency response planning. People exposed to this radiation level or more for more than 2 minutes may encounter problems with escape and evacuation and therefore be at risk of injury and death.

Pool fire modelling was conducted using DNVGL Phast and Safeti version 6.7.

3.4 Methodology for Frequency Analysis

"What is the likelihood that the hazards identified, will be realised?"

Frequency analysis relates to the likelihood that an event will occur. This likelihood is based upon previous accidents for similar materials and equipment, and the manner of failure. Often such previous accident data is summarised in the form of frequency databases. In this study, the likelihood of events occurring was based on frequency information from the BEVI publication [7].

The table below summarises the scenarios considered as well as the associated frequencies of occurrence.

Table 3.3: Release scenarios and associated frequencies of occurrence

Type of Equipment	System	Scenario	Base Frequency
Fixed storage or processing units at atmospheric pressure or lower (for example, tanks, blending vessels) and atmospheric transport units (for example, standard road tankers, intermediate bulk containers (IBCs)	Diesel storage	1a) Catastrophic rupture (with bund overtopping if necessary).	5.00E-06
		1b) ROAD TANKER Instantaneous release of contents (Each compartment is considered a tank, so frequency is divided by the number of compartments)	1.00E-05
		2a) Entire contents released in 10 min or large hole in the processing unit (a large hole is typically the size of the largest appurtenance on the processing unit).	5.00E-06
		2b) Atmospheric transport units – release of entire contents from the largest connection	5.00E-07
		3a) Small hole in vessel (leak typically 10 mm diameter).	1.00E-04
Fixed storage or processing units classified as	All pressurised process and	1) Catastrophic rupture with instantaneous failure (including a boiling liquid expanding vapour explosion (BLEVE) where applicable).	5.00E-07

[7] Dutch National Institute of Public Health and the Environment (RIVM), Centre for External Safety in their publication Reference Manual Bevi Risk Assessments version 3.2 of July 2009.

Type of Equipment	System	Scenario	Base Frequency
pressure vessels (for example, reactors, storage spheres) and pressurized transport units (for example, pressurized road tankers, includes movable cylinders as well as large volume transport cylinders)	storage vessels and cylinders	2) Entire contents released in 10 min or large hole in the processing unit (a large hole is typically the size of the largest appurtenance on the processing unit).	5.00E-07
		3) Small hole in vessel (leak typically 10 mm diameter).	1.00E-05
		4) Pressure safety valve release (if applicable).	2.00E-05
Additional scenarios: Loading into tankers	All road tankers	1) Rupture of loading/unloading hose (per hour)	4.00E-06
		2) Leak in loading/unloading hose with an effective diameter of 10% of the nominal diameter, up to a maximum of 50 mm. (per hour)	4.00E-05
		3a) Atmospheric tanker - Instantaneous release of entire contents, pool fire (per hour)	5.80E-09
		3b) Pressurised tanker - Instantaneous release of entire contents, BLEVE (per hour)	5.80E-10
Pipe, hose, arm (onsite pipelines, including cylinder filling operations) PER METRE PER YEAR	All pipework	1) Pipeline, hose, arm full bore rupture.	1.00E-07
		2) Small hole in pipeline, hose, arm (typically a leak with effective diameter of 10 % to 50 % of the pipeline diameter).	5.00E-07
Heat Exchangers (hazardous material in pipes and design pressure of shell is less than maximum pressure of piped material.	Reboiler	1) Rupture of 10 pipes at the same time	1.00E-05
		2) Rupture of 1 pipe	1.00E-03
		3) Leak with an effective diameter of 10% of the nominal diameter of one pipe, up to a maximum of 50 mm	1.00E-02
Distillation Column	Distillation column	1) Instantaneous release of entire contents of the column	5.00E-06
		2) Release of entire contents in 10 minutes in a continuous stream	5.00E-06
		3) Continuous release from a hole with an effective diameter of 10 mm	1.00E-04

Furthermore, frequency data published is often generic and several facility-specific factors must be considered. This was done in this study by way of event tree analysis. Frequency modelling was carried out in DNVGL Safeti version 6.7, including Event Tree Analysis to determine the likelihood of the various events.

Details of frequencies used in the study are provided in Section 8.

3.5 Methodology for Risk Summation and Assessment

"The combination of consequence and likelihood are combined and reported here."

Risk summation was carried out using DNV Safeti version 6.7 and individual risk and societal risk were reported. Once risk is calculated, it must be assessed against standing criteria. In this study, assessment was performed against the acceptability criteria defined by the UK HSE as follows.

3.5.1 Individual Risk Acceptability Criteria

Individual Risk represents the chance that an individual will experience fatal injury as a result of major accidents emanating from site. The risk can be 'acceptable' or 'unacceptable' depending on its magnitude. Individual Risk tolerability or acceptability is based upon data from the UK HSE in their publication 'Reducing Risk Protecting People (R2P2)' [8]. Individual Risk can be categorised into various regions as illustrated in Figure 3.3.

3.5.1.1 Intolerable Risk for workers

Individual Risk calculated to be at or above the 1 x 10^{-3} /year level is considered intolerable for all individuals, including workers at industrial sites. Workers at industrial sites can withstand a higher level of risk than members of the general public because they tend to be organised and drilled in emergency response, generally healthier and mobile and tend to be equipped with personal protective equipment (PPE).

3.5.1.2 Intolerable Risk for members of the public

Individual Risk calculated to be at or above the 1 x 10^{-4} /year level is considered intolerable for members of the general public. This level assumes a theoretical individual present for 24 hours per day and 365 days per annum at a location.

3.5.1.3 Risk Tolerable if ALARP

Risk calculated to be between the 1 x 10^{-6} /year and either the 1 x 10^{-4} /year (general public) or the 1 x 10^{-3} /year levels, can be tolerated if proven to be 'ALARP'. The phrase 'ALARP' stands for As Low As Reasonably Practicable. In this region, illustrated in Figure 3.3, risk can be tolerated if it can be proven by site that it has considered options for reducing the risk further that the costs of any measures to further reduce risk are grossly disproportionate to the risk reduction benefits gained.

[8] The Health and Safety Executive (HSE), Reducing risks, protecting people – HSE's decision-making process, Norwich 2001.

3.5.1.4 Broadly Acceptable Risk

Risk calculated to be below the 1 x 10^{-5} / year is considered broadly acceptable for workers, while risk below 1 x 10^{-6} / year is considered broadly acceptable for members of the general public.

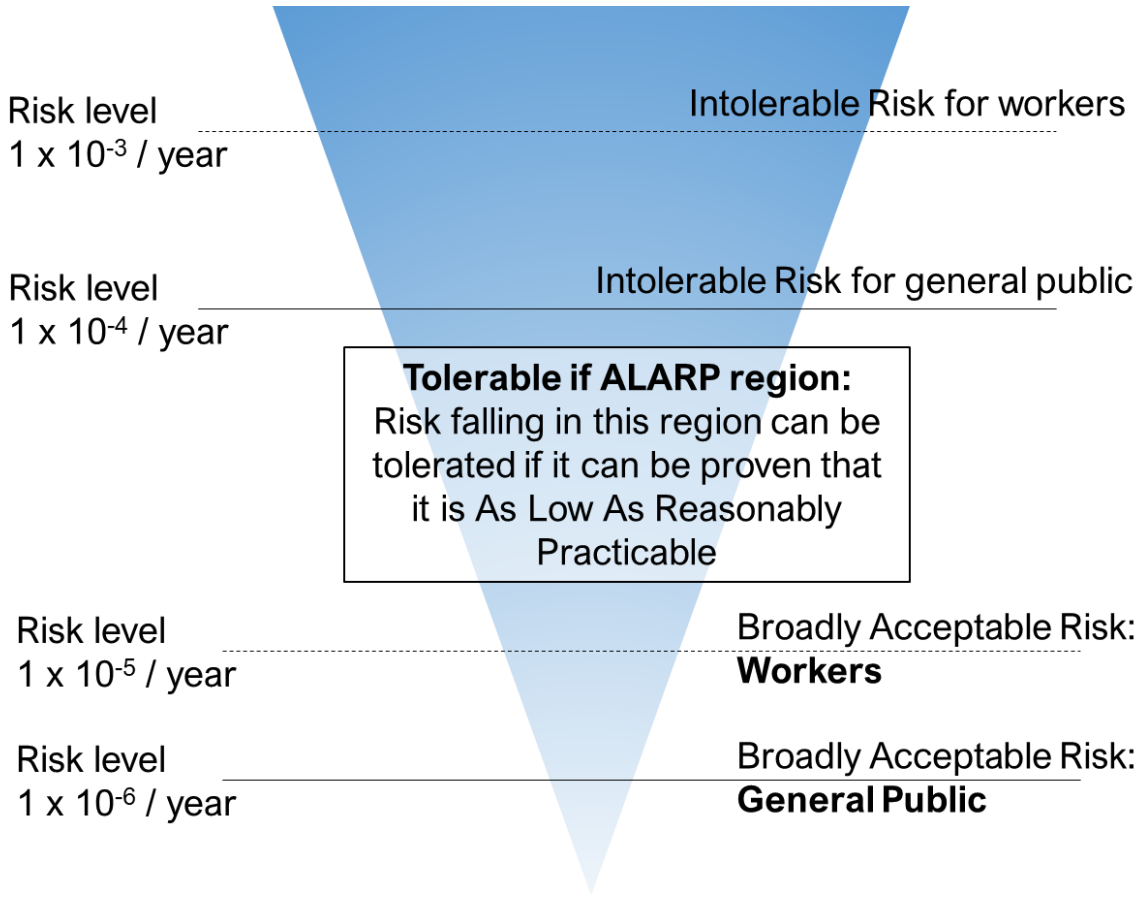

Figure 3.3: Individual Risk Acceptability Criteria [8]

3.5.2 Societal Risk Acceptability

Societal Risk has been presented in this report in the form of an FN Curve. FN Curves are defined in the CMPT publication [9] as plots showing frequency of events vs the number of fatalities arising from those events. They display cumulative frequencies (F) of events involving N or more fatalities. They are useful illustrations the relationship between frequency and size of the accident.

FN Curves often contain risk tolerability criteria; the criteria used in this study was derived from the UK HSE [8] and is illustrated in Figure 3.4. The tolerability criteria are illustrated here using two straight lines (red and blue).

[9] Spouge J, Centre for Marine and Petroleum Technology (CMPT), A Guide To Quantitative Risk Assessment for Offshore Installations, 1999.

The region above the red line indicates a region of intolerable risk, the area below the blue line indicates an area of broadly acceptable risk. Societal risk located between these lines can be tolerated if it is ALARP.

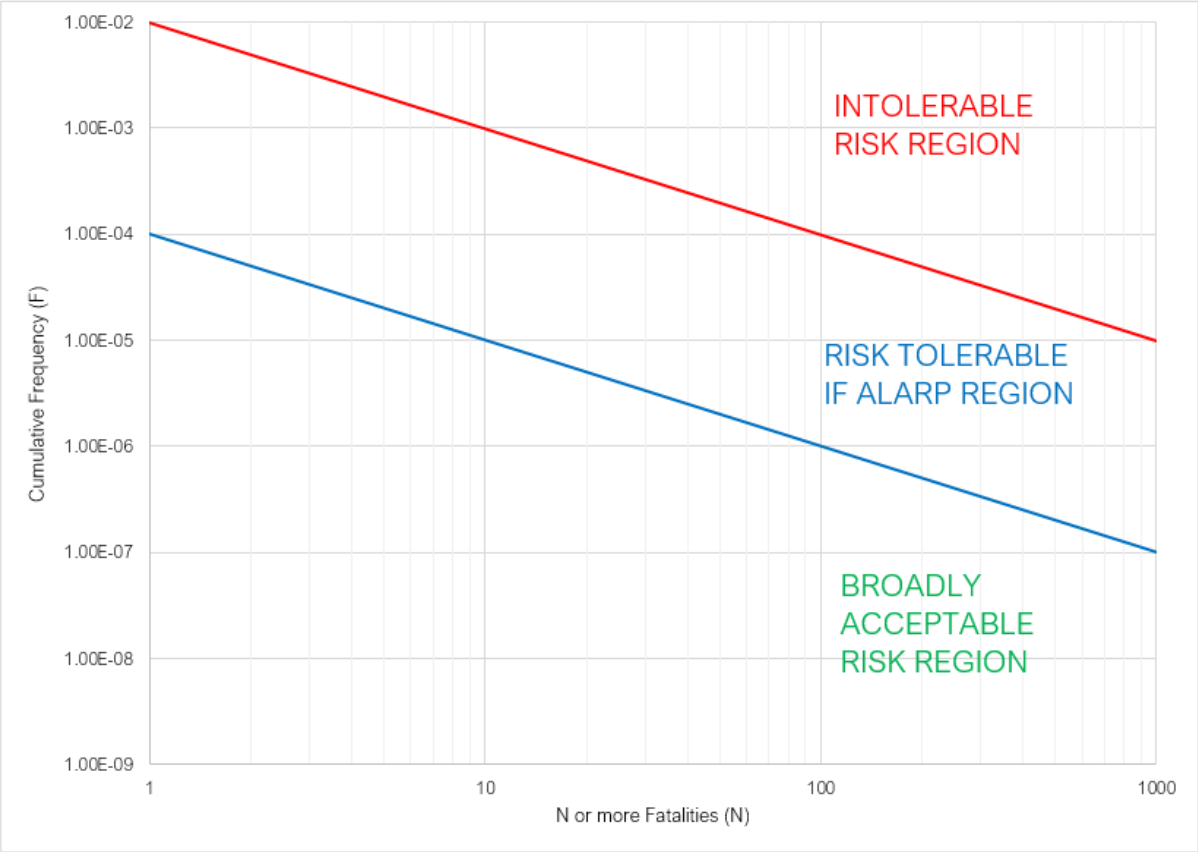

Figure 3.4: An example of an FN Curve showing societal risk acceptability limits

3.5.3 Methodology for Land Use Planning

Risk was used in this study as a basis for making land use judgments and providing land use advice. The approach is based on the approach defined in SANS 1461:2018 to land use planning which summarises as follows.

3.5.3.1 STEP 1: Consultation Zones

The standard defines three consultation zones: an outer zone, middle zone and inner zone, illustrated in Figure 3.5. Each of the zones is defined according to an individual risk level, as shown in the figure. Once the zones are determined, the appropriateness of land uses or potential land uses in each zone can be determined through a classification of types of land uses.

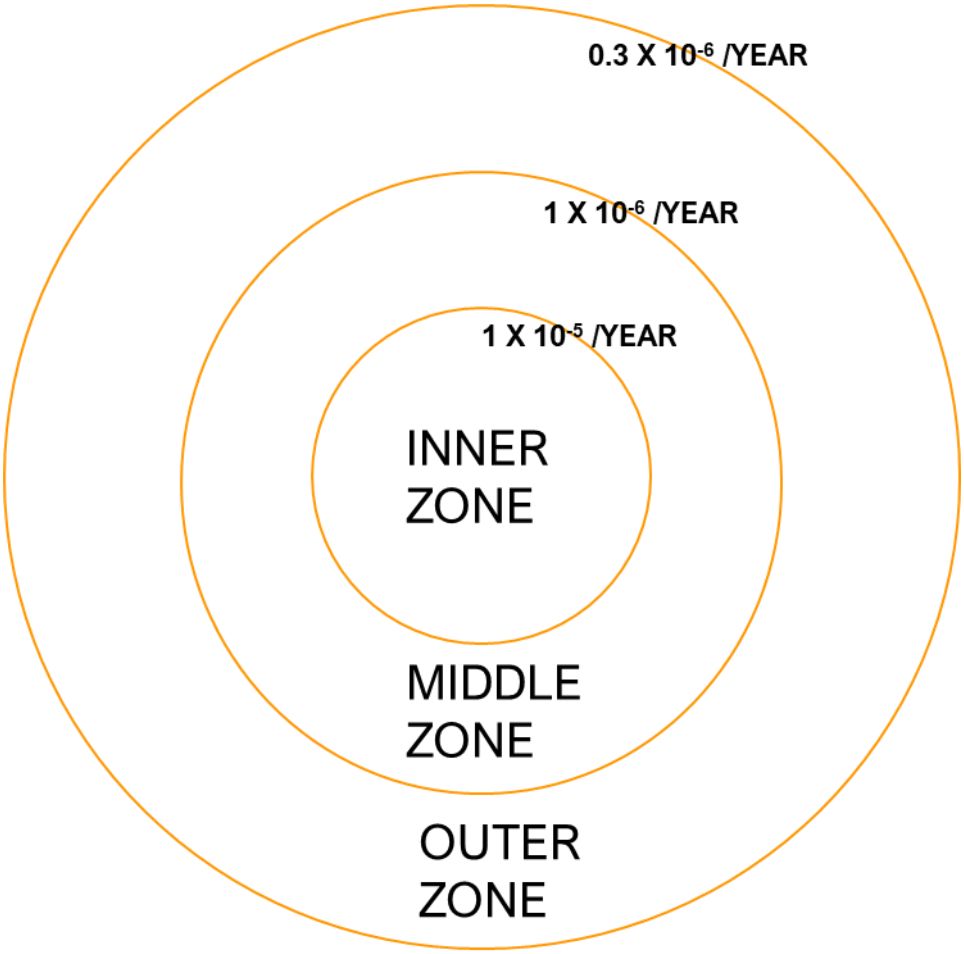

Figure 3.5: SANS 1461:2018 Land Use Planning Consultation Zones

3.5.3.2 STEP 2: UK HSE's Classification of land uses

Land uses can be separated based on their sensitivity to major incidents, as follows:

Table 3.4: Land Use Sensitivity Levels and Descriptions

Sensitivity Level	Type of Land Use
Level 1	Based on normal working population
Level 2	Based on the general public – at home and involved in normal activities
Level 3	Based on vulnerable members of the public (children, those with mobility difficulties or those unable to recognize physical danger
Level 4	Large examples of Level 3 and outdoor examples of Level 2

3.5.3.3 STEP 3: Land Use Advice based on Sensitivity and Consultation Zones

Once the consultation zones and sensitivity levels have been determined, one can provide advice as to whether a type of development can go ahead based on the following guidance:

Sensitivity Level	Development in Inner Zone	Development in Middle Zone	Development in Outer Zone
Level 1	Do Not Advise Against (DAA)	Do Not Advise Against (DAA)	Do Not Advise Against (DAA)
Level 2	Advise Against (AA)	Do Not Advise Against (DAA)	Do Not Advise Against (DAA)
Level 3	Advise Against (AA)	Advise Against (AA)	Do Not Advise Against (DAA)
Level 4	Advise Against (AA)	Advise Against (AA)	Advise Against (AA)

3.6 Methodology for Risk Treatment

"The major risk issues are highlighted and methods for reducing risk are suggested and assessed."

Following the risk assessment stage, all scenarios resulting in intolerable risk and risk which can be tolerable if proven to be ALARP, were analysed further in the Demonstration of ALARP stage. In this stage, options for risk reduction were considered, criteria for deciding between these options (which may include cost) as well as the resulting decrease in risk if each option is applied.

Should the client require a detailed comparison between options including a cost benefit analysis, this shall be conducted separately.

4 INHERENTLY SAFER OPERATION

4.1 Placement of future diesel tank

During the site visit described in Section 1.2, the location of a proposed bunded 23,000 litre aboveground diesel storage was discussed with the base case location (referred to as Proposed Location 1 in an internal Air Products Memorandum entitled "Coega Diesel Storage Location" written by Nomcebo Gina, Technical Manager, circulated on 26th June 2019 (the 'Memorandum') considered unsuitable due to its proximity to the air intake of the site's Main Air Compressor (MAC) (location shown as 'Deviation Reference 1' in Figure 4.1). The potential locations, as per the Memorandum, are shown in Figure 4.1. The Memorandum referred to three other proposed locations, referred to as Proposed Locations 2, 3 and 4; consideration to AP's operations as well as safety and risk considerations with reference to AP's Global Basic Engineering Practice, 2S302.

Figure 4.1: Proposed location of diesel tank as per the Memorandum

4.1.1 Design of petroleum storage tanks – Venting Devices

The concern with the location of the diesel tank is based on the premise that aboveground atmospheric petroleum storage tanks (such as the one being proposed) are commonly fitted with normal venting devices to prevent build-up of overpressure or vacuum inside the tank, therefore protecting the integrity of the vessel. Causes for build-up of overpressure or vacuum are described in the American Petroleum Institute (API) standard 2000 'Venting Atmospheric and Low-Pressure Storage Tanks' as commonly being from:

- Movement of liquid in and out of the tank;
- Breathing of the tank due to changes in weather;
- Exposure to fire; or
- Other factors including equipment failure or operator error.

Furthermore, the South African National Standard (SANS) number 10089-1 'The petroleum industry Part 1: Storage and distribution of petroleum products in above-ground bulk installations' sets requirements for these types of tanks and includes requirements for normal and emergency venting.

The process of normal venting of the tank may introduce hydrocarbon vapour to the air, which may:

- Migrate to the air intake of the MAC and affect the ambient quality of the air being fed into the system, introducing:
    - Contaminants which affect the functioning of the filtration system(s) such as the molecular sieves installed in the system; and/or
    - Introducing hydrocarbon vapours which may present a fire and/or explosion hazard (potential combustion from interaction with concentrated oxygen in the system).

- Accumulate in the vicinity of the diesel tank and be present in concentrations between the flammability limits of diesel, presenting a flash fire hazard. (NOTE: The flash point of diesel is relatively high (considered to be >60°C) and build-up of flammable vapour may be considered unlikely but still possible).

4.1.2 Evaluation of potential location of the diesel tank from a Major Hazard Perspective

Several locations were considered for the placement of the diesel tank, referred to as Proposed Locations 1 to 4 in the Memorandum. Considerations for the location of the tank from a Major Hazard perspective included:

- Proximity to ignition sources and processes which may present a fire or explosion hazard;
- Proximity to personnel and buildings (and potential impact of pool fire radiation and/or vapour dispersion);
- Proximity to neighbouring facilities (and potential impact of pool fire radiation and/or flammable vapour dispersion); and
- Dominant wind direction(s) (and impact on pool flame tilt and vapour dispersion) [10].

4.1.2.1 Evaluation of Proposed Locations

The various locations were **qualitatively** evaluated as follows:

[10] Wind conditions for Ngqura/Coega indicate that the wind blows predominantly in an Easterly (E) and East-south-easterly (ESE) direction (26.5% of the time) and/or in a South-westerly direction (SW) 14.6% of the time. Data retrieved on 4th July 2019 from https://www.windfinder.com/windstatistics/ngqura_coega.

Table 4.1: Qualitative evaluation of proposed diesel locations

Proposed Location	Proximity to ignition sources and equipment	Proximity to personnel and buildings	Proximity to neighbouring facilities	Dominant wind direction consideration	Conclusion
Number 1	Relatively close to Air Separation Unit (ASU) and specifically, the MAC air intake (Not OK)	Relatively close to the container offices to the east of the site (Not OK)	Relatively distant to neighbouring facilities (nearest boundary approx. 30 m East-south-east) (OK)	Wind is most likely to blow vapour in the direction of the container offices (Not OK)	Not OK
Number 2	Relatively distant from processing equipment and associated ignition sources (OK)	Very close to the existing security building (Not OK)	Very close to the site fence (Not OK)	Wind is most likely to blow vapour in the direction of the bulk cryogenic storage (relatively large distance – vapour likely to dissipate to below lower flammability limit), OR In direction of the security building (Not OK)	Not OK
Number 3	Relatively far from processing equipment and associated ignition sources (OK)	Relatively far from personnel and buildings (OK)	Very close to the site fence (Not OK)	Wind is most likely to blow vapour in the direction of the bulk cryogenic storage (relatively large distance – vapour likely to dissipate to below lower flammability limit) (OK)	OK
Number 4	Relatively far from processing equipment and associated ignition sources (OK)	Located some distance from staff parking and admin building (may require rearrangement of parking bays and additional measures to be confirmed in the MHI Risk Assessment). Personnel in the Admin Building would mostly be located indoors (OK)	Very close to the site fence (Not OK)	Wind is unlikely to blow vapour in the direction of ignition sources (provided parking spaces are rearranged to prevent ignition from petrol engines and that personnel in the admin building are given guidance about smoking) (OK)	OK

4.1.2.2 Conclusion regarding location of diesel tank

This section of the MHI Report has provided an evaluation of the proposed locations for the diesel tank from a Major Hazard perspective and the following locations are considered OK:

- Location 3 – OK;
- Location 4 – OK.

Conclusion on placement of diesel tank

Following this evaluation, the Client's chosen location was Location 1 in Figure *4.1*, ensuring at least a 15.2 metre separation is maintained between the air intake of the MAC and the operation of any automotive equipment / portable combustion engines, in line with an Air Products standard.

5 HAZARD IDENTIFICATION

"What major hazards exist on site? What can go wrong?"

5.1 Hazardous Materials onsite

The site handles several hazardous materials, summarised in the table below. The table provides a description of each material, including CASRN numbers to identify individual components, the throughput or storage capacities, hazardous material classifications as well physical characteristics.

Table 5.1: Hazardous Materials onsite

Name	UN/ CASRN number	Total storage capacity or throughput	SANS 10228 category	Physical, chemical and toxicological characteristics of the materials	Licence restrictions
Oxygen	7782-44-7	**PROJECT OPTION 1:** 77 tons (current) + 122 tons (future) **PROJECT OPTION 2:** 200 tons (future).	Class 2.2	Non-toxic, non-flammable gases	MMRisk assumes all hazardous materials are stored within dangerous goods licence limits.
Argon	7440-37-1	25 tons (future)	Class 2.2	Non-toxic, non-flammable gases	
Nitrogen	7727-37-9	310 tons (current) + 15 tons (future)	Class 2.2	Non-toxic, non-flammable gases	
Carbon dioxide	124-38-9	10 tons (future)	Class 2.2	Non-toxic, non-flammable gases	

The hazardous locations, main occupied buildings and the main site entrance are illustrated in Appendix F issued in the final report revision.

5.2 Any significant incidents which have happened in the past at the site

No significant incidents were reported by the Client.

5.3 Major accidents at related facilities

Major accidents occurring at facilities similar to the site would include release of liquefied gas to produce cryogenic hazards (cold contact with equipment or personnel) leading to cold embrittlement as well as the dispersion of asphyxiant vapours described in Section 3.3: Methodology for Consequence Analysis.

Furthermore, incidents involving the drawing of hydrocarbons into the ASU process may result in the presence of hydrocarbon vapour within its flammability limits and subsequent ignition and flash fire or vapour cloud explosion (VCE) resulting in damage to equipment and injury to personnel.

5.4 Containment systems for analysis

Diesel will be stored onsite in a horizontal vessel which will likely be bunded; the bund will likely have a capacity exceeding the storage volume of the diesel plus 10%.

The liquefied gases stored onsite are volatile (i.e. flash readily upon release to atmosphere) and therefore bunding is not considered necessary except for large, catastrophic releases. Even in the event of catastrophic releases, it is expected that boil-off of spilled material would be so rapid that any liquid pools would be present for a short period.

5.5 Description of safety systems

The following safety systems onsite were noted:

- Compressor trips exist which trip based on the following parameters:
    - Cooling water availability;
    - Bearing temperatures;
    - Oil temperature;
    - Oil flow.
- Heat exchanger trip (on temperature) exists;
- Distillation column alarms exist, on:
    - Level (HP and LP columns) (no trip);
    - High purity, for both products (trip);
- Liquefaction trip exists on very low temperature;
- For the storage vessels there are level alarm:
    - High Level = alarm in the control room;
    - High-High Level = trip.
- The Coega complex operates a fire-fighting system (located offsite);
- Hydrants, hose reels and fire extinguishers are available onsite;
- Relief devices exist on all storage tanks (including jacket relief devices (JJRD);
- A ‘TriCox’ level control system is operational in all road tankers.

5.6 Isolation systems and associated release durations

Modelling performed in this assessment has taken advantage of the isolation systems present onsite as listed in Section 5.5. Each safety [isolation] system has a probability of failure, described in SANS 1461:2018 and summarised in the table below.

Table 5.2: Isolation systems and associated release durations

System	Release duration	Probability of Failure
Automatic shut off system (e.g. ASOV)	2 minutes	0.001
Semi-automatic: Requires operator control room intervention	10 minutes	0.01
Non-Automated system	30 minutes	0.1
Excess flow valves	5 seconds	Take 0.06
Non-Return Valves (consider if tested regularly)	5 seconds	0.06
Breakaway couplings	5 seconds	0.06
Operator intervention (ESD) (supervised activities)	2 minutes	0.1

6 HAZARD ANALYSIS

6.1 List of scenarios modelled for each containment system

The following scenarios were modelled in line with the requirements of the SANS 1461:2018 standard. These scenarios are based on previous accidents in industry and they range in terms of probability of occurrence. The frequency data associated with each scenario is elaborated further in Section 8.1.

Table 6.1: List of scenarios considered in the QRA

Type of Equipment	System	Scenario
Fixed storage or processing units at atmospheric pressure or lower (for example, tanks, blending vessels) and atmospheric transport units (for example, standard road tankers, intermediate bulk containers (IBCs)	Diesel storage	1a) Catastrophic rupture (with bund overtopping if necessary).
		1b) ROAD TANKER Instantaneous release of contents (Each compartment is considered a tank, so frequency is divided by the number of compartments)
		2a) Entire contents released in 10 min or large hole in the processing unit (a large hole is typically the size of the largest appurtenance on the processing unit).
		2b) Atmospheric transport units – release of entire contents from the largest connection
		3a) Small hole in vessel (leak typically 10 mm diameter).
Fixed storage or processing units classified as pressure vessels (for example, reactors, storage spheres) and pressurized transport units (for example, pressurized road tankers, includes movable cylinders as well as large volume transport cylinders)	All pressurised process and storage vessels and cylinders	1) Catastrophic rupture with instantaneous failure (including a boiling liquid expanding vapour explosion (BLEVE) where applicable).
		2) Entire contents released in 10 min or large hole in the processing unit (a large hole is typically the size of the largest appurtenance on the processing unit).
		3) Small hole in vessel (leak typically 10 mm diameter).
		4) Pressure safety valve release (if applicable).
Additional scenarios: Loading into tankers	All road tankers	1) Rupture of loading/unloading hose (per hour)

Type of Equipment	System	Scenario
		2) Leak in loading/unloading hose with an effective diameter of 10% of the nominal diameter, up to a maximum of 50 mm. (per hour)
		3a) Atmospheric tanker - Instantaneous release of entire contents, pool fire (per hour)
		3b) Pressurised tanker - Instantaneous release of entire contents, BLEVE (per hour)
Pipe, hose, arm (onsite pipelines, including cylinder filling operations) PER METRE PER YEAR	All pipework	1) Pipeline, hose, arm full bore rupture.
		2) Small hole in pipeline, hose, arm (typically a leak with effective diameter of 10 % to 50 % of the pipeline diameter).
Heat Exchangers (hazardous material in pipes and design pressure of shell is less than maximum pressure of piped material.	Reboiler	1) Rupture of 10 pipes at the same time
		2) Rupture of 1 pipe
		3) Leak with an effective diameter of 10% of the nominal diameter of one pipe, up to a maximum of 50 mm
Distillation Column	Distillation column	1) Instantaneous release of entire contents of the column
		2) Release of entire contents in 10 minutes in a continuous stream
		3) Continuous release from a hole with an effective diameter of 10 mm

6.2 Description of causes, consequences, preventive and mitigative measures

This section summarises the release scenarios possible at the site, and analyses the probable causes, preventive measures, as well as mitigative measures and end consequences. Air Products sites undergo periodic HAZOP review and therein a detailed set of loss of containment scenarios with associated causes, consequences and safeguards are deliberated at the session(s). Several recommendations are raised at the sessions; the discussions at the session would be related to incidents related to the ones discussed in this assessment.

6.3 Organisational measures in place at the site

MMRisk is of the opinion that the organisational measures at the site are enough for the type of site and organisation. The site runs the following management systems:

- ISO 9001;
- OHSAS 18000 accredited;
- ISO 22000;
- CAIA Responsible Care membership.

6.4 Requirements in terms of Environmental Conservation Act, 1989

The Environment Conservation Act of 1989 has been largely replaced by the National Environmental Management Act, 1998 (NEMA) (however, MMRisk understands that several provisions still stand).

MMRisk understands that an Environmental Impact Assessment (EIA) is currently underway for the increased storage capacity at the site. MMRisk understands that Savannah (EIA Consultant) is in the process of submitting a Basic Assessment and undergoing the public notification process.

7 CONSEQUENCE ANALYSIS

"If things do go wrong onsite, what is the extent of the potential damage?"

7.1 Scenarios included in risk analysis

The scenarios listed in Table 6.1 of Section 6.1: List of scenarios modelled were included in the risk calculations with the exception of oxygen due to limitations in the software used, DNVGL Phast Risk Version 6.7. The software was able to analyse the consequences related to releases of oxygen but did however consider oxygen as an inert material and therefore did not apply fatality probabilities as described in Section 3.3.2.

7.2 Key process data for major scenarios

Key process data was compiled for each system, as shown in Section 2.2, through information from the site visit as well as engineering information obtained from the site.

The consequences are shown in this section in order of severity, and per material for the main materials stored and handled onsite.

7.3 Consequences for Oxygen

7.3.1 LP Column catastrophic rupture

The LP Column is designed for oxygen recovery. A catastrophic rupture of that portion of the distillation column was modelled and subsequent release of oxygen at an initial pressure of 0.4 barg and approximately -196°C was modelled. The release from height would result in a slumping gas (from the initially low temperature) released at low momentum (from the low initial pressure in the column). The vapour would be entrained relatively slowly into the surrounding air and would disperse some distance at relatively high oxygen concentration. Concentrations of 30 volume % and 40 volume % in air were of interest as described in Section 3.3.2: Methodology for Oxygen enrichment modelling; these are illustrated in Figure 7.1 below for a low ambient wind speed of 1.5 m/s. The contours show the maximum extent of the vapour dispersed, and assuming that wind could be blowing in any direction.

The oxygen-enrichment of air in areas shown in Figure 7.1 would result in increased risk of ignition / increased fire risk at 'Dynamic Commodities' directly east. The impact relates to the potential for incidents occurring at those locations rather than damage from the release itself.

The initially low temperature vapour would have some cryogenic effect on surrounding equipment with a chance of embrittlement and resulting equipment damage.

As a result of the above, between the contours in Figure 7.1, a fatality probability of approximately 1% would be expected were a release to occur.

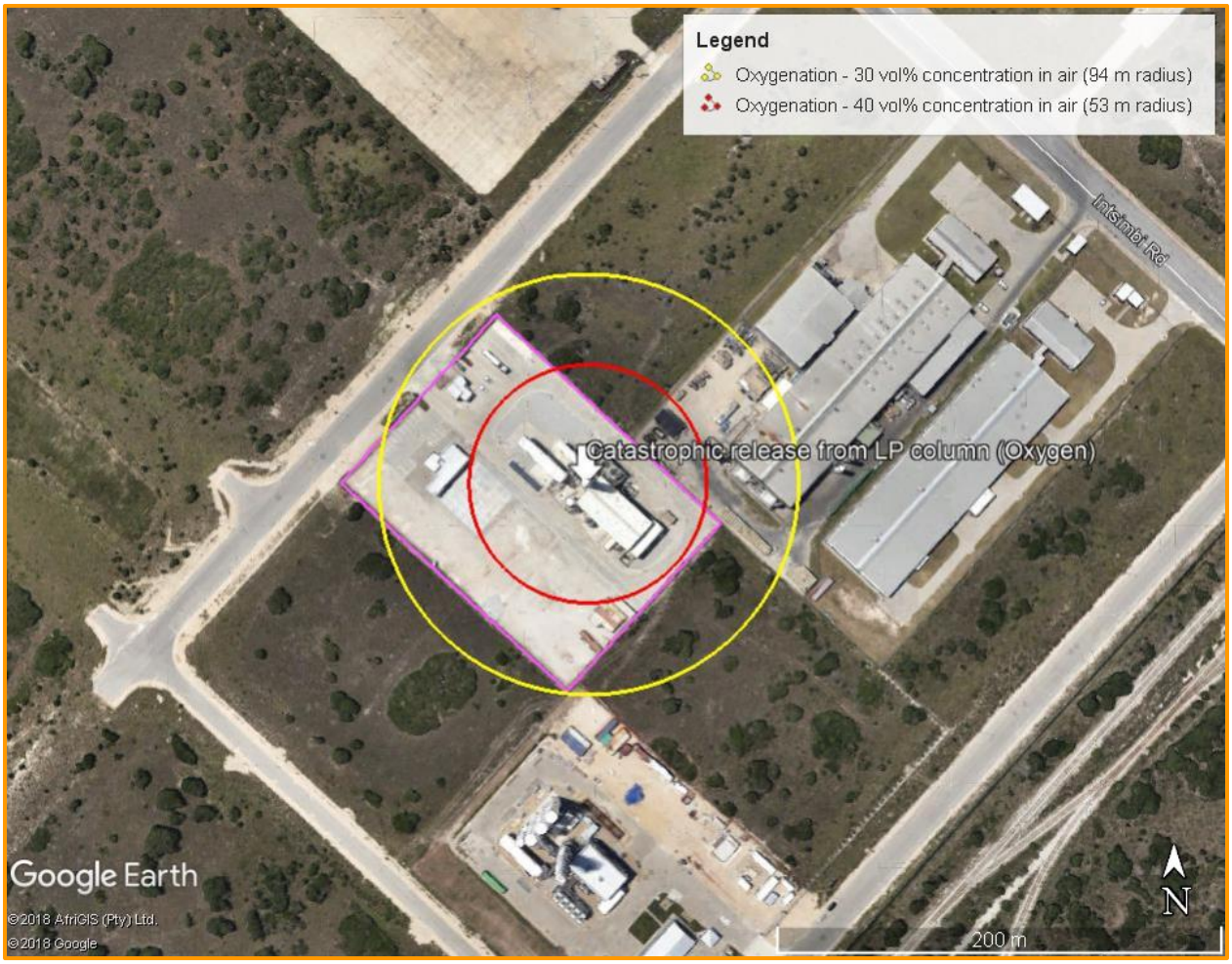

Figure 7.1: Oxygen enrichment contours from LP Column catastrophic rupture

7.3.2 Consequences: Current LOX bulk storage

The Oxygen enrichment consequences in the event of a catastrophic rapture for the existing site Liquid Oxygen (LOX) storage capacity of 77 tons are shown in Figure 7.2. These show that the 30% oxygenation contour extends appreciably beyond the plant boundary over Dynamic Commodities to the north of the site. The 40% oxygenation contour only marginally breaches the site boundary. Between the yellow and red contours it is expected that an increased fire risk would be experienced with an associated increase in fatality probability to a level of 1% fatality probability.

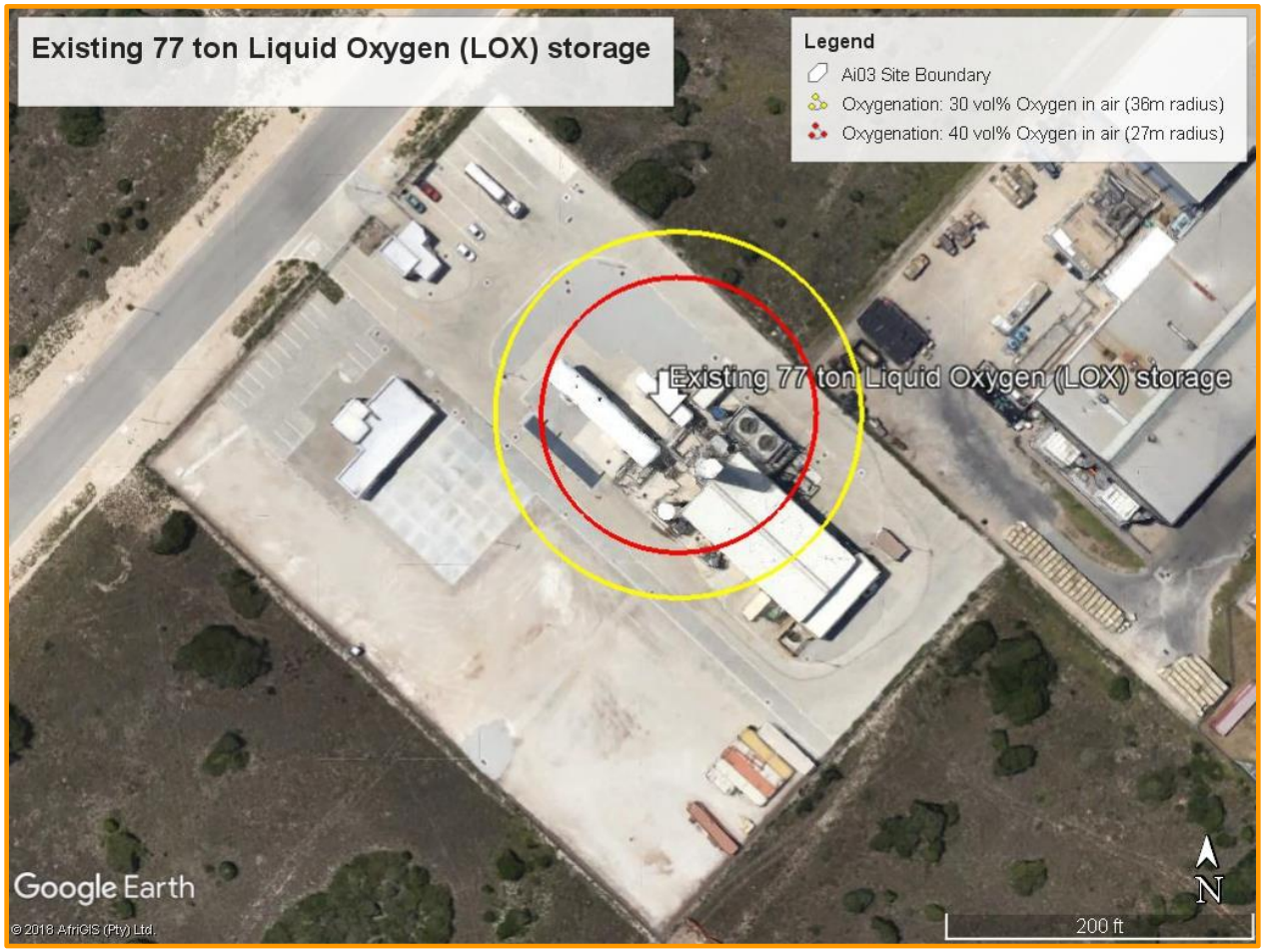

Figure 7.2: Oxygen enrichment contours from existing storage catastrophic rupture

7.3.3 Consequences: Project options for oxygen storage (Options 1 and 2)

In addition to the existing 77 ton Liquid Oxygen (LOX) storage capacity, the site has considered two options for the storage of oxygen, described in Section 5.1: Hazardous Materials onsite:

- Future 122-ton storage in addition to the current 77 tons already stored onsite (to a total of 200 tons) (Option 1); and
- A future 200-ton storage vessel at the same location, to replace the existing 77-ton storage onsite (Option 2).

The consequences shown in the figures below illustrate the potential impact of hyper-oxygenation from catastrophic failure of oxygen vessels, with resulting increased risk of fire in the case of existing installations as well as with the two options being considered for increasing storage capacity to 200 tons. The consequences

for Option 2 (200-ton vessel) are more pronounced, with the 30 vol% oxygenation contour extending further beyond the site boundary over Dynamic Commodities in comparison to Option 1.

For Option 1 the contour also reaches beyond the plant boundary but has a greater share of its circumference within the plant site.

Both Options would result in the extension of enrichment contours beyond the site boundary and therefore indicate that the site is an MHI as per the descriptions given in Section 1.5.

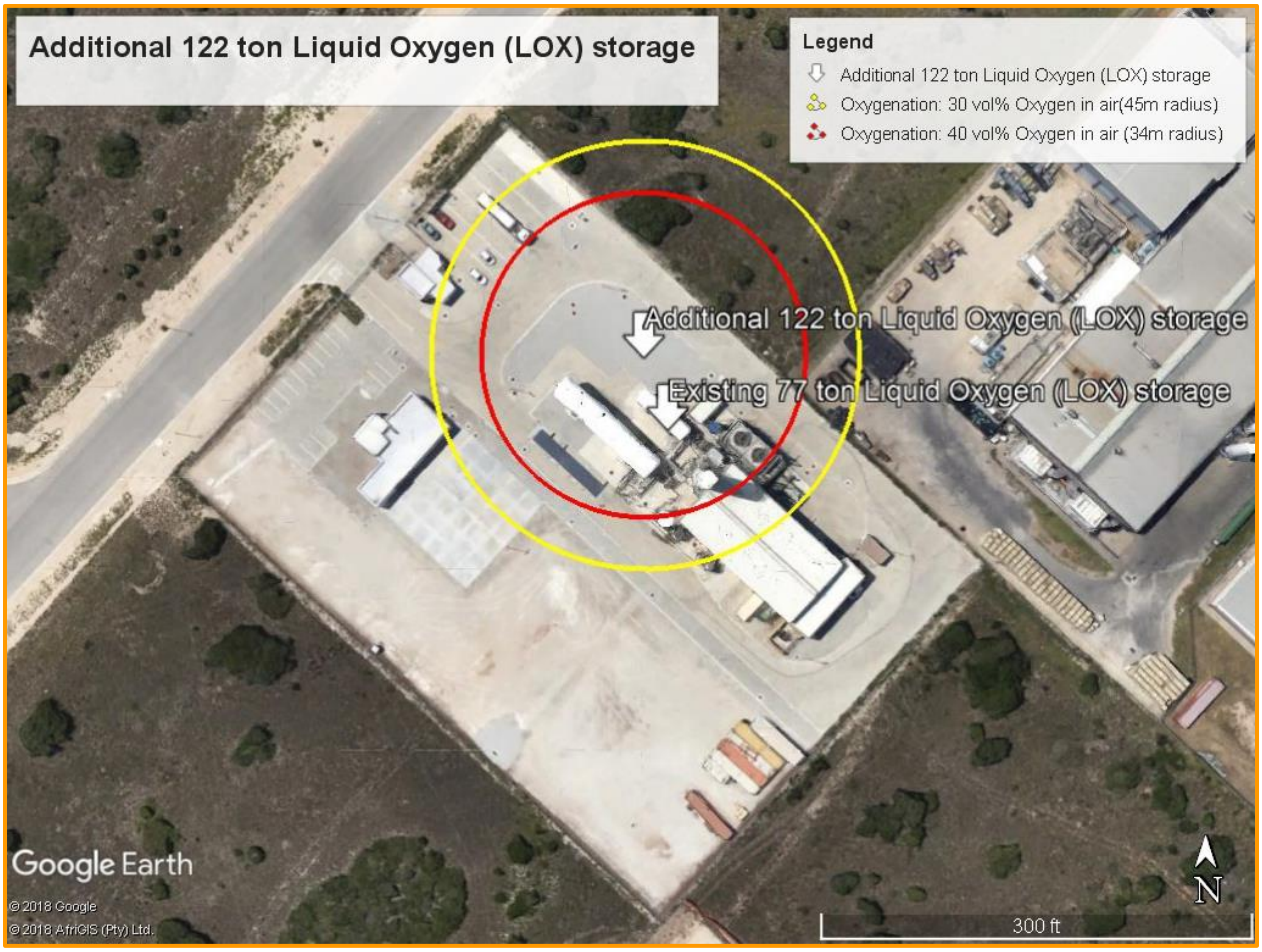

Figure 7.3: Oxygen enrichment contours from 'Option 1' catastrophic rupture

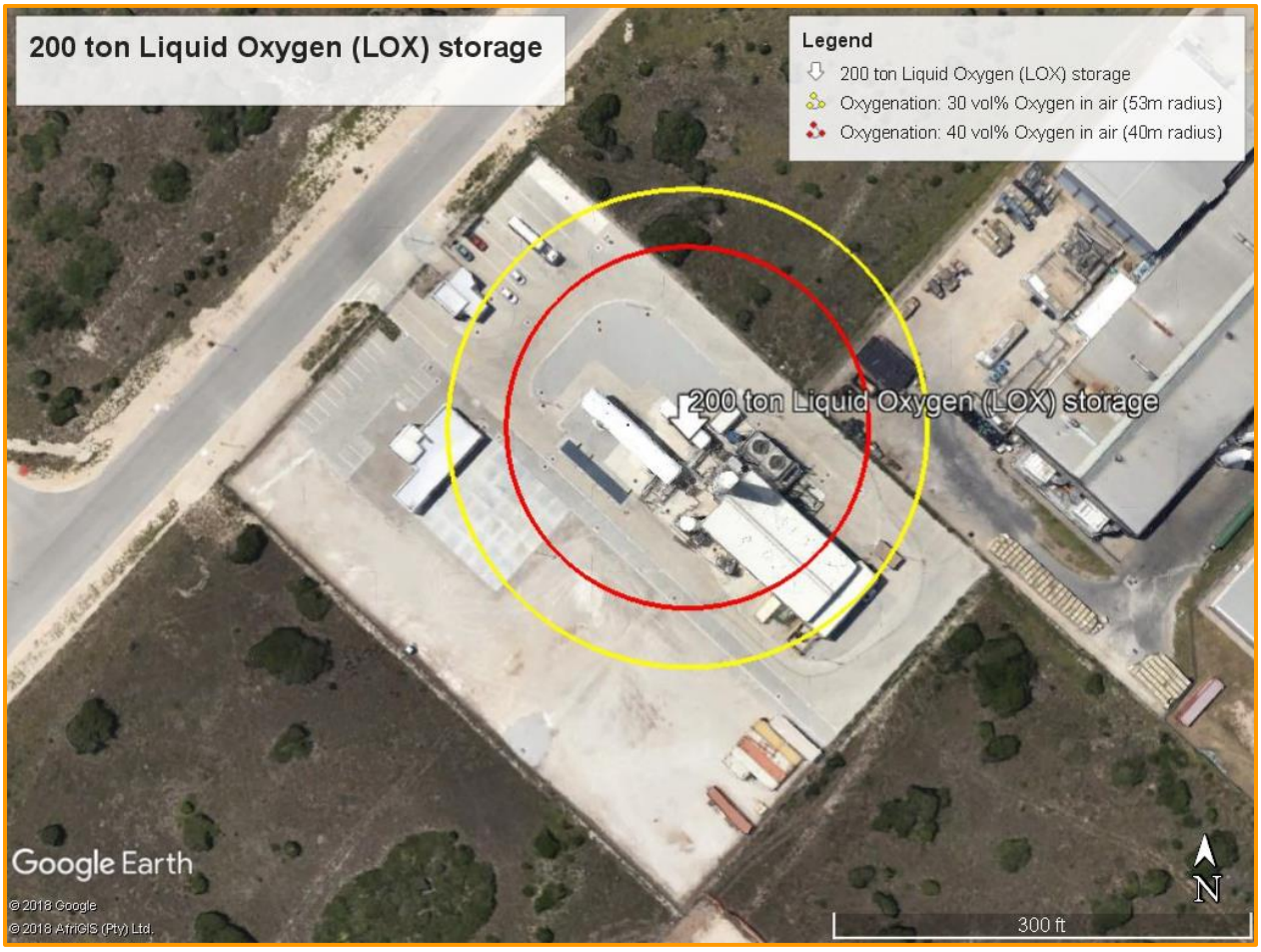

Figure 7.4: Oxygen enrichment contours from 'Option 2' catastrophic rupture

7.4 Consequences for Diesel

Diesel tank storage loss of containment (such as from a large leak or a catastrophic rupture) could result in the formation of a flammable pool covering the entire area of the bund. Were the pool to ignite, a pool fire could form resulting in the generation of thermal radiation contours as shown in Figure 7.5 for a high wind speed of 9 m/s and assuming that wind could be blowing in any direction.

The 37.5 kW/m^2 contour would be limited to the area near the bund. It is assumed that were an even to occur personnel would be able to find shelter and it is likely that only personnel who respond to the event (fire team members or the Emergency Services) would experience that level of thermal radiation.

The 12.5 kW/m^2 and 6.3 kW/m^2 contours would extend onto the main site road with some impact on the building housing the ASU. **There would not be excessive impact on the air intake to the MAC from a thermal radiation perspective.** Any personnel present in or near the ASU building should be advised to escape diesel-related incidents via the site road to the north of the site heading westwards towards the main exit. Personnel located in the building would be shielded from the impact of radiation.

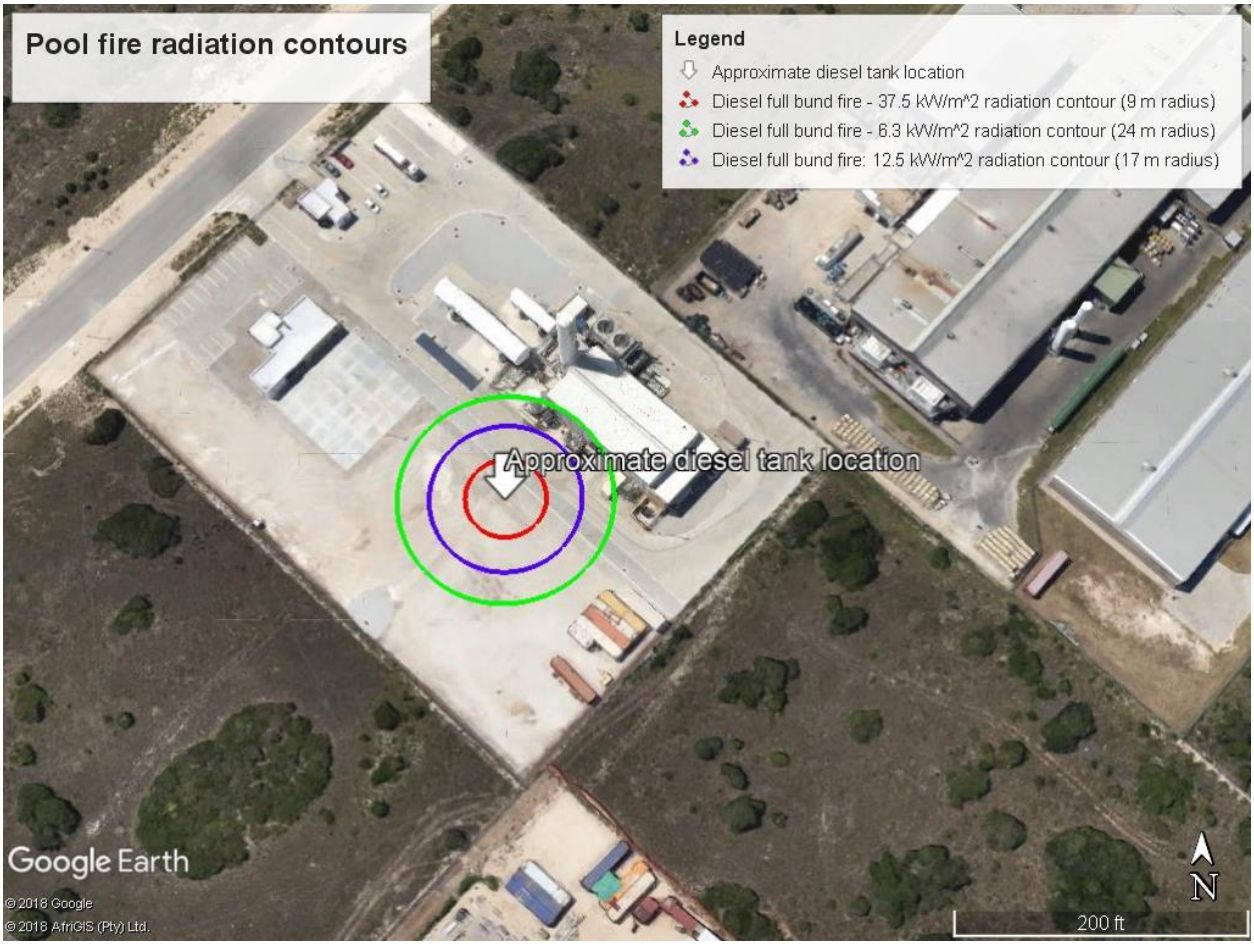

Figure 7.5: Diesel full bund fire – pool fire radiation contours (high wind speed 9 m/s)

7.5 Consequences for carbon dioxide

Losses of containment of carbon dioxide would result in the dispersion of asphyxiating vapour as shown in Figure 7.6. The maximum extent of a CO_2 would be in the region of 20 metre radius and the contour would not be expected to reach off site for a low wind speed of 1.5 m/s, which represents the most conservative conditions for atmospheric dispersion. The administration building as well as future Filling Halls would be impacted. Personnel in those areas would either be instructed to shelter in place (e.g. in the administration building, with ventilation systems off to prevent ingress of CO_2 into the building) or to evacuate to an appropriate assembly point away from the area.

Within the contour, personnel exposed to the vapour may experience asphyxiation effects described in Section 3.3.1 which may, in the worst-case lead to loss of consciousness and potential death. Personnel responding to the incident would have to be equipped with sufficient personal protective equipment (PPE) including breathing apparatus to mitigate against the impact of the gas.

Figure 7.6: Asphyxiant vapour dispersion – future CO_2 vessel catastrophic rupture

7.6 Effect of ingress of hydrocarbon vapour into ASU process

The ingress of hydrocarbon vapour – such as from normal venting of the diesel tank proposed to be located onsite, may result in a fire or explosion hazard affecting the ASU and associated equipment.

If hydrocarbon vapour were to be in contact with oxygen, MMRisk is of the opinion that the concentration of oxygen would far exceed that of hydrocarbon vapour (which would be in trace amounts) and therefore the mixture would be too rich in oxygen to combust.

However, were the hydrocarbon vapours to be in contact with air, such as in the atmosphere or the MAC there could be the risk of explosion within the ASU. Due to the hydrocarbon vapours likely being present only in trace amounts, the inventory of hydrocarbon vapour available for fire or explosion would be limited and therefore the effects would unlikely result in a major release, but rather on equipment damage.

The system contains mitigation measures against this event, with the presence of filters and molecular sieves in the process, as well as principles of inherently safer operation preventing the presence of hydrocarbon vapours.

8 FREQUENCY ANALYSIS

"The likelihood of things going wrong is analysed in this section."

Frequency analysis means the analysis of the likelihood that an event will occur. There are several techniques possible to determine the likelihood of events taking place. The technique used in this report is based on previous accidents. Scenarios are based on previous losses of containment and have been summarised in the SANS 1461:2018 standard. Frequencies of failure published in the BEVI publication [7] (Module C Section 3 of that publication) were applied.

This likelihood is based upon previous accidents for similar materials and equipment, and the manner of failure.

Furthermore, frequency data published is often generic and several facility-specific factors must be considered. This has been done in this study by way of event tree analysis, which will be elaborated further in this section.

8.1 Failure data used

The following base frequency data was applied in the study:

Table 8.1: Base Frequencies applied to modelling scenarios

Type of Equipment	System	Scenario	Base Frequency
Fixed storage or processing units at atmospheric pressure or lower (for example, tanks, blending vessels) and atmospheric transport units (for example, standard road tankers, intermediate bulk containers (IBCs)	Diesel storage	1a) Catastrophic rupture (with bund overtopping if necessary).	5.00E-06
		1b) ROAD TANKER Instantaneous release of contents (Each compartment is considered a tank, so frequency is divided by the number of compartments)	1.00E-05
		2a) Entire contents released in 10 min or large hole in the processing unit (a large hole is typically the size of the largest appurtenance on the processing unit).	5.00E-06
		2b) Atmospheric transport units – release of entire contents from the largest connection	5.00E-07
		3a) Small hole in vessel (leak typically 10 mm diameter).	1.00E-04
Fixed storage or processing units classified as	All pressurised process and	1) Catastrophic rupture with instantaneous failure (including a boiling liquid expanding vapour explosion (BLEVE) where applicable).	5.00E-07

Type of Equipment	System	Scenario	Base Frequency
pressure vessels (for example, reactors, storage spheres) and pressurized transport units (for example, pressurized road tankers, includes movable cylinders as well as large volume transport cylinders)	storage vessels and cylinders	2) Entire contents released in 10 min or large hole in the processing unit (a large hole is typically the size of the largest appurtenance on the processing unit).	5.00E-07
		3) Small hole in vessel (leak typically 10 mm diameter).	1.00E-05
		4) Pressure safety valve release (if applicable).	2.00E-05
Additional scenarios: Loading into tankers	All road tankers	1) Rupture of loading/unloading hose (per hour)	4.00E-06
		2) Leak in loading/unloading hose with an effective diameter of 10% of the nominal diameter, up to a maximum of 50 mm. (per hour)	4.00E-05
		3a) Atmospheric tanker - Instantaneous release of entire contents, pool fire (per hour)	5.80E-09
		3b) Pressurised tanker - Instantaneous release of entire contents, BLEVE (per hour)	5.80E-10
Pipe, hose, arm (onsite pipelines, including cylinder filling operations) PER METRE PER YEAR	All pipework	1) Pipeline, hose, arm full bore rupture.	1.00E-07
		2) Small hole in pipeline, hose, arm (typically a leak with effective diameter of 10 % to 50 % of the pipeline diameter).	5.00E-07
Heat Exchangers (hazardous material in pipes and design pressure of shell is less than maximum pressure of piped material.	Reboiler	1) Rupture of 10 pipes at the same time	1.00E-05
		2) Rupture of 1 pipe	1.00E-03
		3) Leak with an effective diameter of 10% of the nominal diameter of one pipe, up to a maximum of 50 mm	1.00E-02
Distillation Column	Distillation column	1) Instantaneous release of entire contents of the column	5.00E-06
		2) Release of entire contents in 10 minutes in a continuous stream	5.00E-06
		3) Continuous release from a hole with an effective diameter of 10 mm	1.00E-04

8.2 Determining final frequency of each failure scenario

8.2.1 Fraction of year hazard exists onsite

For several of the scenarios, the hazards are not present for 100% of the time in a year. For such scenarios a factor was multiplied to the base frequency according to the time present on site. These factors were dependent upon the nature of the hazard and considering the site's operating hours summarised in Section 2.2.

8.2.2 Event Tree Analysis

Event Tree Analysis is a process which allows for the application of control factors to release scenarios to reduce their frequency of occurrence. In this technique the base frequencies (see Section 8.1) are multiplied by their respective control factors. For flammable materials categories include the probability of immediate or delayed ignition, and/or the probability that no ignition will occur. Event trees were used for instantaneous as well as continuous releases of flammable liquid (in the case of diesel) as shown in Figure 8.1 which follows; the following options which represent the branches in the Event Trees were used in determining final frequencies:

- Probability of early ignition;
- Probability of delayed ignition;
- Probability of encountering confinement/ congestion.

The probabilities for the various branches of the Event Trees used were derived from SANS 1461:2018 as well as the BEVI publication and modelled within DNVGL Safeti software.

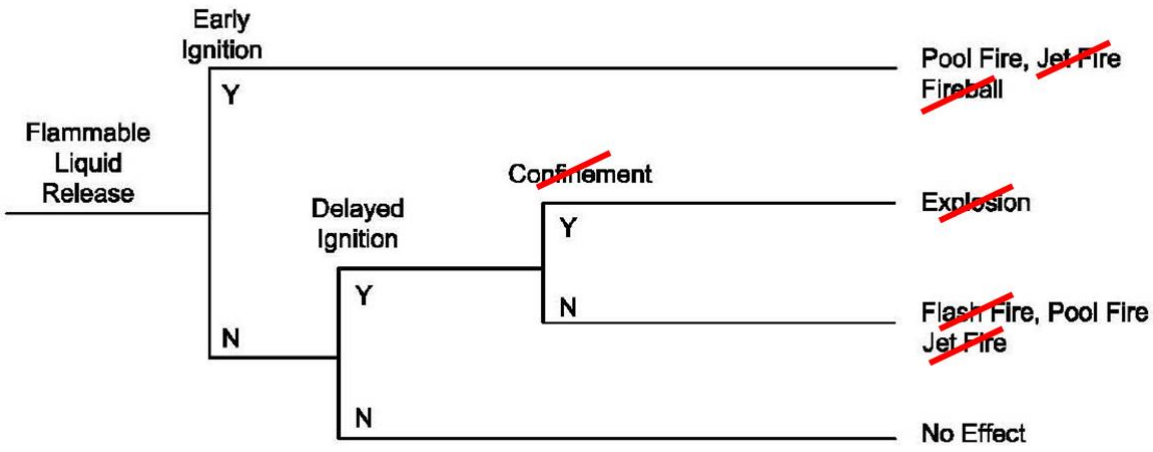

Figure 8.1: Event Tree used to determine final frequencies (release of flammable liquid, such as diesel)

For non-flammable gases the event tree factors would include such factors as probability that control factors would work. In this assessment, those factors impacted the inventory of gas released, as well as the probability of an event occurring, based on the assumed probability of failure of safety systems discussed in Section 5.6.

8.2.3 Estimation of the probability of a major incident

The event tree shown above illustrates how an initial release frequency can be factored down to a final frequency. An example calculation is:

Consider a leak through a length of pipework leading to a continuous release of a flammable liquid such as diesel, with a base frequency of f_{pipe}.

To calculate the final frequencies of the various possible end results of the leak, the following arithmetic was performed based on the event tree.

- To find the probability of an early pool fire → $f_{early\ pool\ fire} = f_{pipe} * P_{early\ ignition}$
- To find the probability of a pool fire with late ignition (late pool fire) → $f_{late\ pool\ fire} = f_{pipe} * (1 - P_{early\ ignition})$
- Etc.

This logic was applied to all leak frequencies listed in Section 8.1.

9 RISK RESULTS

In this study, risk has been calculated and presented in three forms:

- Individual Risk – the risk of death or serious injury based on the location of an individual, illustrated by risk contours around an installation. This calculation does not consider the actual population in an area but quantifies risk of death and injury were a person to be located at various points around the site.

- Societal Risk – the risk of death or serious injury of a population, illustrated by an 'FN-Curve'. Societal risk takes into account populations around a facility and determines the maximum possible number of fatalities, the scenarios and associated frequencies of each scenario, expressed cumulatively on an FN-Curve. This will be illustrated in Section 9.3.

- Land-use Planning – Individual risk can also be used to determine the appropriateness of land uses around MHI facilities. To this end, the risk levels of 1×10^{-5}, 1×10^{-6} and 3×10^{-7} have been used as a basis for judging the appropriateness of land use around site.

Day and Night – the risk calculations take into account the operations that occur mainly during the day and those that occur mainly during the night, as well as population distribution during the day and during the night.

9.1 Interpreting the risk results

The reader is referred to Section 3.5 for a full description of the methodology used and the criteria for assessing risk as broadly acceptable, intolerable, or Tolerable if it can be proven to be As Low As Reasonably Practicable (ALARP).

9.2 Individual Risk Results

The individual risk contours illustrated in the figures below are of the type 'Location Specific Individual Risk (LSIR)' contours. These show the chance of death of a theoretical person if they are positioned at a location 24 hours per day, 365 days per year. LSIR is an overstatement of risk which is widely accepted as sufficiently conservative. In reality, workers will spend the length of a shift per day and not the entire day. However, when a worker is off, another worker may replace her in doing her task, therefore, overall it can be considered that there is an individual at that point or area, all the time.

The risk acceptability criteria are described in Section 3.5.1 and the individual risk profiles for the site are illustrated in Figure 9.1.

Individual risk for those located outdoors

Figure 9.1 illustrates individual risk of death for those located outdoors; being located outdoors implies a lack of shielding for asphyxiating vapour as well as thermal radiation exposure, as would be the case for those located indoors. The contours extend as follows:

Individual Risk Contour	Associated tolerability	Observations
1 x 10^{-6} / year	Below this level, risk is broadly acceptable for members of the public. This is the indicator for whether or not the site is a Major Hazard Installation.	The contour does not extend beyond the site and is concentrated around the proposed diesel installations.
3 x 10^{-7} / year	At this level, risk is broadly acceptable, but an indicator of appropriateness of land-use (see Section 9.5)	This contour is limited to the site, around the diesel tank as well as around the distillation column.
1 x 10^{-8} and 1 x 10^{-9}/ year	At these risk levels, risk is broadly acceptable.	These are limited to the site primarily over the bulk oxygen and nitrogen storage and diesel tank, for both Oxygen storage Options.

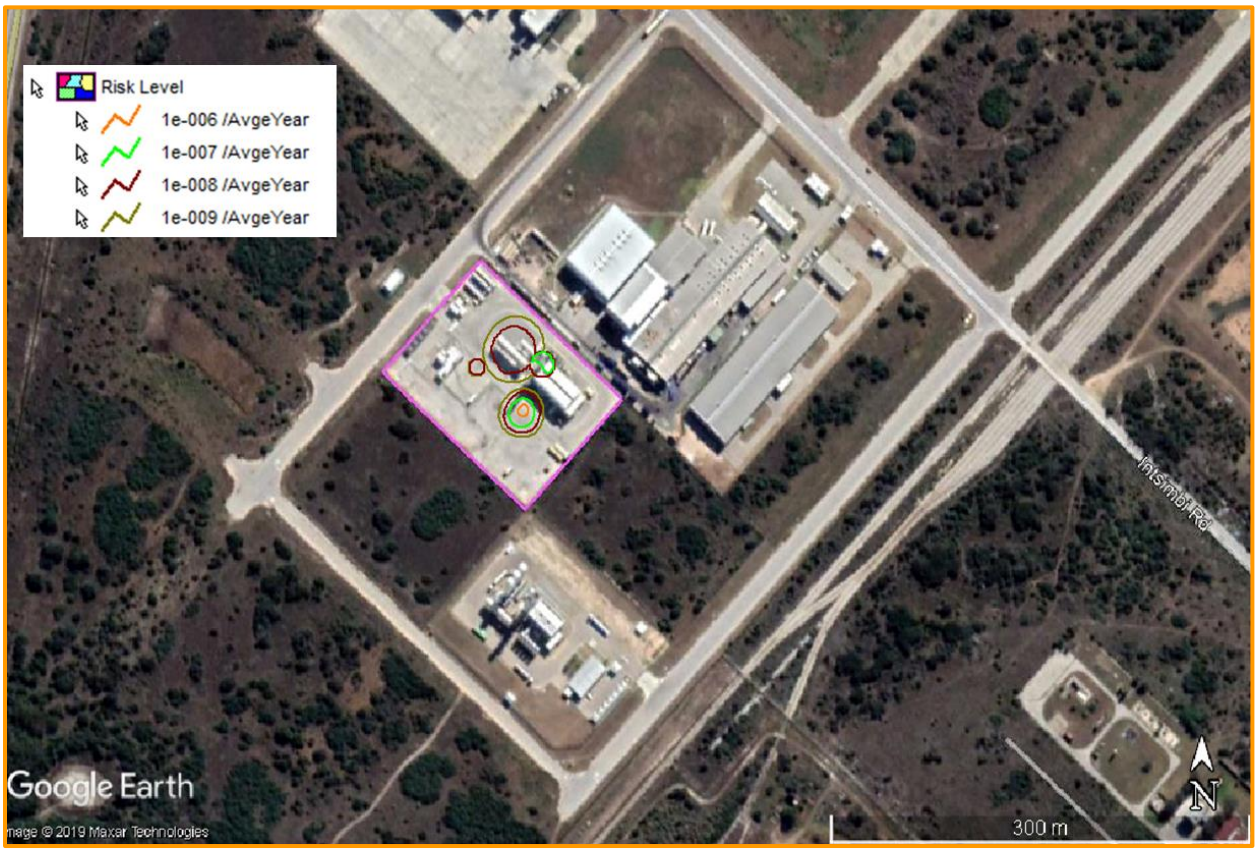

Figure 9.1: Individual Risk Contours for personnel located outdoors

9.3 Societal risk results

Societal risk considers populations around the site to determine risk tolerability. In this study, this is presented in the form of an FN-Curve, which illustrates scenarios with the potential to cause death, as well as considers the frequency of each scenario. The frequencies of the scenarios are then summed to show a cumulative risk of death, i.e. the frequency (F) of causing N or more fatalities against the number of fatalities, N.

As illustrated in Figure 9.2 there are tolerability limits as suggested by SANS 1461:2018 (see Section 3.5.2), as illustrated by the red and blue sloped lines. Above the red line is the region where societal risk is intolerable; below the blue line is the region where societal risk is broadly acceptable. Between these lines is the region where risk can be tolerated if it is proven to be ALARP (see Section 3.5.2).

Description of the site's FN Curve (societal risk results)

Day time societal risk is based upon activities onsite which take place only during the day and upon day-time population levels, and similarly nighttime risk is based upon activities taking place at night and on populations of people during the night. The FN Curve given below is a combination of daytime and nighttime risk.

As seen in Figure 9.2, risk is broadly acceptable, with the maximum number of fatalities for a single event expected to be = 1, and with that event having an associated frequency of approximately 2×10^{-8} events / year.

Societal risk was assessed to be low based on the nature of the products – consequences contributing to fatalities would be expected to extend a relatively small distance from the leak source(s) in the case of asphyxiants. Furthermore, the relatively low likelihood of occurrence of events due to the safety systems available onsite contributed to the low societal risk.

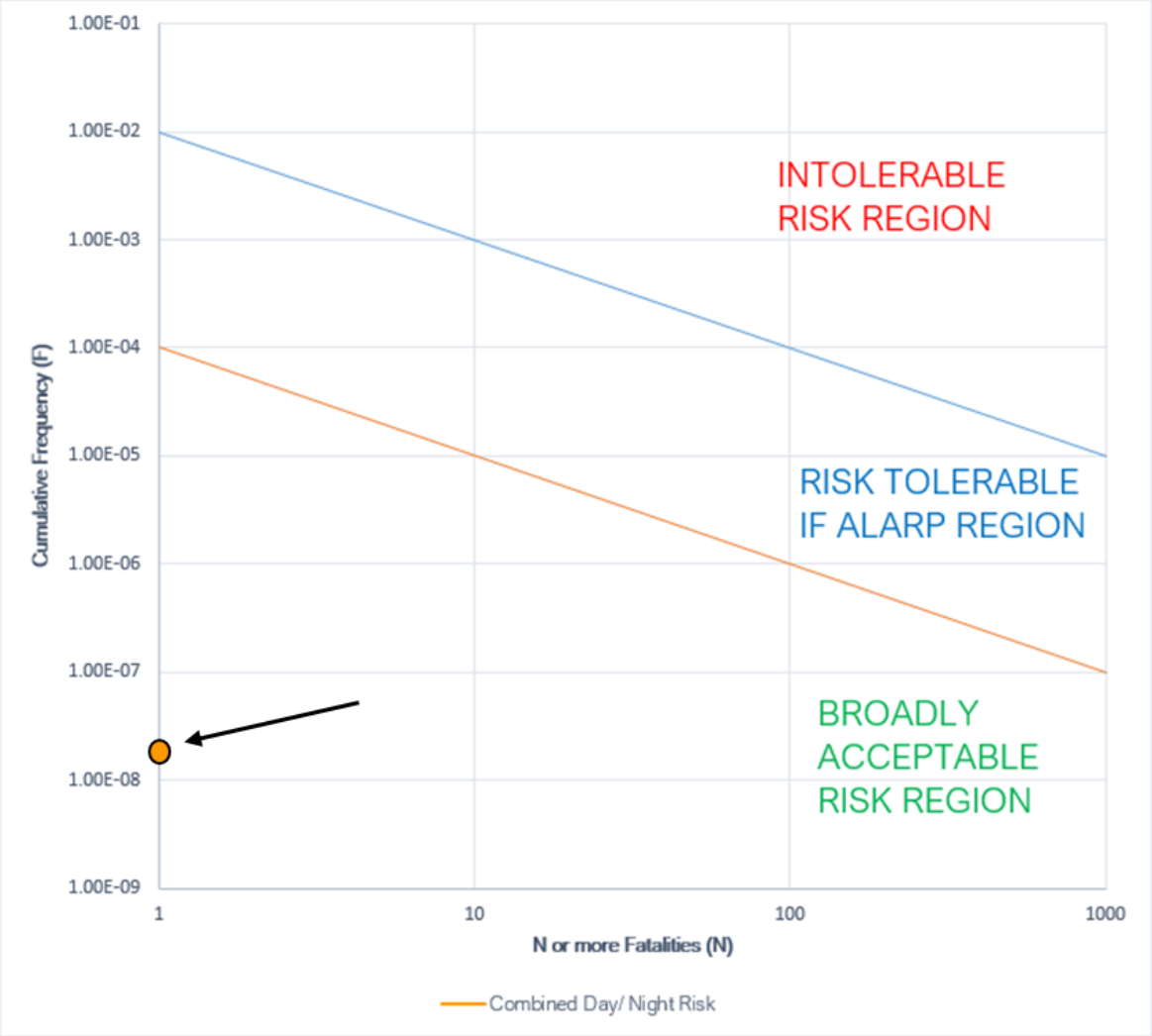

Figure 9.2: FN Curve illustrating societal risk level of the site

9.4 Risk Judgement and Treatment

9.4.1 Risk Judgement

This section provides a judgement of the risk results shown in Sections 9.2 and 9.3.

9.4.1.1 Judgement of Consequences

The consequences (Section 7) showed that oxygen losses of containment could have impact on Dynamic Commodities to the north of the site. These include consequences for the current case, future Option 1 and future Option 2.

Diesel losses of containment were shown to have potential thermal radiation impact on the site's main road and the ASU building but not offsite. Methods of reducing risk to personnel should be investigated and potential methods are shown in Section 9.4.2.

9.4.1.2 Judgement of Individual Risk Levels

Individual risk (Section 9.2) was assessed to be broadly acceptable for personnel and members of the public.

9.4.1.3 Judgement of Societal Risk levels

Societal risk (Section 9.3) was assessed to be broadly acceptable considering populations on and offsite.

9.4.2 Risk Treatment

This section provides options for risk treatment and includes a statement of existing safeguards.

9.4.2.1 Risk Reduction options

Based on the consequence effects shown in Section 7, it would be recommended to find ways to reduce the impact of diesel fires on personnel in the vicinity of the administration building. Options for reducing risk may include:

- Recommended safeguard: Storing fire-fighting foam onsite for use – this may be in the form of portable foam-canon to be used during emergencies involving the diesel tank. In such cases, foam can be spread over the flammable pool to prevent generation of flammable vapour in case of a spill and to fight diesel fires should ignition take place.

- Recommended safeguards: Other safeguards may be applied as recommended in SANS 10089 standard.

9.5 Land Use Planning

The concept of Land-Use Planning is discussed in Section 3.5.3; the purpose of Land-Use Planning section is to inform future land use around the site and to provide a basis for opposing (if necessary) future developments around the site. The Inner, Middle and Outer Zones are defined in SANS 1461:2018 as follows:

- Outer Zone: The zone between the $1x10^{-6}$ and $3x10^{-7}$ / year individual risk contours;
- Middle Zone: The zone between the $1x10^{-5}$ and $1x10^{-6}$ / year individual risk contours;

- Inner Zone: Inside the $1x10^{-5}$ / year individual risk contour.

None of the zones extend offsite for the site, indicating no specific land-use restrictions around the site.

10 EMERGENCY RESPONSE DATA

The site's Emergency Response Plan was assessed against:

- The requirements of **Provision 6. (1) of the MHI Regulations**, and
- The South African National Standard **(SANS) 1514: Emergency Response Planning for Major Hazard Installations**.

The main gaps identified in the evaluation were as follows:

Table 10.1: Results of ERP evaluation against legislation (see also Appendix E)

Regulation	Requirement	Comment
MHI Regulation 6 (1) (c)	"… review the on-site emergency plan and, where necessary, update the plan, in consultation with the relevant local government, at least once every three years; …"	The ERP mentions the intention to update and review the plan periodically, however, MMRisk was unable to identify the interval of such update / review, in the plan. **MMRisk recommends that the interval of review / update be mentioned in the ERP.**
MHI Regulation 6 (1) (d)	sign a copy of the on-site emergency plan in the presence of two witnesses, who shall attest the signature;(this just needs to be done in the presents of witnesses, but it will be best to choose people who are important to the documentation details)	A signature page exists with space for 2 signatures: Site manager and Site Emergency Coordinator. The MHI Regulations require a third signature such that 2 witnesses have signed. **MMRisk would recommend the addition of another signature field such that the Site Emergency Coordinator and the third signee are the two witnesses required by this regulation.**
6.1.5	The results from the risk management process shall be used as the basis of determining scenarios for emergency preparedness and response plans.	MMRisk recommends that, where applicable, information from the MHI Risk Assessment be incorporated into the ERP such that emergency procedures are based on results from the MHI Risk Assessment, as applicable.

11 RECOMMENDATIONS / RISK REDUCTION MEASURES

Based on the risk analysis herein, the following recommendations are made:

Recommendation Number:	1
Recommendation wording:	Carry out advertisement and notification as required by provision 2(1) of the MHI Regulations.
Rationale:	MMRisk declares the site a Major Hazard Installation because the 1% fatality probability contours illustrated in Section 7: Consequence Analysis extended beyond the boundary of the site.
Priority:	High

Recommendation Number:	2
Recommendation wording:	Consider procuring and storing fire-fighting foam onsite (for future diesel installation).
Rationale:	Fire-fighting foam in this case may be in the form of portable foam-canon to be used during emergencies involving the diesel tank. In such cases, foam can be spread over the flammable pool to prevent generation of flammable vapour in case of a spill and to fight diesel fires should ignition take place. Other measures can be explored as required by SANS 10089-1.
Priority:	Medium

Recommendation Number:	3
Recommendation wording:	Update the Emergency Response Plan considering the future installations onsite
Rationale:	There are several installations being planned and an update of the site's Emergency Response Plan would be necessary to ensure emergency procedures are proportional to the risk onsite.
Priority:	Medium

- END OF MAIN REPORT BODY -

MMrisk

Ai03-REP-MHI-1

APPENDICES

A: Proof of Competency

B: Material Safety Data Sheets (MSDSs)

C: The MHI Regulations

D: The Emergency Response Plan (ERP)

E: Evaluation Table for ERP

F: Layout Diagrams for future Oxygen storage (Options 1 and 2)

APPENDIX A:

Proof of Competency

labour

Department:
Labour
REPUBLIC OF SOUTH AFRICA

National Department of Labour
Republic of South Africa

APPROVED INSPECTION AUTHORITY

Registered in accordance with the provisions of the Occupational Health and Safety Act, Act 85 of 1993, as amended and the Major Hazard Installation Regulations.

This is to certify that:

MMRISK (PTY) LTD

has been registered by the Department of Labour as an Approved Inspection Authority: Type A, to conduct Major Hazard Installation Risk Assessment, in terms of Regulation 5(5)(a), of the Major Hazard Installation Regulations.

CONDITIONS OF REGISTRATION:

- The AIA must at all time comply with the requirements of the Occupational Health and Safety Act, Act 85 of 1993, as amended.
- This registration certificate is not transferable.
- This registration will lapse if there is a name change of the AIA or change in ownership.

CHIEF INSPECTOR

Valid from: **12 November 2018**
Expires: **11 October 2022**
Certificate Number: **CI MHI 0013**

sanas
South African National Accreditation System

CERTIFICATE OF ACCREDITATION

In terms of section 22(2)(b) of the Accreditation for Conformity Assessment, Calibration and Good Laboratory Practice Act, 2006 (Act 19 of 2006), read with sections 23(1), (2) and (3) of the said Act, I hereby certify that: -

MMRISK (PTY) LTD
Co. Reg. No.: 2016/516497/07
CENTURION

Facility Accreditation Number: **MHI0037**

is a South African National Accreditation System Accredited Inspection Body to undertake **TYPE A** inspection provided that all SANAS conditions and requirements are complied with

This certificate is valid as per the scope as stated in the accompanying schedule of accreditation, Annexure "A", bearing the above accreditation number for

THE ASSESSMENT OF RISK ON MAJOR HAZARD INSTALLATIONS

The facility is accredited in accordance with the recognised International Standard

ISO/IEC 17020:2012

The accreditation demonstrates technical competency for a defined scope and the operation of a management system

While this certificate remains valid, the Accredited Facility named above is authorised to use the relevant SANAS accreditation symbol to issue facility reports and/or certificates

Mr R Josias
Chief Executive Officer

Effective Date: 12 October 2018
Certificate Expires: 11 October 2022

This certificate does not on its own confer authority to act as an Approved Inspection Authority as contemplated in the Major Hazard Installation Regulations. Approval to inspect within the regulatory domain is granted by the Department of Labour.

ANNEXURE A

SCHEDULE OF ACCREDITATION

Facility Number: MHI0037

TYPE A

Permanent Address: MMRisk (Pty) Ltd 1234 Sand Hills Close Copperleaf Centurion 0149 Cell: 072 596 3181 E-mail: motlatsimabaso@gmail.com	**Postal Address:** P O Box 89228 Heuweloord Centurion 0173 Issue No.: 01 Date of issue: 12 October 2018 Expiry date: 11 October 2022	
Nominated Representative: Mr M Mabaso **Quality Manager:** Mr M Mabaso	**Technical Manager:** Mr M Mabaso	**Technical Signatory:** Mr M Mabaso
Field of Inspection	**Service Rendered**	**Codes and Regulations**
Regulatory: The supply of services as an Inspection Authority for Major Hazard Risk Installation as defined in the Major Hazard Risk Installation Regulations, Government Notice No. R692 of 30 July 2001	Major Hazard Installation Risk Assessments for the following material categories: 2) Gases: i) Flammable Gases ii) Non-flammable, non-toxic gases (asphyxiants) iii) Toxic gases 3) Flammable liquids 4) Flammable solids, substances liable to spontaneous combustion, substances that on contact with water release flammable gases	MHI Regulation par. 5 (5) (b) i) Frequency/Probability Analysis ii) Consequence Modelling iii) Hazard Identification and Analysis vi) Emergency planning reviews Guideline for quantitative risk assessment "Purple Book" CPR 18E, first edition 1999 A guide for the Control of Major Accident Hazard Regulations 1999, UK HSE.

Original date of accreditation: 12 October 2018

ISSUED BY THE SOUTH AFRICAN NATIONAL ACCREDITATION SYSTEM

Accreditation Manager

APPENDIX B:

Material Safety Data Sheets (MSDSs)

OXYGEN

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	:	OXYGEN
Chemical formula	:	O2
Synonyms	:	Oxygen, Oxygen gas, Gaseous Oxygen, GOX
Use of the substance/preparation	:	General Industrial
Manufacturer/Importer/Distributor	:	Air Products South Africa (Pty) Ltd. Silver Stream Business Park, 1st Floor, Building 3, 10 Muswell Road South, Bryanston, 2191
Telephone	:	+27 (0)11 570 5000 (Head Office) +27 (0)11 977 6444 (Customer Care Cylinders) 0800 023 298 (Engineering / Bulk Services)
Emergency telephone Number (24h)	:	0800 650 315

2. COMPOSITION / INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Volume)
Oxygen	7782-44-7	100 %

Concentration is nominal. For the exact product composition, please refer to Air Products technical specifications.

3. HAZARDS IDENTIFICATION

Main Hazard / Emergency Overview

High pressure, oxidizing gas.

Vigorously accelerates combustion.

Keep oil, grease, and combustibles away.

May react violently with combustible materials.

Potential Health Effects

Inhalation	:	Breathing 75% or more oxygen at atmospheric pressure for more than a few hours may cause nasal stuffiness, cough, sore throat, chest pain and breathing difficulty. Breathing pure oxygen under pressure may cause lung damage and also central nervous system effects.
Eye contact	:	No adverse effect.
Skin contact	:	No adverse effect.
Ingestion	:	Ingestion is not considered a potential route of exposure.
Aggravated Medical Condition	:	If oxygen is administered to persons with chronic obstructive pulmonary disease, raising the oxygen concentration in the blood depresses their breathing and raises their retained carbon dioxide to a dangerous level.

4. FIRST AID MEASURES

General advice	:	Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
Eye contact	:	Seek medical advice.
Skin contact	:	Seek medical advice.
Ingestion	:	Ingestion is not considered a potential route of exposure.
Inhalation	:	Consult a physician after significant exposure. Move to fresh air. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	All known extinguishing media can be used.
Specific hazards	:	Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Oxidant. Strongly supports combustion. May react violently with combustible materials. Some materials which are noncombustible in air may burn in the presence of an oxidizer. Move away from container and cool with water from a protected position. Keep adjacent cylinders cool by spraying with large amounts of water until the fire burns itself out. If possible, stop flow of product.
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.
Further information	:	Some materials that are noncombustible in air will burn in the presence of an oxygen enriched atmosphere (greater than 23.5%). Fire resistant clothing may burn and offer no protection in oxygen rich atmospheres.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Clothing exposed to high concentrations may retain oxygen 30 minutes or longer and become a potential fire hazard. Stay away from ignition sources. Evacuate personnel to safe areas. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ventilate the area.
Environmental precautions	:	Do not discharge into any place where its accumulation could be dangerous. Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	:	Ventilate the area.
Additional advice	:	If possible, stop flow of product. Increase ventilation to the release area and monitor concentrations. If leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

7. HANDLING AND STORAGE

Handling

All gauges, valves, regulators, piping and equipment to be used in oxygen service must be cleaned for oxygen service. Oxygen is not to be used as a substitute for compressed air. Never use an oxygen jet for cleaning purposes of any sort, especially clothing, as it increases the likelihood of an engulfing fire. Only experienced and properly instructed persons should handle compressed gases. Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C. Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Do not remove valve guards. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container.

If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Do not smoke while handling product or cylinders. Never recompress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in piping. Never permit oil, grease, or other readily combustible substances to come into contact with valves or containers containing oxygen or other oxidants. Do not use rapidly opening valves (e.g. ball valves). Open valve slowly to avoid pressure shock. Never pressurize the entire system at once. Use only with equipment cleaned for oxygen service and rated for cylinder pressure. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C. Prolonged periods of cold temperature below -30°C should be avoided.

Storage

Containers should be stored in a purpose built compound which should be well ventilated, preferably in the open air. Full containers should be stored so that oldest stock is used first. Stored containers should be periodically checked for general condition and leakage.

Observe all regulations and local requirements regarding storage of containers. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Keep containers tightly closed in a cool, well-ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C. Display "No Smoking or Open Flames" signs in the storage areas. Return empty containers in a timely manner.

Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance with local regulations.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Ensure adequate ventilation.

Personal protective equipment

Respiratory protection	:	Users of breathing apparatus must be trained.
Hand protection	:	Sturdy work gloves are recommended for handling cylinders. The breakthrough time of the selected glove(s) must be greater than the intended use period.
Eye protection	:	Safety glasses recommended when handling cylinders.
Skin and body protection	:	Safety shoes are recommended when handling cylinders.
Special instructions for protection and hygiene	:	Ensure adequate ventilation, especially in confined areas. Gloves must be clean and free of oil and grease.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	Compressed gas.
Color	:	Colorless gas
Odor	:	No odor warning properties.
Molecular Weight	:	32 g/mol
Relative vapor density	:	1.1 (air = 1)
Relative density	:	1.1 (water = 1)
Vapor pressure	:	Not applicable.
Density	:	0.0013 g/cm^3 at 21 °C Note: (as vapor)
Specific Volume	:	0.7540 m^3/kg at 21 °C
Boiling point/range	:	-183 °C
Critical temperature	:	-118 °C
Melting point/range	:	-219 °C
Autoignition temperature	:	Not applicable.
Water solubility	:	0.039 g/l

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions.
Materials to avoid	:	Flammable materials. Organic materials. Avoid oil, grease and all other combustible materials.

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Ingestion	:	No data is available on the product itself.
Inhalation	:	No data is available on the product itself.
Skin	:	No data is available on the product itself.

Chronic Health Hazard

Premature infants exposed to high oxygen concentrations may suffer delayed retinal damage that can progress to retinal detachment and blindness. Retinal damage may also occur in adults exposed to 100% oxygen for extended periods (24 to 48 hr). At two or more atmospheres central nervous system (CNS) toxicity occurs.

Symptoms include nausea, vomiting, dizziness or vertigo, muscle twitching, vision changes and loss of consciousness and generalized seizures. At three atmospheres, CNS toxicity occurs in less than two hours and at six atmospheres in only a few minutes.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity	:	No data is available on the product itself.
Toxicity to other organisms	:	No data available.

Persistence and degradability

Mobility	:	No data available.
Bioaccumulation	:	No data is available on the product itself.

Further information

No ecological damage caused by this product.

13. DISPOSAL CONSIDERATIONS

Waste from residues/ unused products	:	Return unused product in original cylinder to supplier. Contact supplier if guidance is required.
Contaminated packaging		Return cylinder to supplier.

14. TRANSPORT INFORMATION

ADR

Proper shipping name	:	OXYGEN, COMPRESSED
Class	:	2.2 (5.1)
UN/ID No.	:	UN1072
Class	:	2
ADR/RID Hazard ID no.	:	25

IATA

Proper shipping name	:	Oxygen, compressed
Class	:	2.2 (5.1)
UN/ID No.	:	UN1072

IMDG

Proper shipping name	:	OXYGEN, COMPRESSED
Class	:	2.2 (5.1)
UN/ID No.	:	UN1072

RID

Proper shipping name : OXYGEN, COMPRESSED

Class : 2.2 (5.1)

UN/ID No. : UN1072

Further Information

Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact an Air Products customer service representative.

15. REGULATORY INFORMATION

OHS Act	:	Occupational Health and Safety Act 85 of 1993 (and Regulations)
SANS 10265	:	The classification and labelling of dangerous substances and preparations for sale and handling
SANS 10019	:	Transportable containers for compressed, dissolved and liquefied gases – Basic design, manufacture, use and maintenance
SANS 1518	:	Transport of dangerous goods – Design, construction, testing, approval and maintenance of road vehicles and portable tanks
SANS 10228	:	The identification and classification of dangerous goods for transport
SANS 10229-1&2	:	Transport of dangerous goods – Packaging and large packaging for road and rail transport Part 1: Packaging / Part 2: Large Packaging
SANS 10263-2	:	The warehousing of dangerous goods Part 2: The storage and handling of gas cylinders

NB: Refer to latest edition

16. OTHER INFORMATION

Hazard symbol	:	O Oxidizing
R-phrase(s)	:	R 8 Contact with combustible material may cause fire.
S-phrase(s)	:	S17 Keep away from combustible material.

Ensure all national/local regulations are observed.

Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

(Reference www.airproducts.com :- Air Products PLC OXYGEN
MSDS Number 300000000110 / Version 1.15 / Revision Date 01.04.2009)

NITROGEN

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	:	Nitrogen
Chemical formula	:	N2
Synonyms	:	Nitrogen, Nitrogen gas, Gaseous Nitrogen, GAN
Use of the substance/preparation	:	General Industrial
Manufacturer/Importer/Distributor	:	Air Products South Africa (Pty) Ltd. Silver Stream Business Park, 1st Floor, Building 3, 10 Muswell Road South, Bryanston, 2191
Telephone	:	+27 (0)11 570 5000 (Head Office) +27 (0)11 977 6444 (Customer Care Cylinders) 0800 023 298 (Engineering / Bulk Services)
Emergency telephone Number (24h)	:	0800 650 315

2. COMPOSITION / INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Volume)
Nitrogen	7727-37-9	100 %

Concentration is nominal. For the exact product composition, please refer to Air Products technical specifications.

3. HAZARDS IDENTIFICATION

Main Hazard / Emergency Overview

High pressure gas.

Simple asphyxiant - Can cause rapid suffocation.

Self contained breathing apparatus (SCBA) may be required.

Potential Health Effects

Inhalation	:	In high concentrations may cause asphyxiation. Asphyxiation may bring about unconsciousness without warning and so rapidly that victim may be unable to protect themselves.
Eye contact	:	No adverse effect.
Skin contact	:	No adverse effect.
Ingestion	:	Ingestion is not considered a potential route of exposure.
Chronic Health Hazard	:	Not applicable.
Aggravated Medical Condition	:	None.
Symptoms	:	Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness.

Environmental Effects

Not harmful.

4. FIRST AID MEASURES

General advice	:	Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
Eye contact	:	Not applicable.
Skin contact	:	Not applicable.
Ingestion	:	Ingestion is not considered a potential route of exposure.
Inhalation	:	Remove to fresh air. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. In case of shortness of breath, give oxygen.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	All known extinguishing media can be used.
Specific hazards	:	Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Product is nonflammable and does not support combustion. Move away from container and cool with water from a protected position. Keep containers and surroundings cool with water spray.
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Evacuate personnel to safe areas. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Monitor oxygen level. Ventilate the area.
Environmental precautions	:	Do not discharge into any place where its accumulation could be dangerous. Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	:	Ventilate the area.
Additional advice	:	If possible, stop flow of product. Increase ventilation to the release area and monitor oxygen level. If leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

7. HANDLING AND STORAGE

Handling

Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C. Only experienced and properly instructed persons should handle compressed gases. Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Do not remove valve guards. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container.

Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close valve after each use and when empty. Do not subject containers to abnormal mechanical shocks which may cause damage to their valve or safety devices. Never attempt to lift a cylinder by its valve guard. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Do not smoke while handling product or cylinders. Never re-compress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in piping. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C. Prolonged periods of cold temperature below -30°C should be avoided.

Storage

Full containers should be stored so that oldest stock is used first. Containers should be stored in a purpose built compound which should be well ventilated, preferably in the open air. Stored containers should be periodically checked for general condition and leakage. Observe all regulations and local requirements regarding storage of containers. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Keep containers tightly closed in a cool, well-ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C. Return empty containers in a timely manner.

Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance with local regulations. Keep away from combustible material.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Provide natural or mechanical ventilation to prevent oxygen deficient atmospheres below 19.5% oxygen.

Personal protective equipment

Respiratory protection	:	Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmosphere. Air purifying respirators will not provide protection. Users of breathing apparatus must be trained.
Hand protection	:	Sturdy work gloves are recommended for handling cylinders. The breakthrough time of the selected glove(s) must be greater than the intended use period.
Eye protection	:	Safety glasses recommended when handling cylinders.
Skin and body protection	:	Safety shoes are recommended when handling cylinders.
Special instructions for protection and hygiene	:	Ensure adequate ventilation, especially in confined areas.
Remarks	:	Simple asphyxiant.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	Compressed gas.
Color	:	Colorless gas
Odor	:	No odor warning properties.
Molecular Weight	:	28 g/mol
Relative vapor density	:	0.97 (air = 1)
Vapor pressure	:	Not applicable.
Density	:	0.0012 g/cm^3 at 21 °C Note: (as vapor)
Specific Volume	:	0.8615 m^3/kg at 21 °C
Boiling point/range	:	-196 °C
Critical temperature	:	-147 °C
Melting point/range	:	-210 °C
Water solubility	:	0.02 g/l

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions.
Hazardous decomposition products	:	None.

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Ingestion	:	No data is available on the product itself.
Inhalation	:	No data is available on the product itself.
Skin	:	No data is available on the product itself.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity	:	No data is available on the product itself.
Toxicity to other organisms	:	No data available.

Persistence and degradability

Mobility	:	No data available.
Bioaccumulation	:	No data is available on the product itself.

Further information

No ecological damage caused by this product.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products	:	Contact supplier if guidance is required. Return unused product in original cylinder to supplier.
Contaminated packaging	:	Return cylinder to supplier.

14. TRANSPORT INFORMATION

ADR

Proper shipping name	:	NITROGEN, COMPRESSED
Class	:	2.2
UN/ID No.	:	UN1066
Class	:	2
ADR/RID Hazard ID no.	:	20

IATA

Proper shipping name	:	Nitrogen, compressed
Class	:	2.2
UN/ID No.	:	UN1066

IMDG

Proper shipping name	:	NITROGEN, COMPRESSED
Class	:	2.2
UN/ID No.	:	UN1066

RID

Proper shipping name	:	NITROGEN, COMPRESSED
Class	:	2.2
UN/ID No.	:	UN1066

Further Information

Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact an Air Products customer service representative.

15. REGULATORY INFORMATION

OHS Act	:	Occupational Health and Safety Act 85 of 1993 (and Regulations)
SANS 10265	:	The classification and labelling of dangerous substances and preparations for sale and handling
SANS 10019	:	Transportable containers for compressed, dissolved and liquefied gases – Basic design, manufacture, use and maintenance
SANS 1518	:	Transport of dangerous goods – Design, construction, testing, approval and maintenance of road vehicles and portable tanks
SANS 10228	:	The identification and classification of dangerous goods for transport
SANS 10229-1&2	:	Transport of dangerous goods – Packaging and large packaging for road and rail transport Part 1: Packaging / Part 2: Large Packaging
SANS 10263-2	:	The warehousing of dangerous goods Part 2: The storage and handling of gas cylinders

NB: Refer to latest edition

16. OTHER INFORMATION

R-phrase(s)	:	Not a hazardous substance in accordance with SANS 10265:1999

Ensure all national/local regulations are observed.

Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

(Reference www.airproducts.com :- Air Products PLC Nitrogen
MSDS Number 300000000099 / Version 1.12 / Revision Date 11.05.2008)

CARBON DIOXIDE

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	:	Carbon Dioxide
Chemical formula	:	CO_2
Synonyms	:	Carbon dioxide, Carbonic Anhydride, Carbonic Acid Gas, Carbon Anhydride
Use of the substance/preparation	:	General Industrial
Manufacturer/Importer/Distributor	:	Air Products South Africa (Pty) Ltd.
		Silver Stream Business Park, 1st Floor, Building 3,
		10 Muswell Road South,
		Bryanston, 2191
Telephone	:	+27 (0)11 570 5000 (Head Office)
		+27 (0)11 977 6444 (Customer Care Cylinders)
		0800 023 298 (Engineering / Bulk Services)
Emergency telephone Number (24h)	:	0800 650 315

2. COMPOSITION / INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Volume)
Carbon dioxide	124-38-9	100 %

Concentration is nominal. For the exact product composition, please refer to Air Products technical specifications.

3. HAZARDS IDENTIFICATION

Main Hazard / Emergency Overview

Can cause rapid suffocation.

Compressed liquefied gas.

Avoid breathing gas.

Direct contact with liquid can cause frostbite.

Self contained breathing apparatus (SCBA) may be required.

Potential Health Effects

Inhalation	:	Concentrations of 10% CO_2 or more can produce unconsciousness or death. In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Asphyxiation may bring about unconsciousness without warning and so rapidly that victim may be unable to protect themselves.
Eye contact	:	Contact with liquid may cause cold burns/frost bite.
Skin contact	:	Contact with liquid may cause cold burns/frost bite.
Ingestion	:	Ingestion is not considered a potential route of exposure.
Chronic Health Hazard	:	Not applicable.
Target Organs	:	None.
Symptoms	:	Shivering fit. Sweating. Blurred vision. Headache. Increased pulse rate. Shortness of breath. Rapid respiration. Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness.

4. FIRST AID MEASURES

General advice	:	Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
Eye contact	:	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Keep eye wide open while rinsing. Seek medical advice.
Skin contact	:	Wash frost-bitten areas with plenty of water. Do not remove clothing. Cover wound with sterile dressing.
Ingestion	:	Ingestion is not considered a potential route of exposure.
Inhalation	:	Move to fresh air. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. In case of shortness of breath, give oxygen.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	All known extinguishing media can be used.
Specific hazards	:	Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Product is nonflammable and does not support combustion. Move away from container and cool with water from a protected position. If possible, stop flow of product. Keep adjacent cylinders cool by spraying with large amounts of water until the fire burns itself out.
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Evacuate personnel to safe areas. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ventilate the area. Monitor oxygen level.
Environmental precautions	:	Should not be released into the environment. Do not discharge into any place where its accumulation could be dangerous. Prevent further leakage or spillage. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
Methods for cleaning up	:	Ventilate the area.
Additional advice	:	If possible, stop flow of product. Increase ventilation to the release area and monitor oxygen level. If leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

7. HANDLING AND STORAGE

Handling

Only experienced and properly instructed persons should handle compressed gases. Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C. Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Do not remove valve guards. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container.

Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close valve after each use and when empty. Do not subject containers to abnormal mechanical shocks which may cause damage to their valve or safety devices. Never attempt to lift a cylinder by its valve guard. Always use backflow protective device in piping. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C. Prolonged periods of cold temperature below -30°C should be avoided. Never attempt to increase liquid withdrawal rate by pressurizing the container without first checking with the supplier. Never permit liquefied gas to become trapped in parts of the system as this may result in hydraulic rupture.

Storage

Full containers should be stored so that oldest stock is used first. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place.

Observe all regulations and local requirements regarding storage of containers. Stored containers should be periodically checked for general condition and leakage. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion.

Containers should be stored in a purpose built compound which should be well ventilated, preferably in the open air. Keep containers tightly closed in a cool, well-ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C. Return empty containers in a timely manner.

Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance with local regulations. Keep away from combustible material.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Provide natural or mechanical ventilation to prevent oxygen deficient atmospheres below 19.5% oxygen.

Personal protective equipment

Respiratory protection	:	Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmosphere. Air purifying respirators will not provide protection. Users of breathing apparatus must be trained.
Hand protection	:	Sturdy work gloves are recommended for handling cylinders. The breakthrough time of the selected glove(s) must be greater than the intended use period.
Eye protection	:	Safety glasses recommended when handling cylinders.
Skin and body protection	:	Safety shoes are recommended when handling cylinders.
Special instructions for protection and hygiene	:	Ensure adequate ventilation, especially in confined areas.

Exposure limit(s)

Carbon dioxide	Time Weighted Average (TWA): EH40 WEL	5,000 ppm	9,150 mg/m^3
Carbon dioxide	Short Term Exposure Limit (STEL): EH40 WEL	15,000 ppm	27,400 mg/m^3
Carbon dioxide	Time Weighted Average (TWA): EU ELV	5,000 ppm	9,000 mg/m^3

9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	Liquefied gas.
Color	:	Colorless gas
Odor	:	No odor warning properties.
Molecular Weight	:	44.01 g/mol
Relative vapor density	:	1.519 (air = 1)
Relative density	:	0.82 (water = 1)
Vapor pressure	:	57.30 bar (831.04 psia) at 20 °C
Density	:	0.0018 g/cm^3 at 21 °C Note: (as vapor)
Specific Volume	:	0.5456 m^3/kg at 21 °C
Boiling point/range	:	-88.1 °C
Critical temperature	:	31.1 °C
Melting point/range	:	-56.6 °C
Water solubility	:	2.000 g/l

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions.

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Ingestion	:	No data is available on the product itself.
Inhalation	:	No data is available on the product itself.
Skin	:	No data is available on the product itself.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity	:	No data is available on the product itself.
Toxicity to other organisms	:	No data available.

Persistence and degradability

Mobility	:	No data available.
Bioaccumulation	:	No data is available on the product itself.

Further information

When discharged in large quantities may contribute to the greenhouse effect.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products	:	Return unused product in original cylinder to supplier. Contact supplier if guidance is required.
Contaminated packaging	:	Return cylinder to supplier.

14. TRANSPORT INFORMATION

ADR

Proper shipping name	:	CARBON DIOXIDE
Class	:	2.2
UN/ID No.	:	UN1013
Class	:	2
ADR/RID Hazard ID no.	:	20

IATA

Proper shipping name	:	Carbon dioxide
Class	:	2.2
UN/ID No.	:	UN1013

IMDG

Proper shipping name	:	CARBON DIOXIDE
Class	:	2.2
UN/ID No.	:	UN1013

RID

Proper shipping name	:	CARBON DIOXIDE
Class	:	2.2
UN/ID No.	:	UN1013

Further Information

Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact an Air Products customer service representative.

15. REGULATORY INFORMATION

OHS Act	:	Occupational Health and Safety Act 85 of 1993 (and Regulations)
SANS 10265	:	The classification and labelling of dangerous substances and preparations for sale and handling
SANS 10019	:	Transportable containers for compressed, dissolved and liquefied gases – Basic design, manufacture, use and maintenance
SANS 1518	:	Transport of dangerous goods – Design, construction, testing, approval and maintenance of road vehicles and portable tanks
SANS 10228	:	The identification and classification of dangerous goods for transport
SANS 10229-1&2	:	Transport of dangerous goods – Packaging and large packaging for road and rail transport Part 1: Packaging / Part 2: Large Packaging
SANS 10263-2	:	The warehousing of dangerous goods Part 2: The storage and handling of gas cylinders

NB: Refer to latest edition

16. OTHER INFORMATION

R-phrase(s)	:	Not a hazardous substance in accordance with SANS 10265:1999

Ensure all national/local regulations are observed.

Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

(Reference www.airproducts.com :- Air Products PLC Carbon Dioxide
MSDS Number 300000000020 / Version 1.12 / Revision Date 11.05.2008)

ARGON

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	:	Argon
Chemical formula	:	Ar
Synonyms	:	Argon, Argon gas, Gaseous Argon, GAR
Use of the substance/preparation	:	General Industrial
Manufacturer/Importer/Distributor	:	Air Products South Africa (Pty) Ltd. Silver Stream Business Park, 1st Floor, Building 3, 10 Muswell Road South, Bryanston, 2191
Telephone	:	+27 (0)11 570 5000 (Head Office) +27 (0)11 977 6444 (Customer Care Cylinders) 0800 023 298 (Engineering / Bulk Services)
Emergency telephone Number (24h)	:	0800 650 315

2. COMPOSITION / INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Volume)
Argon	7440-37-1	100 %

Concentration is nominal. For the exact product composition, please refer to Air Products technical specifications.

3. HAZARDS IDENTIFICATION

Main Hazard / Emergency Overview

High pressure gas.

Simple asphyxiant - Can cause rapid suffocation.

Self contained breathing apparatus (SCBA) may be required.

Potential Health Effects

Inhalation	:	In high concentrations may cause asphyxiation. Asphyxiation may bring about unconsciousness without warning and so rapidly that victim may be unable to protect themselves.
Eye contact	:	No adverse effect.
Skin contact	:	No adverse effect.
Ingestion	:	Ingestion is not considered a potential route of exposure.
Chronic Health Hazard	:	Not applicable.
Aggravated Medical Condition	:	None.
Symptoms	:	Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness.

Environmental Effects

Not harmful.

4. FIRST AID MEASURES

General advice	:	Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
Eye contact	:	Not applicable.
Skin contact	:	Not applicable.
Ingestion	:	Ingestion is not considered a potential route of exposure.
Inhalation	:	Remove to fresh air. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. In case of shortness of breath, give oxygen.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	All known extinguishing media can be used.
Specific hazards	:	Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Product is non-flammable and does not support combustion. Move away from container and cool with water from a protected position. Keep containers and surroundings cool with water spray.
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level. Evacuate personnel to safe areas. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Monitor oxygen level. Ventilate the area.
Environmental precautions	:	Do not discharge into any place where its accumulation could be dangerous. Prevent further leakage or spillage if safe to do so.
Methods for cleaning up	:	Ventilate the area.
Additional advice	:	If possible, stop flow of product. Increase ventilation to the release area and monitor oxygen level. If leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in the user's system, close the cylinder/source valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

7. HANDLING AND STORAGE

Handling

Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C. Only experienced and properly instructed persons should handle compressed gases. Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Do not remove valve guards. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container.

Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close valve after each use and when empty. Do not subject containers to abnormal mechanical shocks which may cause damage to their valve or safety devices. Never attempt to lift a cylinder by its valve guard. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Do not smoke while handling product or cylinders. Never re-compress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in piping. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C. Prolonged periods of cold temperature below -30°C should be avoided.

Storage

Full containers should be stored so that oldest stock is used first. Containers should be stored in a purpose built compound which should be well ventilated, preferably in the open air. Stored containers should be periodically checked for general condition and leakage. Observe all regulations and local requirements regarding storage of containers. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Keep containers tightly closed in a cool, well-ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C. Return empty containers in a timely manner.

Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance with local regulations. Keep away from combustible material.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Provide natural or mechanical ventilation to prevent oxygen deficient atmospheres below 19.5% oxygen.

Personal protective equipment

Respiratory protection	:	Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmosphere. Air purifying respirators will not provide protection. Users of breathing apparatus must be trained.
Hand protection	:	Sturdy work gloves are recommended for handling cylinders.
		The breakthrough time of the selected glove(s) must be greater than the intended use period.
Eye protection	:	Safety glasses recommended when handling cylinders.
Skin and body protection	:	Safety shoes are recommended when handling cylinders.
Special instructions for protection and hygiene	:	Ensure adequate ventilation, especially in confined areas.
Remarks	:	Simple asphyxiant.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form	:	Compressed gas.
Color	:	Colorless gas
Odor	:	No odor warning properties.
Molecular Weight	:	39.95 g/mol
Relative vapor density	:	1.379 (air = 1)
Vapor pressure	:	Not applicable.
Density	:	0.0017 g/cm^3 at 21 °C Note: (as vapor)
Specific Volume	:	0.6043 m^3/kg at 21 °C
Boiling point/range	:	-185.8 °C
Critical temperature	:	-122.4 °C
Melting point/range	:	-189.3 °C
Water solubility	:	0.061 g/l

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions.
Hazardous decomposition products	:	None.

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Ingestion	:	No data is available on the product itself.
Inhalation	:	No data is available on the product itself.
Skin	:	No data is available on the product itself.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity	:	No data is available on the product itself.
Toxicity to other organisms	:	No data available.

Persistence and degradability

Mobility	:	No data available.
Bioaccumulation	:	No data is available on the product itself.

Further information

This product has no known eco-toxicological effects.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products	:	Contact supplier if guidance is required. Return unused product in original cylinder to supplier.
Contaminated packaging	:	Return cylinder to supplier.

14. TRANSPORT INFORMATION

ADR

Proper shipping name	:	ARGON, COMPRESSED
Class	:	2.2
UN/ID No.	:	UN1006
Class	:	2
ADR/RID Hazard ID no.	:	20

IATA

Proper shipping name	:	Argon, compressed
Class	:	2.2
UN/ID No.	:	UN1006

IMDG

Proper shipping name	:	ARGON, COMPRESSED
Class	:	2.2
UN/ID No.	:	UN1006

RID

Proper shipping name	:	ARGON, COMPRESSED
Class	:	2.2
UN/ID No.	:	UN1006

Further Information

Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact an Air Products customer service representative.

15. REGULATORY INFORMATION

OHS Act	:	Occupational Health and Safety Act 85 of 1993 (and Regulations)
SANS 10265	:	The classification and labelling of dangerous substances and preparations for sale and handling
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SANS 1518	:	Transport of dangerous goods – Design, construction, testing, approval and maintenance of road vehicles and portable tanks
SANS 10228	:	The identification and classification of dangerous goods for transport
SANS 10229-1&2	:	Transport of dangerous goods – Packaging and large packaging for road and rail transport Part 1: Packaging / Part 2: Large Packaging
SANS 10263-2	:	The warehousing of dangerous goods Part 2: The storage and handling of gas cylinders

NB: Refer to latest edition

16. OTHER INFORMATION

R-phrase(s)	:	Not a hazardous substance in accordance with SANS 10265:1999

Ensure all national/local regulations are observed.

Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

(Reference www.airproducts.com :- Air Products PLC Argon
MSDS Number 300000000004 / Version 1.11 / Revision Date 11.05.2008)

APPENDIX C:

The MHI Regulations

Government Gazette

REPUBLIC OF SOUTH AFRICA

Regulation Gazette No. 7122

Vol. 433 Pretoria 30 July 2001 No. 22506

AIDS HELPLINE: 0800-123-22 Prevention is the cure

CONTENTS

INHOUD

GOVERNMENT NOTICE
GOEWERMENTSKENNISGEWING

DEPARTMENT OF LABOUR
DEPARTEMENT VAN ARBEID

No. R. 692 **30 July 2001**

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993

MAJOR HAZARD INSTALLATION REGULATIONS

The Minister of Labour has, after consultation with the Advisory Council for Occupational Health and Safety, under section 43 of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993), made the regulations in the Schedule.

SCHEDULE

Definitions

1. In these regulations any expression to which a meaning has been assigned in the Act shall have the meaning so assigned and, unless the context otherwise indicates —

"emergency plan" means a plan in writing which, on the basis of identified potential incidents at the installation, together with their consequences, describes how such incidents and their consequences should be dealt with on-site and off-site;

"local government" means a local government as defined in section 1 of the Local Government Transition Act, 1993 (Act No. 209 of 1993);

"material safety data sheet" means a material safety data sheet as contemplated in regulation 7 of the General Administrative Regulations;

"near miss" means any unforeseen event involving one or more hazardous substances which, but for mitigating effects, actions or systems, could have escalated to a major incident;

"on-site emergency plan" means the emergency plan contemplated in regulation 6;

"risk assessment" means the process contemplated in regulation 5;

"rolling stock" means any locomotive, coach, railway carriage, truck, wagon or similar contrivance used for the purpose of transporting persons, goods or any other thing, and which can run on a railway;

"temporary installation" means an installation that can travel independently between planned points of departure and arrival for the purpose of transporting any substance, and which is only deemed to be an installation at the points of departure and arrival, respectively;

"the Act" means the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993);

"transit" includes any time or place in which rolling stock may be between planned points of departure and arrival.

Scope of application

2. (1) Subject to the provisions of subregulation (3) these regulations shall apply to employers, self-employed persons and users, who have on their premises, either permanently or temporarily, a major hazard installation or a quantity of a substance which may pose a risk that could affect the health and safety of employees and the public.

(2) These regulations shall apply to local governments, with specific reference to regulation 9.

(3) These regulations shall not apply to nuclear installations registered in terms of the Nuclear Energy Act, 1993 (Act No. 131 of 1993).

Notification of installation

3. (1) Every employer, self-employed person and user shall notify the chief inspector, provincial director and relevant local government in writing of —

(a) the erection of any installation that will be a major hazard installation, prior to commencement of erection thereof; and

(b) the conversion of any existing installation into a major hazard installation, prior to such conversion.

(2) Every employer, self-employed person and user shall notify the chief inspector, the local government and the provincial director within 60 days of the promulgation of these regulations of an existing major hazard installation.

(3) No employer, self-employed person and user shall modify an installation by increasing its storage or production capacity, or altering the process or by effecting any other change that may increase the risk of an existing major hazard installation, without notifying the chief inspector, relevant local government and provincial director in writing.

(4) The information submitted by an employer, self-employed person and user in terms of subregulations (1), (2) and (3), shall include —

(a) the physical address of the installation;

(b) the complete material safety data sheets of all substances that resulted in the installation being classified as a major hazard installation;

(c) the envisaged maximum quantity of such substance that may be on the premises at any one time;

(d) the risk assessment of the major hazard installation as contemplated in regulation 5(1); and

(e) any further information that may be deemed necessary by an inspector in the interests of the health and safety of the public.

(5) Subregulations (1), (2) and (3) shall not apply to rolling stock in transit.

(6) An employer, self-employed person and user shall advertise the notifications contemplated in subregulations (1), (2) and (3) in at least one newspaper serving the communities in the vicinity of the installation which is to be declared a major hazard installation, a proposed major hazard installation or an existing installation which is to be modified, and by way of notices posted within those communities.

(7) Any interested or affected person may make representations in writing to the relevant local government or provincial director within 60 days about an existing major hazard installation or after the erection, conversion, modification of a major hazard installation, if that installation is not acceptable to that person.

Temporary installations

4. (1) Any employer, self-employed person and user who has a temporary installation on his or her premises which would, taking into consideration the risks attached to the quantity of substance and the procedure of discharge, result in that temporary installation being declared a major hazard installation if it were not a temporary installation, shall be deemed to be responsible for the storage and discharge of that installation while on his or her premises.

(2) An employer, self-employed person and user contemplated in subregulation (1) shall ensure that a risk assessment for the storage and discharge procedure be carried out for a temporary installation prior to the risk coming into existence.

(3) An employer, self-employed person and user contemplated in subregulation (1) shall, after taking into consideration the risk assessment, take the reasonably practicable steps that may be necessary to reduce the risks attached to the storage and discharge of a temporary installation.

Risk assessment

5. (1) An employer, self-employed person and user shall, after consultation with the relevant health and safety representative or relevant health and safety committee, carry out a risk assessment at intervals not exceeding five years and submit such risk assessment to the chief inspector, relevant local government and provincial director.

(2) The risk assessment is the process of collecting, organising, analysing, interpreting, communicating and implementing information in order to identify the probable frequency, magnitude and nature of any major incident which could occur at a major hazard installation, and the measures required to remove, reduce or control the potential causes of such an incident.

(3) An employer, self-employed person and user shall inform the relevant health and safety representative or relevant health and safety committee in writing of the arrangements made for the assessment contemplated in subregulation (1), give them 60 days within which to comment thereon and ensure that the results of the assessment are made available to the relevant representative or committee who may comment thereon.

(4) An employer, self-employed person and user shall make available on the premises a copy of the latest risk assessment for inspection by an inspector.

(5) An employer, self-employed person and user shall ensure that the risk assessment contemplated in subregulation (1), shall —

(a) be carried out by an Approved Inspection Authority which is competent to express an opinion as to the risks associated with the major hazard installation; and

(b) at least include —

(i) a general process description of the major hazard installation;

(ii) a description of the major incidents associated with that type of installation and the consequences of such incidents, which shall include potential incidents;

(iii) an estimation of the probability of a major incident;

(iv) a copy of the site emergency plan;

(v) an estimation of the total result in the case of an explosion or fire;

(vi) in the case of toxic release, an estimation of concentration effects of such release;

(vii) the potential effect of an incident on a major hazard installation or part thereof on an adjacent major hazard installation or part thereof;

(viii) the potential effect of a major incident on any other installation, members of the public and residential areas;

(ix) meteorological tendencies;

(x) the suitability of existing emergency procedures for the risks identified;

(xi) any requirements laid down in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989); and

(xii) any organisational measures that may be required.

(6) (a) An employer, self-employed person and user shall ensure that the risk assessment required in terms of subregulation (1) is reviewed forthwith if -

(i) there is reason to suspect that the preceding assessment is no longer valid;

(ii) there has been a change in the process involving a substance resulting in the installation being classified a major hazard installation or in the methods, equipment or procedures in the use, handling or processing of that substance; or

(iii) after an incident that has brought the emergency plan into operation or after any near miss.

(b) Where the risk assessment has been updated an employer, self-employed person and user shall submit a copy of the updated risk assessment to the chief inspector, the relevant local government and the provincial director within 60 days.

(7) Subregulation (5)(b) shall not apply in the case of rolling stock in transit: Provided that the operator of a railway shall ensure —

(a) that a risk assessment applicable to rolling stock in transit is carried out and made available for inspection at the request of an inspector or local

government or both that local government and inspector, as the case may be; and

(b) that in the interests of the health and safety of the public the necessary precautions are taken.

(8) An employer, self-employed person and user shall ensure that the risk assessments contemplated in subregulations (1) and (5)(a) be made available for scrutiny by any interested person or any person that may be affected by the activities of a major hazard installation, at a time and place and in a manner agreed upon between the parties.

On-site emergency plan

6. (1) An employer, self-employed person and user shall after submission of the information contemplated in regulation 3(4) —

(a) establish an on-site emergency plan to be followed inside the premises of the installation or part of the installation classified as a major hazard installation in consultation with the relevant health and safety representative or the relevant health and safety committee;

(b) discuss the emergency plan with the relevant local government, taking into consideration any comment on the risk related to the health and safety of the public;

(c) review the on-site emergency plan and, where necessary, update the plan, in consultation with the relevant local government, at least once every three years;

(d) sign a copy of the on-site emergency plan in the presence of two witnesses, who shall attest the signature;

(e) ensure that the on-site emergency plan is readily available at all times for implementation and use;

(f) ensure that all employees are conversant with the on-site emergency plan; and

(g) cause the on-site emergency plan to be tested in practice at least once a year and keep a record of such test.

(2) Any employer, self-employed person and user owning or in control of a pipeline that could pose a threat to the general public shall inform the relevant local government and shall be jointly responsible with the relevant government for the establishment and implementation of an on-site emergency plan.

(3) Subregulation (1) shall not apply to rolling stock in transit: Provided that the operator of a railway shall —

(a) establish an emergency plan for each route traversed within 12 months of the coming into operation of these regulations;

(b) draw up the plan contemplated in paragraph (a) in consultation with the local government through whose jurisdiction that rolling stock is being transported;

(c) sign a copy of the on-site emergency plan in the presence of two witnesses, who shall attest the signature;

(d) ensure that the plan is readily available at all times for implementation and use; and

(e) cause that plan to be tested when reasonably practicable and keep a record of such test.

Reporting of risk and emergency occurrences

7. (1) Every employer, self-employed person and user of a major hazard installation and owner or user of a pipeline shall –

(a) subject to the provisions of regulation 6 of the General Administrative Regulations, within 48 hours by means of telephone, facsimile or similar means of communication inform the chief inspector, the provincial director and relevant local government of the occurrence of a major incident or an incident that brought the emergency plan into operation or any near miss;

(b) submit a report in writing to the chief inspector, provincial director and local government within seven days; and

(c) investigate and record all near misses in a register kept on the premises, which shall at all times be available for inspection by an inspector and the local government.

(2) Every employer, self-employed person and user shall in the case of a major incident or an incident contemplated in subregulation (1) that was or may have been caused by a substance, inform the supplier of that substance of the incident.

(3) An employer, self-employed person and user shall –

(a) record all near misses in a register kept on the premises, which shall at all times be available for inspection by an inspector; and

(b) ensure that the contents of the register contemplated in paragraph (a) shall also be available in the event of an inspection contemplated in regulation 5(4).

General duties of suppliers

8. (1) Every person that supplies a substance to a major hazard installation that has been classified as a major hazard installation for the reason of the presence of that substance in that installation shall ensure that he or she supplies with the substance a material safety data sheet contemplated in regulation 7 of the General Administrative Regulations.

(2) On receipt of the information contemplated in regulation 7(2), every supplier of the relevant substance shall assess the circumstances and substance involved in an incident or potential incident and inform all persons being supplied with that substance, of the potential dangers surrounding it.

(3) Every supplier of a hazardous substance to a major hazard installation shall provide a service that shall be readily available on a 24-hour basis to all employers, self-employed persons and users, the relevant local government and any other body concerned, to provide information and advice in the case of a major incident with regard to the substance supplied.

General duties of local government

9. (1) Without derogating from the provisions of the National Building Regulations and Building Standards Act, 1977 (Act No. 103 of 1977), no local government shall permit the erection of a new major hazard installation at a separation distance less than that which poses a risk to —

(a) airports;

(b) neighbouring independent major hazard installations;

(c) housing and other centres of population; or

(d) any other similar facility:

Provided that the local government shall permit new property development only where there is a separation distance which will not pose a risk in terms of the risk assessment: Provided further that the local government shall prevent any development adjacent to an installation that will result in that installation being declared a major hazard installation.

(2) Where a local government does not have facilities available to control a major incident or to comply with the requirements of this regulation, that local government shall make prior arrangements with a neighbouring local government, relevant provincial government or the employer, self-employed person and user for assistance.

(3) All off-site emergency plans to be followed outside the premises of the installation or part of the installation classified as a major hazard installation shall be the responsibility of the local government.

Closure

10. An employer, self-employed person and user shall notify the chief inspector, relevant provincial director and local government in writing, 21 days prior to the installation ceasing to be a major hazard installation.

Offences and penalties

11. Any person who contravenes or fails to comply with any provision of regulations 3(1), 3(2), 3(3), 3(4), 3(6), 4(2), 4(3), 5, 6, 7, 8 or 9, shall be guilty of an offence and on conviction be liable to a fine or to imprisonment for a period of 12 months and, in the case of a continuous offence, to an additional fine of R200 or additional imprisonment for each day on which the offence continues: Provided that the period of such additional imprisonment shall not exceed 90 days.

APPENDIX D:

The Emergency Response Plan

EMERGENCY PLAN

AIR PRODUCTS SOUTH AFRICA (PTY) LTD

COEGA FACILITY

ASU

Bumba Road, Coega IDZ, Zone 3

GPS Coordinates: S33o47'35.0"
E025o37'36.0

EMERGENCY TELEPHONE NUMBERS	
EMERGENCY SERVICES - POLICE	**10111**
EMERGENCY SERVICES – AMBULANCE	**10177**
EMERGENCY SERVICES – FIRE	**041 585 1555**
SITE/FACILITY MANAGER:	**JP VAN WYK**
SITE EMERGENCY COORDINATOR:	**VINCENT NTULI**
AIR PRODUCTS EMERGENCY RESPONSE CENTER:	**0800 650 315**

Full lists of emergency numbers are given in Section 1

REV: 04

DATE: 04-2019

APPROVED BY:

Role	Name	Signature	Date
Site Manager / 16(2)	**JP van Wyk**		**11/04/2019**
Site Emergency Coordinator	**V Ntuli**		**11/04/2019**

CHANGE LOG

Rev	Rev	Author(s)	Description of Revision
	4	V Ntuli	Add new security contacts

NOTE:

No set of guidelines can cover all situations. There is no substitute for sound judgment and common sense.

These guidelines are intended to aid the user by providing general instructions and listing communication channels, support agencies and corrective measures that are commonly available.

For all Emergency Situations the basic principles to be followed are;

- **SOUND** the alarm.
- **CONTACT** the Emergency Coordinator.
- **ASSESS** the risk.
- **CONTROL** the situation.
- **MITIGATE** the situation.

WARNING

- *Personnel are not permitted to approach a hazardous area for emergency response unless they are trained emergency responders, equipped with proper protective equipment, operate within the limits of the site emergency plan, and back up support is available*
- *Emergency Responders may proceed only if safe to do so without putting yourself or other plant personnel at risk*
- *DO NOT approach a leak unless the oxygen content in the area is confirmed to be between 19.5% and 23.5%, or the appropriate PPE and back up support is available*
- *DO NOT enter an oxygen enriched atmosphere (greater than 23.5% oxygen)*
- *DO NOT enter atmospheres that are greater than 40% LEL*

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CONTENTS

SECTION 1 : EMERGENCY INFORMATION & TELEPHONE LISTINGS

1.1 SITE INFORMATION – LOCATION, OPERATING HOURS, NUMBER OF EMPLOYEES

Location

Physical Address:	Bumba Road, Coega IDZ, Zone 3, Port Elizabeth, 6100
Postal Address:	Bumba Road, Coega IDZ, Zone 3, Port Elizabeth, 6100
Tel No:	041 405 9605
GPS Coordinates:	S33o47'35.0" E025o37'36.0
Directions / Nearest Intersection:	N2 off-ramp to Neptune Road, Coega IDZ, Zone 3

Access / entrances for emergency vehicles

GATE 1	M17
GATE 2	Neptune Road
GATE 3	
GATE 4	

Site operating Hours

	DAY	NIGHT
WEEKDAY	08H00 – 16H30	16H30 – 08H00
WEEKEND	06H00 – 18H00	18H00 – 06H00
PUBLIC HOLIDAY	06H00 – 18H00	18H00 – 06H00

Number of people on site

	Employees	TES personnel	Other personnel
DAY SHIFT 08h00 - 16h30	9	0	2
NIGHT SHIFT 16h30 – 08h00			2
WEEKEND DAY SHIFT 08h00 - 16h30			2
WEEKEND NIGHT SHIFT 16h30 – 08h00			2

1.2 TELEPHONE LISTINGS – EXTERNAL EMERGENCY CONTACTS

Emergency Services

	Name	Contact details
Fire Dept:	Nelson Mandela Bay Metro	041 585 1555
Site Doctor:		
Hospital:	Dora Nginza Hospital	041 406 4111
	Netcare Greenacres Hospital	041 390 7000/7070
	Mercantile Private Hospital	041 401 2700
	Livingstone Hospital	041 405 9111
	Provincial Hospital	041 392 3911
	Life St George's Hospital	041 392 6111
Ambulance		10 177
Ambulance	Gardmed	041 373 6777
	Net care 911	086 091 1000
Police:	Mount Road, North End	041 394 6326
	Swartkops SAPS	041 408 8331
	Motherwell SAPS	041 4076408
Police Flying Squad		10111
Security:	Coega Gate House	041 403 0603
Security:	Air Products	041 405 9612
Vehicle Recovery:	AA Emergency Breakdown	083 843 22 or 083 THEAA
Spill Response:	Spill Tech	0861 00 0366

Utilities

	Name	Contact details
Electricity:	Nelson Mandela Bay Metro	041 374 4434
Water:	Coega IDZ	041 360 7811

Government Dept

	Name	Contact details
Dept of Labour:	Port Elizabeth, Govan Mbeki Street	041 506 5000
Environmental Affairs:	Nelson Mandela Bay Metro	041 505 4451

1.3 TELEPHONE LISTINGS - AIR PRODUCTS EMERGENCY CONTACTS

Corporate

CRISIS MANAGEMENT OFFICER:	MAROPENG BAHULA	**079 898 5886**
AIR PRODUCTS EMERGENCY RESPONSE CENTER:		**0800 650 315**

Site Specific

Role	Name	Contact details
SITE MANAGER:	JP VAN WYK	**041 402 9916**
SITE EMERGENCY COORDINATOR:	VINCENT NTULI	**041 405 9608**

1.4 TELEPHONE LISTINGS - FACILITY NEIGHBOURS & AFFECTED PARTIES

Neighbouring Companies:

Company Name	Contact Person	Contact Tel No.
AFROX	Andile Qwase	041 405 9643
Dynamic Commodities	Control Room	041 405 9888
Coega Dairy	Johan Schlebusch	041 405 0000
Famous Brands	Johan Schlebusch	041 405 0000

Pipeline Customers:

Company Name	Contact Person	Contact Tel No.
None		

Temporary Employment Services (with people on site)

Company Name	Contact Person	Contact Tel No.

Independent Contractors (with people on site)

Company Name	Contact Person	Contact Tel No.
Supercare	Jason Swanepoel	081 016 7339 / 041 365 1117
Stallion Security Services	Xolile Tshem	082 3256342

SECTION 2 : EMERGENCY ACTION PLAN OVERVIEW

2.1 PURPOSE

The procedures are to provide a plan of action to control potential emergencies which may arise at this facility. Actions under these procedures are to be directed at:

- minimizing personal injury;
- limiting property damage;
- and minimizing interruption of operations.

2.2 SCOPE

This Site Emergency plan is applicable to the Air Products South Africa,

COEGA FACILITY

This Emergency Plan covers potential types of site emergencies or off-site emergencies which could impact site operations, personnel, facilities and/or the surrounding community.

Specific emergency plans are available to deal with off-site emergencies which do not impact the site operations.

Although operations and maintenance employees are trained and knowledgeable of the hazards of the chemicals they work with daily, and, are expected to respond to incidental spills in the areas in which they work (as defined in Section 5) assistance may be required from other facilities or external resources.

2.3 RELATED DOCUMENTS

The following documents shall be maintained to be use in conjunction with this plan;

- Safety Data Sheet File
- Site Emergency Shut-down Procedures / Work Instructions
- Customer ER Plan (where site is situated within customer premises)
- MHI Risk Assessment

2.4 DEFINITIONS

EMERGENCY: Any abnormal event which may threaten to affect operations within and outside the Facility perimeters or which may require assistance from third parties to control shall be considered to be an emergency for which control procedures and instructions shall be devised.

Such events include but are not limited to: fires and explosions, uncontrollable spills and emissions, medical emergencies, workplace violence, and natural disasters.

CRISIS: An unstable or crucial time or state of affairs in which a decisive change is pending, especially with the distinct possibility of an undesirable outcome.

Examples include public disaster, fatality(ies), interruption of public activity (closure of highway, damage to public structures, etc.), involvement of emergency personnel and regional, national, or international news media.

2.5 RESPONSIBILITY AND AUTHORITY

2.5.1 Facility Manager / Appointed 16(2): has the overall responsibility and authority to ensure the implementation and compliance with this procedure.

The Facility Manager is responsible for;

- Generating and maintaining an up-to-date written emergency action plan for the facility.
- Ensuring the emergency plan is available and communicated to all employees
- Identifying and appointing suitable persons to take control of certain functions during an emergency to minimise the effect of the emergency situation, e.g. fire teams, first-aid teams, evacuation marshals, etc.
- Identifying and appointing suitable persons to ensure all monitoring, detection, alarms and ER equipment is available and maintained in good working condition.

In the event of an emergency, the Facility Manager or his/her designee shall be the Emergency Coordinator.

2.5.2 Department Managers/Supervisors: are responsible to ensure that all employees are trained according to this procedure.

2.5.3 Employees: are responsible to adhere to the relevant sections of this procedure, and to raise the alarm in the event of an emergency.

- The employee first becoming aware of a potential emergency shall report immediately to the Emergency Coordinator.
- Employees shall respond to emergency situations only to the extent they have been trained to do so. A description of the training is described in this section under "TRAINING AND DRILLS".

2.6 ER TEAM ROLES

2.6.1 Site Emergency Coordinator (SEC)

The Site Emergency Coordinator is the senior Air Products representative who is in charge of Crisis or Emergency Operations at the site. The SEC leads the Incident Management Team (IMT) and, as needed, works directly with the Crisis Management Officer to coordinate crisis control activities. The Emergency Coordinator uses the information in *Attachment E2* to guide his/her actions

The Emergency Coordinator will normally make determinations to request the fire department, rescue units, police, or other outside Emergency Services as needed.

The Emergency Coordinator is also responsible for:

- The decision to evacuate the site.
- The coordination of a personnel count, including visitors.
- The notification of surrounding neighbours and businesses.
- The decision to return to the site (in coordination with outside Emergency Services).

During an emergency, the Emergency Coordinator shall designate a person to staff a phone in order to maintain necessary communications.

The Emergency Coordinator will assign personnel to tend the main plant entrance(s) to send Emergency Response Services to the desired area and keep unnecessary personnel from entering.

The Emergency Coordinator is responsible for accounting for all employees, visitors and contractors personally or through a designee, after an evacuation by having everyone on site report to a predetermined designated assembly area and conducting a head count.

The Emergency Coordinator will activate the Crisis Management System when the emergency involves serious injury or fatality, the assistance of outside Emergency Services or extensive news media coverage. Activation is accomplished by calling the Air Products Crisis Management Officer on **079 898 5886**. When Crisis Management is activated refer to *Attachment E4, "Crisis Management Checklist"*.

NB: *In the absence of the Emergency Coordinator (e.g. during off hours), the senior person available at the facility shall act as the Emergency Coordinator. The acting Emergency Coordinator shall remain in that capacity until relieved by the Emergency Coordinator (or more senior person)*

2.6.2 Emergency Response Team

Appointed ER Team members are identified in *Attachments C1-C3*

Full details of their duties and responsibilities are defined in their letters of appointment, Attachments C4 – C7

Roles;

- **Area Emergency Marshals:** Take control of the emergency evacuation of personnel and control the ER activities in their area of responsibility.
- **Fire Fighters:** control or extinguish minor / early stage fires using portable fire extinguishers. Advanced Fire-fighters may also use fire hoses.
- **First Aiders:** tend to injured employees until emergency medical services arrive.
- **Hazardous Materials Technicians:** respond to releases or potential releases of hazardous materials for the purpose of protecting nearby persons, the environment, or property. Respond **only defensively, to control the release from a safe distance**, to keep it from spreading and to prevent exposures

2.6.3 Security

The Site Security personnel shall assist the Site Emergency Controller to ;

- Keep access / entrances open and clear
- Control access of personnel / visitors – prohibit entrance/exit of vehicles or people (unless permission is given by the Emergency Controller)
- Direct Emergency services to correct area
- Provide PPE to Emergency Services

2.7 EMERGENCY EVACUATION PROCEDURE

2.7.1 Reporting Emergencies

Employees on site first identifying an emergency or potential emergency (e.g., fire, explosion, chemical leak/spill, medical, workplace violence, or natural disaster) shall activate the appropriate alarm (manual pull box, public address system, plant intercom, etc.) as specified below to notify the Emergency Coordinator or the Senior Person on site.

2.7.2 Alarm System(s)

The location of alarms is indicated on the Site Plan

The alarm system is used to notify people on site that an emergency exists and what their immediate response should be. In addition, to the extent possible, it should identify the type of emergency condition (fire, explosion, chemical spill/release, medical) and the location of the emergency.

The alarm system(s) at this site for notifying people on site of an emergency are:

	TYPE OF ALARM	RESPONSE ACTION
1.	Fire Alarm	Gather at emergency assembly point
2.		

The alarm system is tested routinely at the following times :

Quarterly

2.7.3 Emergency Evacuation and Assembly Areas

Emergency escape routes have been posted in each work area, and all employees have been trained in the correct procedures to follow.

The emergency evacuation assembly areas will be located at the following locations:

Primary Location: **Next to the Guard house**

Secondary Location *:

'Safe Haven' **

** The secondary location shall be used as an assembly point **only** if the primary location is involved in an emergency or access to it is blocked.*

*** The 'safe haven' is a room which can be sealed in case escape routes are inaccessible due to gas release*

Employees shall view any windsocks at the site noting wind direction and proceed to the location which is upwind when appropriate.

The escape routes and assembly locations, in addition to being posted in the work area, can be found in *Attachments A1 & A2*

In the event of an emergency evacuation, the Emergency Coordinator shall ensure that the following items are taken to the assembly area:

- The Visitor's Log sheets and Employee Roster
- A cellular phone or 2-way radio, when available.

2.7.4 Emergency Control Centre (ECC)

The Emergency Response shall be coordinated from the Emergency Control Centre (ECC).

Primary Location: **Guard House**

Secondary Location*:

* *In case the primary location is involved in an emergency or access to it is blocked.*

The following items must be available at the ECC:

- A current copy of this Site Emergency Action Plan.
- The Safety Data Sheet file.

2.7.5 Actions to be Taken When The Alarm Sounds

Employees : Offices	Evacuate the building through the nearest emergency exit If you are not in your own office do not return to your department but evacuate through the nearest emergency exit Proceed to the Emergency assembly Point Assemble with your department to facilitate roll call
Employees (and contractors) : operations & maintenance	Stop work and ensure that the equipment and area is safe. Proceed to the emergency assembly point. Some employees may need to remain on site to shut down operations before evacuating (refer 2.7.9) *NB: Following the emergency the permit to work will have to be reissued. The previous permit will now be invalid*.
Operators of motor vehicles or motorised equipment	Immediately move your vehicle out of the road so as not to obstruct emergency vehicles. Turn off your vehicle and walk to the nearest emergency assembly point.
Visitors and contractors	Visitors are the responsibility of the person being visited. They must be assisted to the nearest emergency exit and escorted to the assembly point Contractors must evacuate to the assembly point as instructed during the induction process
First Aiders	Collect first aid bag Collect the first aiders **hard hat (plant first aiders) or bib (office first aiders)** for identification**.** Report to the Emergency Co-ordinator / designated assembly point for further instructions after Roll Call has been taken
Fire Team	Collect the fire team **PPE** (will also serve as identification) Report to the Emergency Co-ordinator for further instructions after Roll Call has been taken

Area Emergency Marshal(s)	Ensure all personnel in their area have evacuated ('sweep' the area) and equipment is safe (shut-down where required). Report to the Emergency Co-ordinator for further instructions after Roll Call has been taken
Site Emergency Co-ordinator	Determine the type of emergency Co-ordinate the Fire Team Leaders and Area Emergency Marshals to locate emergency i.e. fire etc. Contact Emergency services if required Liaise with Emergency Services and Armed Response Report on emergency and action to Management

2.7.6 Personnel Accountability after Evacuation

The Emergency Coordinator, or designee, shall conduct a head count.

Rosters shall be maintained listing normal personnel present during each shift from which a head count can be made. See *Attachment E3 "Employee Roster".*

- Everyone must be accounted for by name.
- Missing persons shall be reported to the Emergency Coordinator.

Visitor and Employee Log sheets shall be used to account for visitors and employees visiting from other facilities.

2.7.7 Rescue, Fire Fighting and Medical Duties

Emergency Response Team Members must assemble at the initial assembly points. The respective Team leaders will discuss an emergency action plan with the Emergency Response Co-ordinators.

Teams will then execute the action plan if and only if it is safe to do so. The Team leaders have the right to refuse his teams response if he feels an area is too dangerous

Attachment C1 lists individuals at the site who have been trained and certified in First Aid and CPR, who may voluntarily tend to injured employees until Emergency Medical Services arrive.

Attachment C2 lists individuals who have been trained and certified in Fire Fighting.

2.7.8 Emergencies Involving Releases or Spill of Hazardous Materials

The Facility Hazardous Chemical Substances Program and SDSs identify the hazardous substances on site, the quantities in which they are stored, the consequences of an uncontrolled release, the types of releases that could require an emergency response and what is considered an incidental release.

Refer *Attachment D "Major Hazardous Chemical List"*

Only trained First Responders / Hazardous Materials Technicians *(see Attachment C3)* shall respond to releases or spills of hazardous materials. Refer Section 5.

2.7.9 Procedures for Employees Who Remain to Perform Critical Plant Operations Before They Evacuate

Emergency operations and plant shutdown procedures are included in the Site Emergency Shut-down Procedures / Work Instructions File.

2.8 PRE-EMERGENCY PLANNING AND COORDINATION WITH OUTSIDE PARTIES

The Emergency Coordinator has identified outside agencies that the site may utilise (e.g., fire department, police, emergency medical services, spill response) to control the emergency.

These agencies have been notified and invited to review this emergency response plan. Emergency contact phone numbers are maintained in this plan.

2.9 EMERGENCY EQUIPMENT

The equipment available at this site for use in the event of emergencies is identified in *Attachments B1-B4*.

2.10 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment required to be worn when responding to specific emergencies is identified in Emergency Response Awareness training, the Facility PPE Hazard Assessment, JSA's and appropriate SDS.

2.11 COMMUNICATION WITH MEDIA AND EXTERNAL 3RD PARTIES (INCLUDING VIA SOCIAL MEDIA)

Only nominated personnel who have been trained are permitted to communicate with media or external 3rd Parties during and after the incident. No unauthorised personnel may post any information or pictures on any Social media.

Any personnel approached by media / 3rd parties for comment shall refer them to the Corporate or Site Communications Spokesperson.

Corporate Communications Spokesperson(s)	**JOSUA LE ROUX**	**082 570 7397**
	ARTHI GOVENDER	**082 447 2609**
Site Communications Spokesperson(s)	**JP VAN WYK**	**082 788 0112**

2.12 TAKING AND DISTRIBUTION OF PHOTOGRAPHS

Only ER Team members, investigation teams and the Marketing Dept are permitted to take photographs during and after the event unless specifically requested by the Site Emergency Coordinator (SEC).

All photographs taken shall be given to the SEC. No photographs may be distributed internally or externally without the permission of the SEC.

2.13 PRESERVATION AND COLLECTION OF EVIDENCE FOR INCIDENT INVESTIGATION

Care shall be taking during and after the emergency situation to preserve evidence which will be required for the incident investigation.

No person may disturb the site or remove any article or substance involved in the incident unless required to prevent a further incident, remove the injured or dead or to rescue persons from danger.

After the incident the area shall be cordoned off and not disturbed without the consent of the SEC or, in the case of a fatality, loss of limb or part of a limb, the Department of Labour Inspector

2.14 CRITIQUE OF RESPONSE AND FOLLOW-UP

At the conclusion of an emergency response (or routine training drill), a critique of the event will be conducted. The critique will involve personnel pertinent to the response and will include recommendations for improvement in the various areas of the emergency response, if needed. The critique will be documented and recommendations followed until complete.

2.15 TRAINING AND DRILLS

Site Emergency Action Plan training requirements are defined in the Global EHS Standard 25-020802.

All personnel employed at the facility will receive instructions and will participate in training drills to assure familiarity with emergency procedures and to develop proficiency in carrying out their specific emergency procedure assignments

2.16 EMERGENCY RESPONSE PLAN COMMUNICATION

Hard, controlled copies of the Site Emergency Plan and Guidelines (including Attachments) shall be available at the following locations;

- Emergency Control Centre
- Security
- Reception
- Site Emergency Controller
- Area Emergency Marshal(s)
- Fire Team Leader
- SHEQ Coordinator
- Plant Control rooms

A copy shall be given to the local Fire / Emergency Services for review and approval.

A Distribution list and document Transmittal notices shall be used to track distribution to ensure updates are communicated effectively.

Electronic copies of the Site Emergency Plan and Guidelines and Attachments shall be emailed to the Corporate Risk Manager.

"In Case of Emergency" flyers (*Attachment E8) s*hall be posted on notice boards and key locations on the site.

SECTION 3 : SITE ACTIVITIES & POTENTIAL EMERGENCIES

3.1 NATURE OF ACTIVITIES

This plant is manufacturing liquid oxygen and liquid nitrogen, and distribution to Bulk customers.

3.2 HISTORY OF INCIDENTS

To date there have been no incidents on site.

3.3 SPECIFIC AREA INFORMATION

Important features / landmarks

Key information of adjacent premises / activities

None of the surrounding businesses pose any significant risk to Air Product Coega Facility.

3.3 POSSIBLE TYPES OF EMERGENCY & CONSEQUENCES

Type of Emergency	Consequence								
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
Fire									
- General / Structural	X	X	X	X	X	X		X	
- Electrical Equipment	X		X	X					
- Oxygen fed fires	X	X	X	X					
- Flammable Gas	X	X	X	X	X		X	X	
Medical Emergencies									
- Injuries / Illness	X								
Security									
- Threats & Harassing Phone Calls	X		X	X	X				X
- Physical Threats	X								
- Unlawful Acts – Intruders / Vandalism	X		X	X	X		X		
- Bomb Threats	X		X	X	X				X
Emergencies Caused By Neighbours / Customers /Third Parties With Impact									
- Train derailments									
- Neighbour emergency									
Natural Disasters									
- High Winds	X	X	X	X					
- Earthquakes and Aftershocks	X		X	X					
- Severe Rainstorms, Floods, Hail, Lightning	X		X	X					
- Power Outage				X					
Hazardous Materials Release/Spill									
- Flammable Gas	X	X		X		X			
- Asphyxiant Gas	X					X			
- Toxic Gas -									
- Cryogenic Liquid	X	X	X	X		X			
- Hazardous Chemical -	X	X	X	X		X			
- Flammable Liquid Spill – Diesel	X	X	X	X		X			
- Pipeline - ?									
Other									
- Pressure release / high pressure equipment ruptures #	X		X	X	X	X	X	X	X
- Vehicle Accident#	X	X	X			X			

pressure releases/high pressure equipment ruptures/vehicle accidents may result in Hazardous materials releases and/or fires as well as possible flying, falling or uncontrolled moving objects

Consequence Legend

A Harm to Air Products employees, contractors, and the public
B Harm to environment
C Damage to Air Products property and third party
D Loss to process
E Adverse publicity
F Presence of hazardous substances and materials
G Effect on the community
H Difficulty to resume business activity after the incident
I Effect on customers

SECTION 4 : SPECIFIC EMERGENCY ACTION GUIDELINES

4.1 FIRES

Facility Fires – General / Structural

In the event of a **MAJOR** fire, which could be detrimental to personnel safety or result in damage to equipment or structures located within the facility?

- All plant personnel must evacuate to the designated safe haven or assembly area.
- The Emergency Coordinator
    - shall determine when the Fire Department needs to be notified
    - shall, in conjunction with local emergency responders, determine when facility neighbours need to be notified or evacuated

In the event of a **MINOR (EARLY STAGE)** fire i.e. a fire which can be controlled or extinguished by portable fire extinguishers without the need for protective clothing or breathing apparatus

- Personnel who have portable fire extinguisher training may attempt to extinguish the fire after assessing the risk
    - Think before you act.
    - Fires may require electrical equipment to be isolated.
    - Burning materials may give off toxic fumes.
    - Make sure you have a means of egress / escape.
    - Always alert others of the fire before attempting any action.
    - Proceed only if safe to do so without putting yourself and plant personnel at risk.
- If unable to readily extinguish or control the fire, **STOP**. If you have not already done so, **ACTIVATE** the fire alarm and evacuate.
- **NO ATTEMPT** shall be made to extinguish large fires.
- **DO NOT ENTER** any structure, if the fire is beyond your control.

Guidelines for specific types of fire

Facility Fires Involving Electrical Equipment

- Burning materials may give off toxic fumes.
- Lighting or other important electrical functions in the vicinity of the fire may be lost, when the electrical power is shut off.
- Shut off the electrical power to the area from a safe distance.
- Keep a safe distance from any energized or conductive materials such as loose wire, metal rods or beams, or spilled liquids.
- Use an extinguisher that is suitable for the condition.
    - For small fires in cable insulation, windings, or other similar equipment, either carbon dioxide or Halon extinguishers are effective and safe since the extinguishing materials are non conductors. NEVER USE WATER.
- Oil switches, oil-filled transformers, and other electrical equipment containing oil involve the additional hazard of an oil fire. Oil has a relatively high flash point, but it may be heated and ignited by excessive current or an electric arc. Use carbon dioxide, Halon or dry chemical extinguishers for this type of fire. These extinguishers can be used without danger of shock to the operator even if electrical power cannot be shut off. NEVER USE WATER.

Flammable or Combustible Liquid Fires

- If possible, shut or block off the fuel source before attempting to fight the fire – Do so only if the source can be safely reached.
- Use carbon dioxide or dry chemical fire extinguishers.
- Secondary fires involving wood, paper, rubber, etc., should be controlled by soaking with water, providing no exposure to electrical elements exists.

***Special Precautions* to trained fire-fighters**.

- If fuel source is highly volatile, use fire fighting foam or take precautions to suppress flammable vapours to prevent re-ignition (possible with explosive force.)
- If fuel has low volatility, such as oil, cooling with water fog or breaking the combustion reaction with dry chemicals is effective.
- In the case of larger and more intense fires, chemical extinguishers should be used in combination with foam. Foam use should be limited to amounts necessary to smother the fire.
- Water must be used with caution. Addition of water will float most hydrocarbons and cause the fuel to spread increasing the intensity of the fire. Water may be used to cool adjacent equipment if the runoff does not spread the fire. Water fog may reduce the fire intensity, but the runoff may have environmental impacts.

Oxygen-Fed Fires

- Oxygen is non-flammable, but vigorously accelerates combustion. It causes objects to ignite more easily and burn more quickly than normal.
- Normally non-combustible materials, including those used for fireproofing, may burn quickly in an oxygen-rich atmosphere.
- If possible, shut off the source of oxygen before attempting to fight the fire – Do so only if the source can be safely reached.
- Only attempt to extinguish the flames if the oxygen source is shut off and if the resulting fire is small.
- Fight the fire according to the material involved.
    - For wood, rubbish, and textile fires use water and foam.
    - For oil, solvent, grease, and paint fires, use dry chemical powder, carbon dioxide, or foam.
    - For electrical fires use carbon dioxide or dry chemical powder.

***Special Precautions* to trained fire-fighters**.

- Use water to combat the fire directly and to cool and protect nearby combustible objects.
- If the fire is near a cryogenic liquid storage tank, water may be applied to the shell to keep it cool. The water must NEVER contact the diverter valve, relief devices, or outer vessel relief plate. The cold temperature of the cryogenic liquid could freeze the water and inhibit the proper functioning of these safety devices, and a tank rupture could result.

Flammable Gas Fires

- If nearby equipment is not threatened by the fire and the source of the gas cannot be safely turned off, it is often best to allow the fire to burn until the gas is consumed.
- If a flammable gas fire is extinguished before the gas flow is turned off, an explosive mixture of flammable gas and air may be formed. Make sure there is adequate ventilation to dissipate the gas.
- Even with protective equipment, emergency personnel should never enter an area where flammable gases may have accumulated.
- If possible, stop the flow of gas before extinguishing the fire – Do so only if the source can be safely reached.
- Water spray can be used to cool and protect adjacent combustible equipment or materials.
- Fight secondary fires according to the material involved.
    - For wood, rubbish, and textile fires use water and foam.
    - For oil, solvent, grease, and paint fires use dry chemical powder, carbon dioxide, or foam.
    - For electrical fires use carbon dioxide or dry chemical powder.
- Cylinders in fires
    - Cylinders in or near fires must be cooled by the use of a water stream to prevent heat and pressure build-up and possible rupture of cylinders.

***Special Precautions* to trained fire-fighters**

- If the fire is near a cryogenic liquid storage tank, water may be applied to the shell to keep it cool. The water must NEVER contact the diverter valve, relief devices, or outer vessel relief plate. The cold temperature of the cryogenic liquid could freeze the water and inhibit the proper functioning of these safety devices, and a tank rupture could result.
- HYDROGEN can burn with an almost invisible flame, and often can only be detected visually by heat waves. If entering an area where a suspected hydrogen fire may exist, always approach the area with caution.
- ACETYLENE cylinders. Use extreme caution when fighting a fire involving acetylene cylinders. Do not approach the fire. Spray water from a safe distance. *Refer Acetylene Cylinders in Fires*

Acetylene Cylinders in Fires

NB: Acetylene in cylinders can become unstable when exposed to heat. Container failure due to internal decomposition has been known to occur hours after the heat source was removed.

- Immediately evacuate – follow the normal procedures.
    - The main risk once the area is evacuated is missile style objects should the cylinder explode so a minimum radius of 50m should be evacuated, and personnel should shelter behind solid objects, not standing in front of windows etc
- Contact the fire brigade, advising that there are acetylene cylinders involved.
- If it is safe to do so, spray water onto cylinder, but take care to shelter behind a solid structure (not a light breeze block wall or any structure containing fuel) in case cylinder explodes. The use of a monitor is recommended, and once established personnel should withdraw outside of the evacuation zone.
    - When the Fire Brigade arrive, advise them of the location of the cylinders, and if known the quantities and products involved.
- Acetylene cylinders shall be kept cool by application of water for a minimum of 24 hours (preferably longer). This can be achieved in a number of ways (spray from a fire hose, immersion in water bath etc.).
- If possible leave the cylinders in situ, however if it is impractical or competent authorities (fire brigades) require it to be moved to a more suitable position for long term cooling then the following methodology is acceptable
    - Cool the cylinder from a safe location for a minimum of 2 hours – fire hose
    - From a safe location examine the cylinder to check if it is uniformly cold. This can be done using;
        - a thermal camera – pause the cooling long enough for the water to substantially dry from the cylinder – 5 minutes and examine
        - the 'wetting test' – pause water application and observe the cylinder for signs of steam rising from its surface, or, if no steam is observed, check to see if the wetted cylinder surface dries out quickly or remains wetted.
    - If steam is seen or the surface dries out quickly, recommence cooling.
    - If the cylinder is uniformly cold approach the cylinder and confirm results by hand. If cool it is permissible to relocate the cylinder – with care

      ** It is NOT appropriate to approach the cylinder to undertake the initial check by hand.*
    - If any of the checks indicate the cylinder is not uniformly cool – continue to cool for another 1 hour before checking again

      ** Care is important as the cylinder is still potentially dangerous.
- Other precautions shall include
    - Do not allow the cylinder to drop from height, or in other ways be exposed to knocks & bumps.
    - Continue to check for warm spots on regular basis
    - If mechanical transport is involved it shall be done slowly and the cylinder shall be completely secured.

4.2 MEDICAL EMERGENCIES AND PERSONNEL INJURY

- In the event of injury or sudden illness due to an accident or natural causes, immediately notify your supervisor or the Emergency Coordinator.
- Apply First Aid or CPR only if you are trained and certified.
- The Emergency Coordinator shall determine if outside Emergency Services are required.
- In the event of a fatality or serious personal injury, the Emergency Coordinator must immediately notify his/her line manager. If within 5 minutes, the line manager cannot be contacted, the Emergency Coordinator shall activate the Crisis Management System by calling the Air Products Crisis Management Officer on **079 898 5886**.

4.3 SECURITY THREATS & EVENTS

Threats and Harassing Phone Calls

- A threat is a telephone call, email, letter, note, etc. which conveys an overt threat of harm or damage to Company personnel or property.
- A harassing phone call is a telephone call which implies threat, impedes production, or is intended to annoy by means of its timing, frequency, or objectionable or obscene language.
- When a threat or harassing phone call is received:
  - Obtain as much information about the call and the caller as possible. Use the *Threats and Harassing Phone Calls Checklist, Attachment E1*, to document the information.
  - Notify Site Management immediately and evaluate the threat.
  - If Site Management cannot be reached, notify Vincent Ntuli on 041 405 9608. Explain the situation and request assistance.

Physical Threats, Threatening Behaviour, or Acts of Violence against Employees

- IMMEDIATE THREATS
  - If a situation arises that you feel is an **immediate** threat, i.e. the situation could result in bodily harm to one or all parties involved, deal with it calmly. Do not retaliate, use common sense and remove yourself from the area.
  - Contact the security resources (local police, etc.) for the site as necessary.
  - Contact Site Management.
  - After the situation is resolved, Site Management shall contact Vincent Ntuli on 041 405 9608/072 316 8745 for follow-up action.
- PERCEIVED THREATS
  - If a situation arises that you feel is a **perceived** threat, i.e. the situation has the potential to escalate over time if no action is taken, report it to Site Management.
  - Site Management shall contact Vincent Ntuli on 041 405 9608/072 316 8745 to assess the situation.
- **In the case of strike action**
  - Engage additional security and warn local police of pending or immediate threat.
  - Lock / barricade gates.
  - Keep everybody out of line of sight of the protestors (preferably inside buildings).
  - Contact Air Products delivery vehicles and personnel to warn them not to approach the site until it is clear.

Unlawful Acts

- INTRUDERS:
  - Do not attempt to confront the intruder yourself.
  - Contact the security resources (local police, etc.) for the site.
  - Contact Site Management.
  - Use phones as discreetly as possible to summon help.
- VANDALISM:
  - If vandals are discovered in the act:
  - Contact the security resources (local police, etc.) for the site. Air Products personnel **will not** assume the role of police.
  - Contact Site Management.
- If vandalism is discovered:
  - Report it immediately to Site Management.
  - Secure the area.
  - Site Management will evaluate if the damage constitutes a hazard to personnel or plant operation.
  - Site Management will notify the security resources (local police, etc.) for the site.

Bomb Threats

- When a bomb threat is received:
  - Obtain as much information about the call and the caller as possible. Use the *Threats and Harassing Phone Calls Checklist, Attachment E1*, to document the information.
  - Notify and evacuate any areas of the plant that may be **immediately** threatened.
  - Notify Site Management immediately and evaluate the bomb threat. Determine if the facility should be shut down and evacuated.
  - Notify the local police.
  - If Site Management cannot be reached, notify Vincent Ntuli on 041 405 9608. Explain the situation and request assistance.
  - If Site Management cannot be reached, notify *Vincent Ntuli on 041 405 9608/ 072 316 8745 as per ER matrix*. Explain the situation and request assistance
- Bomb Threat - Plant Evacuation:
  - If the bomb threat is indefinite regarding the time period; or no time is offered; immediate defensive action is required. Evacuate the plant and proceed to the designated assembly area.
  - Leave the Main Gate open.
  - Take a head count to ensure all site personnel and visitors have left the site and are accounted for.
  - Do not use two-way radios for communication. The bomb triggering device could use radio frequencies to set it off.
  - After evacuation, contact the local police and Line Management. Any further action and decision to return to the site will be determined by Site Management and local police.
- Bomb Threat - Plant Shutdown:
  - The decision to perform an Emergency or Normal Shutdown of the plant must be made by Site Management.
  - Follow the Site Work Instruction Manual for appropriate Emergency and Normal Shutdown procedures for the plant.
- Bomb Threat - Search:
  - Whenever possible, search procedures must be accomplished by professionals, i.e. bomb squads or rescue teams that are affiliated with the local police or fire departments.

    NOTE: THE REMOVAL AND/OR DISARMING OF A BOMB OR EXPLOSIVE DEVICE MUST BE LEFT TO EXPERTS IN EXPLOSIVE ORDNANCE DISPOSAL
  - If requested to assist in a search, a minimum number of people familiar with the site and the equipment are to be utilized on a voluntary basis.
  - All Air Products personnel involved in a search must realize their mission is only to search and report suspicious objects, **NOT** to move, jar, or touch the object or anything attached to it.

4.4 EMERGENCIES CAUSED BY NEIGHBOURING FACILITIES, CUSTOMERS, OR THIRD PARTIES WITH ON SITE IMPACT.

Train Derailments / Runaway Vehicles (Depending on Surrounding Traffic and Road Conditions)

- The Emergency Coordinator shall;
  - determine appropriate action to be taken based on nature and severity of the incident eg. evacuation, emergency shut-down of plant
  - determine if the ER Team should assist while waiting for emergency services – ***only if safe to do so***
  - ensure local emergency services have clear access to the incident site
  - notify emergency services of the hazards related to the site, products and process
  - communicate with local emergency services to assist where possible
  - notify the Corporate Crisis Management Officer on **079 898 5886**
- All Employees must evacuate to the emergency assembly point and must not interfere with the duties of the emergency services. Once personnel have been accounted for it may be preferable to move them indoors or to an area away from the incident site.
- Employees may not communicate with any media or external 3rd Parties and may **not distribute any information or pictures to 3rd Parties or post on any Social media.**

Emergency Response due to Emergency on Neighbouring Site / Customer Site (if Air Products Facility Located on Customer Site)

- The Emergency Coordinator shall;
  - Communicate with Neighbour / Customer Emergency Controller
  - Determine appropriate action to be taken eg. evacuation, emergency shut-down of plant
  - Comply with Customer Emergency Procedure / Instructions (if applicable)

4.5 NATURAL DISASTERS

Severe Weather Conditions

This guideline lists the precautions to be taken in the event severe weather conditions including high winds, rainstorms, or floods, hail and/or lightning (hurricane, tornado, wind storm) are suspected in the area.

- Have disaster supplies on hand including flashlights and extra batteries, portable, battery-operated radio and extra batteries, first aid kit and manual.
- Plan and practice alternative evacuation routes and assembly points (shelter) as the primary ones may not be suitable in adverse weather conditions.
- The Emergency Coordinator shall make the decision to shut down the facility and evacuate.
- Consider shutting down all power except as needed for emergency services.

High Winds

- Secure loose materials together, if they are stored outside. Bind groups of cylinders together.
- Seek shelter in a basement under something sturdy, like a workbench. If there is no basement, seek shelter in a small interior room in the middle of the building, like a closet or a bathroom. Always stay away from outside walls, windows or glass enclosures.

Severe Rainstorms/Floods

- If the plant is located in a frequently flooded area (flood plain) or is susceptible to flash flooding plan ahead by stockpiling emergency building materials. This can include plywood sheets, plastic sheeting, shovels, and sandbags.
- If possible relocate any loose equipment and material to higher ground.
    - Move all ground-stored cylinders onto elevated docks and secure.
    - Move all vehicles to higher ground.
    - Lock and secure valuables (files, vaults) and move to upper floors if possible.
- Evacuation should be by the safest routes to high ground. Evacuation is much simpler and safer before the flood waters become too deep.
    - Avoid walking through any flood waters. If it is moving swiftly, even water 15 cms deep can sweep you off your feet.
    - Cars can be easily swept away in just 60 cms of moving water. If flood waters rise around a car, it should be abandoned.

Hail Storms

- Seek shelter indoors or undercover and stay away from windows or glass enclosures.
- Stay inside until the hail stops - Do not go outside for any reason. Large hail can cause serious or even fatal injuries.
- Stay out of culverts and lowland areas that may suddenly fill with water.

Lightning

- During thunderstorms no place outside is safe. If you can hear thunder, lightning is close enough to strike. Stop what you are doing and seek safety in a substantial building or a hard-topped metal vehicle.
- Stay off and away from
    - anything tall or high, including rooftops, scaffolding, utility poles and ladders.
    - large equipment such as bulldozers, cranes, backhoes, track loaders and tractors
    - materials or surfaces that can conduct electricity, including metal scaffolding, metal equipment, utility lines, water, water pipes and plumbing
    - areas with explosives / flammable materials
- To avoid the danger of electrocution from lightning, avoid using phones and electrical appliances during a severe storm
- Seeking shelter under trees should be a last resort. It is common during severe storms for trees to lose branches. Also, large isolated trees attract lightning.
- AFTER THE EVENT:
    - Account for all personnel.
    - Enter the site only when it is safe to do so to secure the area and assess damage.
    - Rescue shall be left to trained and equipped personnel. However, if the immediate rescue of a person is needed, the buddy system shall be used. Injured personnel shall be administered first aid as needed in accordance with Section 4, "Specific Emergency Action Guidelines - Medical Emergencies".
    - Product releases resulting from the event shall be handled as per Section 5, "Hazardous Materials Emergency Response Guidelines".
    - Fires or explosions resulting from the event shall be handled as per Section 4, "Specific Emergency Action Guidelines - Fires".

Power Outage

This guideline lists the precautions to be taken in the event of a power outage.

While power outages are rarely life-threatening, they can pose safety hazards.

- Where specific site procedures are in place for a power failure these need to be followed.
- Move to a lighted area, if it can be done safely. Otherwise, stay where you are until help arrives and gives you a safe escort out of the area.
- Notify Supervision at this time, if they do not already know of the power outage.
- Never touch downed power lines, even if they are not sparking. The lines may be dead at first, but they can re-energize automatically.
- Treat all equipment as live.
- UNDER THE DIRECTION OF THE EMERGENCY COORDINATOR:
    - Turn off equipment that might be sensitive to voltage variation such as, computers, and microprocessor-based controllers and alarms to avoid damaging them.
    - Shut down equipment that may otherwise start up automatically when the power is restored.
    - Follow plant operating procedures for securing equipment and bringing equipment back on line when the power is restored.

SECTION 5: HAZARDOUS MATERIALS (HAZMAT) EMERGENCY RESPONSE PLAN & GUIDELINES

5.1 HAZARDOUS MATERIAL EMERGENCY RESPONSE

This facility **does not** have a HAZMAT trained Emergency Response Team.

Employees in their local area will respond to only incidental releases of hazardous materials.

An incidental release is one in which the substance can be absorbed, neutralized, or otherwise controlled at the time of the release by employees in the immediate release area, or by maintenance personnel, and there is no potential safety or health hazard (e.g. fire, explosion, or chemical exposure).

This response to incidental releases may include the following:

- Closing of local and remote operated shut off valves,
- wearing appropriate personal protective equipment as needed,
- containment of small leaks/spills
- prevention of personnel exposure through area isolation.

At this facility, all personnel are trained to, at a minimum, the "HAZWOPER" first responder awareness level, as well as specific operating procedures in order to perform functions listed above.

All releases shall be reported to the Emergency Coordinator or Senior Person on site.

If, during the course of a response to an incidental release of hazardous substance, the release escalates beyond an incidental release, then the employees conducting the response shall cease and the Emergency Coordinator shall activate the alarm system notifying employees to evacuate and call for local Emergency Services.

If the release has off site impact potential, the Emergency Coordinator in collaboration with local Emergency Services must consider notifying surrounding neighbours and businesses.

5.2 DECONTAMINATION

Exposure, First Aid, and decontamination requirements for specific chemicals on site are addressed in the appropriate SDSs in the site's HAZCOM binder.

5.3 CYLINDER LEAKS

- Do not handle leaking cylinders without supervision.
- Determine the source of the leak.
    - Most leaks occur at the valve in top of the cylinder. Areas that may be involved are the valve threads, valve stem and packing, valve outlet, or pressure relief device.
- **NEVER** attempt to repair a leak at the valve threads or pressure relief device.

Guidelines for INCIDENTAL leaks involving flammables, atmospheric inerts, or oxidants.

- If a leak develops in a cylinder containing flammables, atmospheric inerts, or oxidants, make sure there is adequate ventilation to dissipate the gas.
- Keep mobile phones and non IS portable radios away from the source of the leak.
- Move the cylinder to an isolated area (away from combustibles materials if the cylinder involves flammable or oxidizing gases).
- If the leaking cylinder is in a poorly ventilated area, monitor for oxygen deficient atmosphere (and flammable atmosphere if its a flammable gas) before attempting to move the cylinder.
- If the leaking cylinder is still connected to a fill manifold, valve off the remaining cylinders and slowly vent down the leaker through the manifold vent, before attempting any repairs.
- Atmospheric inerts that have been moved outdoors can be vented down by securing the cylinder, opening the valve and discharging the gas at a moderate rate, before attempting any repairs.
- If the leak cannot be safely stopped or controlled, or if the leak escalates beyond an incidental leak contact the Air Products Emergency Response Center at **0800 650 315** or Vincent Ntuli on 041 405 9608.

Guidelines for ANY leaks involving corrosives or toxics.

- Leaks involving corrosive or toxic gas must be evaluated and handled only under the direct supervision of an Air Products Emergency Response Coordinator.
- Evacuate and secure the affected area. Observe any wind socks at the site for the likely direction of fumes or vapours.
- Contact The Air Products Emergency Response Center at **0800 650 315**.
- The Emergency Response Coordinator will determine if the leak can be handled by plant personnel or if a trained Emergency Response team must be dispatched.
- If applicable, emergency response equipment is shown on *Attachment B4*.

5.4 FLAMMABLE GAS RELEASE

Hydrogen, Methane, Ethylene, Synthesis / Natural Gas / Sasgas

- Determine the approximate location of the release (once the release site is located, move away from the source).
- All nonessential personnel shall go to the designated assembly area that is away from and upwind of the release. Observe any windsocks at the site, noting wind direction.
    - Secure the area from vehicular traffic.

  WARNING *- Proceed only if safe to do so without putting yourself or other plant personnel at risk! Plant personnel must never attempt to approach a leak unless the flammable gas concentration is confirmed to be < 10% of the LEL, and the appropriate PPE and back up support is available. Plant personnel are not permitted or trained to enter a hazardous area for emergency response to a major release.*
- **MITIGATE** the situation.
    - If necessary, shut down the affected part of the plant and depressurize the system. See *Attachment A4, "Plant Main Emergency Shut Offs".*
    - In some cases, it may be necessary to start a nitrogen purge on the equipment.
    - Eliminate all ignition sources.
    - If available and necessary, set up fire monitors to establish a water spray to disperse the gas and to keep non-electrical equipment such as pneumatic control systems and instrument air lines cool.
    - If unable to secure the leak, **STOP**. Activate the evacuation alarm and evacuate.

5.5 TOXIC GAS RELEASE

Ammonia

N/A

5.6 CRYOGENIC LIQUID SPILLS

General Guidelines for All Cryogenic Liquid Spills

- **CONTACT** the Emergency Coordinator.
  - The Emergency Coordinator must make a determination as soon as possible as to whether the release has off site potential, i.e., obscuring vision, asphyxiation, fire and energy release.
  - If it is determined that the release does have off site potential, then contact the local Emergency Services.
  - The Emergency Coordinator in conjunction with local Emergency Services shall determine if facility neighbours need to be notified or evacuated.
- **ASSESS** the risk.
  - All cryogenic liquids produce large volumes of gas when they vaporise.
  - Cryogenic liquids will flow and result in accumulation of potentially hazardous atmospheres in low points and drains.
  - Contact with cryogenic liquids or their vapours can cause severe frostbite.
  - A plant evacuation may be necessary, if there is a risk of explosion or a risk of high or low oxygen concentrations depending on the product.
  - A hazardous atmosphere can exist well beyond the visible vapour cloud. Keep well clear of the vapours and direct others to do likewise.
- **CONTROL** the situation.
  - Secure the area from both non-essential personnel and all vehicular traffic.
  - If the vapour cloud is obscuring a neighbouring road, then, provided manpower is available, personnel should be stationed on both sides of the vapour cloud, and well clear of it, to stop traffic. This control should be passed on to the police or fire service as soon as possible.
  - Shut down any air conditioning or ventilating systems that may draw vapours or gas from spills or gas releases into buildings.
  - Carbon steel will be brittle and subject to impact or stress breakage if cooled to cryogenic temperatures. Keep critical lines, structures or vessels warm with water. Stand clear of any structural work that may be subject to collapse.
- **MITIGATE** the situation.
  - If possible, shut off the source of the cryogenic liquid. Whenever possible, accomplish this with a remotely operated valve**. (Do not subject yourself to any unreasonable hazard i.e., high oxygen, combustible or asphyxiating atmospheres, or cryogenic liquid exposure.)** Emergency Stop Buttons, emergency shut off valves, and electrical switches are shown on *Attachment A4*.
  - For minor releases of cryogenic liquids, water can be used to vaporise the liquid, if the source cannot be shut off. Be aware that depending on wind and weather conditions, the resulting expanding vapour cloud can jeopardize plant personnel, equipment, and possibly third parties.
  - Major releases should be vaporised only with the support of local emergency services, and after facility neighbours have been notified.

Liquid Oxygen (LOX) Spill Guidelines

(to be used in addition to the general guidelines)

WARNING – Do Not enter atmospheres that are greater than 23.5% Oxygen

- LOX Emergency Stop Buttons, emergency shut off valves, and electrical switches are shown on *Attachment A4.*
- Although the vapour cloud reveals the presence of a leak, the oxygen-rich area usually extends beyond its boundaries and may exist significantly downwind. Always approach an oxygen leak from upwind. Analyze the air to determine the perimeter of the area with an oxygen content over 23.5%. Keep all personnel outside of this area and shut off all sources of ignition such as electrical equipment, open flames, and machinery.
- If anyone has been exposed to an oxygen-rich area, do not get near any sources of high heat or open flame for at least 30 minutes. Open your clothes and pat them down to ventilate. Change your clothes, if possible. ***DO NOT SMOKE*** *until clothes have been ventilated for at least 30 minutes or changed*.
- Block all vehicular traffic from entering the area.
- Shut down the plant if the control room or other enclosed areas are susceptible to oxygen rich atmospheres. If it is already saturated with oxygen vapours, do not attempt to shut down. Evacuate the area and do not operate any equipment which may provide a source of ignition.
- If vapour clouds drift toward the air intake of instrument or main air compressors, shut them down immediately.
- If vapour clouds drift toward the cooling tower, the fans shall be shut down. Keep the water pumps operating. This may then require shutting down the facility depending on the load, ambient temperature, and the time necessary to keep the fans off.
- If the LOX reaches an asphalt surface or oil-soaked concrete, do not allow any movement, personnel or vehicular, on the affected area for at least 30 minutes after the frost disappears. In cases of large spills penetrating into the ground, this can take days.
- Use drawings and reference material to understand the hydraulics of system and know what is driving the leak. (Examples, tank leak stop head pressure using PIC, loading line leak stop pump, etc.)
- Use drawings to locate pipe spools and understand how they are run/located in box, duct work, or annulus of tanks. (Example, tank leak could be bottom drain, top fill, seal loops, etc.)
- Use existing flow sheets to see if any "injection" points are available upstream of leak. Use taps, drains, and other connections as a location to inject water, or CO2 into piping upstream of leak to freeze pipe or use air, N2, O2 injection to break seal or siphon effects in piping.
- Using fire water to make an ice dam by wetting of leak location to ice over area to seal leak.

Liquid Nitrogen (LIN) and Liquid Argon (LAR) Spill Guidelines

(to be used in addition to the general guidelines)

- LIN and LAR Emergency Stop Buttons, emergency shut off valves, and electrical switches are shown on *Attachment A4*.
- Keep out of, and well away from, the vapour clouds. Although the cloud usually extends beyond the oxygen-deficient area, do not assume that it is a boundary. Atmospheric conditions may cause variations. Approach any areas of suspected oxygen-deficiency from upwind.
- The cold vapours may settle in low-lying areas and cause localized areas of oxygen-deficiency.
- If it is necessary to enter a suspect area, first analyze the oxygen content of the air.

  If the oxygen content is below 19.5%, only HAZMAT trained emergency response teams with the appropriate PPE and back up support are permitted to enter the area.
- If vapours are suspected of having penetrated a building, evacuate the building. Keep ventilators operating on any equipment which withdraws air from the building.
- Equipment can be left running if cold vapours or liquids do not affect any structural members of machinery or piping, and the general operation of the plant is stable.

Liquid Helium (LHe) Spill Guidelines

(to be used in addition to the general guidelines)

N/A

Liquid Carbon Dioxide (LCO_2) Spill Guidelines

(to be used in addition to the general guidelines)

N/A

5.7 OTHER HAZARDOUS CHEMICALS SPILLS

General Guidelines for All Spills (Fuel, Diesel, Oil and Process / Maintenance Chemicals)

Note:

- *Chemicals are listed in Attachment D "Major Hazardous Chemical List"*
- *Refer to Safety Data Sheets for full details*
- *Ensure the appropriate PPE and spill kits are available to handle spills*

- **ASSESS** the risk.
  - The risks presented by the spill should be assessed the moment a spill is discovered.
  - A major spill may require plant employees to evacuate and a response be made by outside services that are equipped and trained to handle major releases.

  WARNING - Proceed only if safe to do so without putting yourself or other plant personnel at risk! Plant personnel must never attempt to approach a major spill (uncontrolled). Plant personnel are not permitted or trained to enter a hazardous area for emergency response to a major spill.
- **CONTROL** the release.
  - Secure the source of the spill.
  - Seal off all drains in the path of the spill.
  - Prevent the spill from spreading to any soil or water sources or from leaving facility using absorbent materials, booms, outside contractors, etc.
- **REPORT** the release.
  - Report all releases to Site Management / Site Emergency Controller.
  - Site Management shall contact the Site SHEQ Coordinator in the event of any release or spill. The Site SHEQ Coordinator will assist in determining if a specific situation warrants reporting and in making the actual reports.
- **CLEAN UP** the impacted area.
  - Cleanup should begin as soon as possible.
  - The Site SHEQ Coordinator will contact a local spill response contractor to arrange for proper clean up and disposal of spilled materials.
  - Spill cleanup contractors must not be allowed to dispose of spill residue until an approved or acceptable disposal facility has been identified.

5.9 PIPELINE ACCIDENT

Onsite

N/A

Off-site – refer Pipeline ER plan

N/A

SECTION 6 : ATTACHMENTS INDEX

A SITE PLOT PLANS

- A1 Evacuation Assembly Locations
- A2 Emergency Exits and Escape Routes
- A3 Emergency Equipment Locations
- A4 Plant Main Emergency Shut-Offs
- A5 Hazardous Chemical Substances Storage Areas

B EMERGENCY EQUIPMENT

- B1 Control Room
- B2 Fire fighting equipment
- B3 First Aid equipment

C ER TEAM INFORMATION

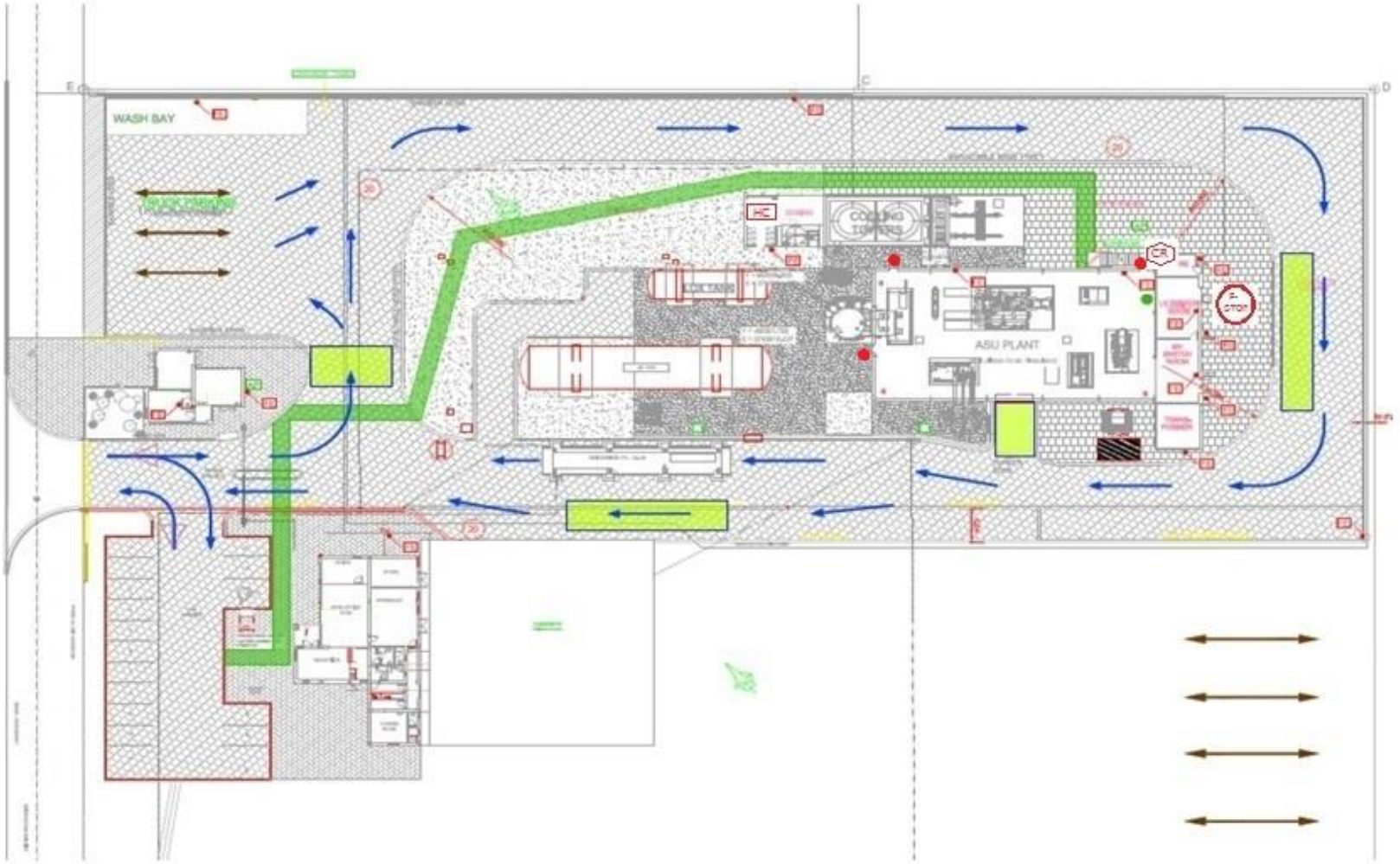
- C1 Organogram/List: First Aiders Team
- C2 Organogram/List: Fire-fighters Team
- C3 Appointment Letter: Site Emergency Coordinator
- C4 Appointment Letter: Area Emergency Marshal
- C5 Appointment Letter: Fire Fighter
- C6 Appointment Letter: First Aider

D MAJOR HAZARDOUS CHEMICAL LIST

E CHECKLISTS / TEMPLATES / FORMS

- E1 Threats and Harassing Phone Calls Checklist (including Bomb Threat)
- E2 Site Emergency Coordinator Checklist
- E3 Employee Roster
- E4 "In Case of Emergency" information

EMERGENCY SITE PLAN: COEGA



EMERGENCY PLAN

EMERGENCY PLAN

EMERGENCY REPONSE TEAMS: Coega Facility

SITE EMERGENCY LEADERSHIP:

SITE EMERGENCY COORDINATOR:

Vincent Ntuli

AREA EMERGENCY MARSHAL:

None

FIRST AIDERS:

- **Sigqibo Mbiyozo**
- **Sinethemba Dzena**
- **Vincent Ntuli**
-

FIRE FIGHTERS:

- **Sigqibo Mbiyozo**
- **Sinethemba Dzena**
- **Vincent Ntuli**
- **Stuart Conyngham**
-

HAZARDOUS MATERIALS TECHNICIANS:

None

-

Refer to Site ER Plan & Guidelines for full procedure

EMERGENCY PLAN

IN CASE OF EMERGENCY: Coega Facility

EMERGENCY SITUATIONS

Such events include but are not limited to: fires and explosions, uncontrollable spills and emissions, medical emergencies, workplace violence, and natural disasters.

BASIC STEPS TO FOLLOW IN AN EMERGENCY ARE:

- **SOUND** the alarm : *situated in the Control room*
- **CONTACT** the Emergency Coordinator and or Emergency Services

EVACUATION RULES: ALL EMPLOYEES / CONTRACTORS / VISITORS:

- When you hear the alarm **EVACUATE** through the nearest emergency exit and proceed directly to the Emergency Assembly point situated *at the Main Gate Guard House*
- Ensure visitors / Contractors are escorted to the assembly point
- Stay calm and participate in roll call
- Remain in the assembly point until the all clear signal has been given

EMERGENCY RESPONSE TEAMS:

- Report to the Emergency Coordinator for further instructions after roll call
- Following guidelines in the Emergency Plan **ASSESS** the risk, **CONTROL** and **MITIGATE** the situation

Note: Employees shall respond to emergency situations only if they have been trained to do so

EMERGENCY TELEPHONE NUMBERS:

SITE MANAGER/ 16(2):	**JP VAN WYK**	**082 788 0112**
SITE EMERGENCY COORDINATOR:	**VINCENT NTULI**	**072 316 8745**
EVACUATION CONTROLLER:	**VINCENT NTULI**	**072 316 8745**
CRISIS MANAGEMENT OFFICER:	**MAROPENG BAHULA**	**079 898 5886**
AIR PRODUCTS EMERGENCY RESPONSE CENTER:		**0800 650 315**
FIRE DEPARTMENT:	**10177 /**	**041 585 1555**
POLICE:	**10111 /**	**041 394 6326**
NET – CARE:		**082 911**

Refer to Site ER Plan & Guidelines for full procedure

EMERGENCY PLAN

THREATS & HARASSING PHONE CALLS CHECKLIST (including Bomb Threats)

** This checklist should be kept readily available at all phones that can accept incoming calls*

CALL DETAILS

Telephone Number at which call was received	Date	Time of Call

YOUR DETAILS

Name: _____

Position: _____

Location: _____ **Telephone No.:** _____

EXACT WORDING OF THREAT / MESSAGE

_____

_____

_____

_____

_____

_____

_____

_____

_____

LISTEN--DO NOT INTERRUPT!!
AFTER CALLER STOPS VOLUNTEERING INFORMATION, ASK THE FOLLOWING QUESTIONS:

Bomb threats;

1. When is the bomb going to explode?
2. Where is the bomb right now?
3. What does the bomb look like?
4. What kind of bomb is it?
5. What will cause the bomb to explode?
6. Did you place the bomb?

All threats;

7. What is the reason for the threat?
8. What is your address?
9. What is your name?

RECORD THE FOLLOWING INFORMATION:

Sex of Caller: _____ **Age:** _____ **Length of Call:** _____

CALLER'S VOICE (check the appropriate descriptors):

☐ Calm	☐ Nasal	☐ Soft	☐ Distinct
☐ Angry	☐ Stutter	☐ Loud	☐ Ragged
☐ Excited	☐ Lisp	☐ Laughter	☐ Cracking Voice
☐ Slow	☐ Rasp	☐ Crying	☐ Clearing Throat
☐ Rapid	☐ Deep	☐ Normal	☐ Accent
☐ Deep Breathing	☐ Slurred	☐ Whispered	☐ Disguised

☐ Familiar--If familiar, who does it sound like? _____

CALLER'S LANGUAGE (check the appropriate descriptors):

☐ Well-spoken(educated)	☐ Incoherent	☐ Foul
☐ Irrational	☐ Taped	☐ Threat Read

BACKGROUND SOUNDS (check the appropriate descriptors):

☐ Street Noises	☐ Animal Noises	☐ Long Distance	☐ Voices
☐ House Noises	☐ Office Machinery	☐ Local	☐ Music
☐ Bar Noises	☐ PA System	☐ Booth	☐ Radio
☐ Motor	☐ Static	☐ Clear	☐ TV
☐ Factory			

☐ Other: _____

WHO WAS NOTIFIED (check the appropriate boxes):

☐ Site Management	☐ Line Management	☐ Security
☐ Police	☐ Fire	☐ Medical
☐ Customer	☐ Other: _____	

ACTION TAKEN (check the appropriate boxes):

☐ Evacuation	☐ Normal Shutdown	☐ Emergency Shutdown

☐ Other: _____

Remarks:

_____

_____

_____

_____

EMERGENCY PLAN

EMPLOYEE ROSTER & EVACUATION ACCOUNTING LIST

FACLITY / SITE: Coega Facility EVACUATION DATE: _____

AREA/DEPT: All ROLL CALL BY: _____

EMPLOYEE NAME	JOB TITLE	Evacuation Accounted For
Vincent Ntuli	Plant Supervisor	
Sigqibo Mbiyozo	Process Controller	
Sinethemba Dzena	Process Controller	
Neliswa Kenene	Office Administrator	
Stuart Conyngham	Technician	
Buhle Hlabingwe	General Dutyman	
Brendan Oelofse	TES – Bulk Driver	
Sisasenkosi Belebana	TES – Bulk Driver	
Mxolisi Cacela	TES – Bulk Driver	
Leslie April	TES – Bulk Driver	
Bonginkosi Nomandla	TES – Bulk Driver	
Sivuyile Masumpa	Ind. Contractor – Cleaner	
	Ind. Contractor – Security	
	Ind. Contractor – Security	

APPENDIX E:

The Evaluation table for the Emergency Response Plan

MMrisk	Emergency Response Plan Evaluation Table

Client Name:	Air Products	Site Name:	Coega site
Project Number:	Ai03	This document Revision:	A

Clause	Requirement	Currently Addressed? (Yes or No)	Notes
MHI Regulations			
6 (1)(c)	"… review the on-site emergency plan and, where necessary, update the plan, in consultation with the relevant local government, at least once every three years; …"	Partially	The ERP mentions the intention to update and review the plan periodically, however, MMRisk was unable to identify the interval of such update / review, in the plan.
6 (1) (d)	sign a copy of the on-site emergency plan in the presence of two witnesses, who shall attest the signature;(this just needs to be done in the presents of witnesses but it will be best to choose people who are important to the documentation details)	Partially	A signature page exists with space for 2 signatures: Site manager and Site Emergency Coordinator. The MHI Regulations require a third signature such that 2 witnesses have signed. **MMRisk would recommend the addition of another signature field such that the Site Emergency Coordinator and the third signee are the two witnesses required by this regulation.**
6 (1) (e)	ensure that the on-site emergency plan is readily available at all times for implementation and use;	Yes	Locations of where the plan is to be located, are given.
6 (1) (f)	ensure that all employees are conversant with the on-site emergency plan	Yes	

6 (1) (g)	cause the on-site emergency plan to be tested in practice at least once a year and keep a record of such test (as mention above)	Mostly	The ERP indicates the intention for drills to be undertaken, however, MMRisk was unable to ascertain the intended frequency of such drills.
SANS 1514:2018			
5.1.1 / 5.1.2	The emergency plans shall indicate the emergency organisational structure which shall include all emergency functions identified both off-site and on-site in their allocated areas of responsibilities involved in managing an emergency.	Yes	
5.1.4	The roles, responsibilities, functions and needs of all key stakeholders shall be clearly identified	Yes	
5.1.5	The establishment shall make every reasonable effort to ensure coordination between on-site and off-site emergency planning.	Yes	Plan mentions the forwarding of the plan to the Emergency Services
5.2.1.1	Each establishment shall establish and maintain an emergency coordinating and planning committee.	Yes	
5.2.1.2	The establishment shall nominate an Establishment Emergency Controller, as head of the Emergency Coordinating and Planning Committee, with a sound knowledge of at least a) the establishment and its processes,	Yes	

	b) materials and equipment relating to the hazards, c) materials and equipment used for emergency response, d) the potential impact of emergencies on people, property and the environment, e) the waste management requirements of the establishment including waste related to site emergencies, and f) the content of the on-site emergency plan.		
5.2.1.3 / 5.2.1.4	An establishment shall nominate at least the following functional representatives for at least the responsibilities related to: Emergency Coordination, Firefighting, First Aid, Evacuation and Communication, whom shall be part of the emergency coordinating and planning committee. The functional representatives shall be part of the emergency coordinating and planning committee, and	Yes	

	shall be responsible for firefighting, first aid, evacuation and communication functions.		
5.2.2	Responsibilities of the Emergency Coordinating and Planning Committee The emergency coordinating and planning committee shall a) establish and determine the documented plan of the establishment for preparing and responding to emergencies relating to fire, explosions or the release of toxic substances or any other emergencies that can escalate into a major incident, b) develop a site specific procedure and organisational diagram indicating the incident management or emergency plan and command system, and c) define responsibilities for the emergency controller of the establishment, emergency team leaders, emergency team, all employees and visitors.	Yes	

5.2.3	Responsibilities of the establishment emergency controller The establishment emergency controller shall a) be in charge of developing and managing an on-site emergency plan for the establishment and shall have overall accountability for all functions performed by the on-site emergency teams during an emergency, b) be accountable for the implementation and review of the on-site emergency plan, c) be accountable for the management of all site emergencies by the assigned people, and d) assign people with accountability for allocated responsibilities for the execution of emergency functions identified.		
5.2.4	Responsibilities of the Team Leaders and Teams	Yes	

	5.2.4.1 Emergency preparedness (EP) team leaders shall be responsible for coordinating the emergency response procedures within their teams. 5.2.4.2 Team members shall be responsible for all emergency response in accordance with the emergency plan, as relevant to the establishment, until the arrival of the emergency services.		
6			
6.1.1	Risk management shall be undertaken to prevent incidents and to minimize their impact if they do occur.	Yes	Contents of the plan imply that risk management was conducted and that the MHI Risk Assessments of the site were consulted.
6.1.2	Risk management shall be linked to emergency planning as a component in order to mitigate risks in conjunction with the process safety management provisions of the establishment.	Yes	
6.1.4	Risk management shall comprise information from a) hazard identification, b) hazard analysis, c) AIA risk assessment, and d) other documents on the hazards.	Yes	

6.1.5	The results from the risk management process shall be used as the basis of determining scenarios for emergency preparedness and response plans.	Yes, mostly	MMRisk recommends that, where applicable, information from the MHI Risk Assessment be incorporated into the ERP such that emergency procedures are based on results from the MHI Risk Assessment, as applicable.
6.2.1	The establishment shall identify and document all hazards in the on-site MHI EP plan based on available risk assessments and other documents on the hazards, where such hazards could initiate or contribute to a major emergency which would require the activation of the MHI EP plans.	Yes	
6.2.2	At least the following hazards shall be considered: a) the hazards arising from the hazardous substances, based on their physical and chemical properties, associated with the establishment, b) the hazards arising from activities or equipment associated with the establishment (for example, cranes, plant, machinery, transport and electrical), c) the hazards arising from processes (for example, high pressure, high temperature), and	Yes	

	d) natural hazards (for example, floods, lightning strike) that could impact upon the safe operation of the establishment.		
6.2.3	The hazard identification step shall reveal a spectrum of incidents that can significantly impact on people, property and the environment including but not limited to a) fire: jet, pool and tank, b) explosions, c) dispersion of toxic, corrosive or explosive chemicals, d) violent exothermic reaction- polymerisation or decomposition, and e) heat radiation.	Yes	
7.1.1	A summary of the outputs of the emergency planning process shall be documented in the emergency plan of the establishment and in the off-site emergency plan of the local government.	Yes	
7.1.2	The plan shall define areas such as the functions of the establishment and organisational structure, emergency procedures, equipment, reporting and	Yes	

	communication channels, and the type of reporting required.		
7.1.3	The MHI establishment shall keep a copy of the plan at the establishment and provide a copy of the plan to the local emergency services with whom the plan was prepared and any other relevant emergency services.	Yes	
7.2.2.1	The introductory section of the plan shall define all situations that constitute MHI related emergencies expected at the facility and an outline of the levels of emergencies identified in accordance with 7.2.7	Yes	
7.2.2.2	The plan should clearly identify a) the name of the establishment and the owner or operator or occupier, b) the location of the establishment, c) a brief summary of the process followed to prepare emergency plan, d) authorisation details (person(s) responsible),	Yes	

	e) contact details – on-site responsible persons, emergency services and neighbouring facilities, and f) document control information.		
7.2.6.1	Details of the MHI related hazards identified as having a significant impact shall be provided in the plan. This should cover MHI hazardous substances and other hazards.	Yes	
7.2.6.2	Details of all hazardous substances under the control of the establishment sufficient to initiate MHI emergencies or to contribute to an initial MHI incident, shall be provided in the plan. The relevant quantities will depend upon the form and properties of these materials. The significance of the problem posed by these materials should be discussed and the way in which the plan addresses any problems identified.	Yes	
7.2.7.1.1	LEVELS AND TYPES OF EMERGENCIES The establishment shall define what constitutes an emergency (i.e. a situation that activates and deactivates the emergency plan). EXAMPLE An emergency for a facility and its operations may be described as a hazardous situation (or threat of a hazardous situation) which requires action to control, correct and return the facility to a safe condition and also requires timely action to	Yes	

protect people, property and the environment from harm.

Table 1 — Examples of levels of emergency

1	2
Description	Emergency services
Confined location An emergency where the impacts on people, property and the environment: are expected to be confined to a specific location within the facility and no escalation is expected	May be required Examples: ruptured drum in warehouse, leaking flange or seal, small fire in a bag store
Site An emergency where the impacts on people, property and the environment:	Should be required Examples: tank or bund fire, pipe rupture

	are expected to spread to or affect all parts of the facility, but not off-site			
	External An emergency where the impacts on people, property and the environment: are expected to impact both within the facility and beyond the boundary of the facility	Will be required Examples: a bomb threat, large tank bund fire, boiling liquid expanding vapour explosion (BLEVE) of large liquefied gas storage toxic gas release, transport incident		
7.2.7.2.1 / 7.2.7.2.2	Emergencies can vary in scale. For this reason, it is required that different levels of emergency are defined for the facility and for the local government. Information obtained during the risk management process shall be utilized in determining the level of emergency for a particular type of incident.		Yes	

7.2.7.3.1	Emergencies shall be defined according to type on the basis of the materials and activities involved.		
7.2.7.3.3	Types of emergencies may include, but are not limited to a) fire (including the generation of toxic combustion products) b) explosion (including BLEVE), c) spill (of hazardous solids and (or both) liquids), d) gas leak (flammable, toxic, asphyxiant, pressurised or refrigerated liquid), e) structural failure, f) natural event (including flood, earthquake, storms, storm tides, etc.),	Yes	

	g) impact event (road vehicles, railways, aircraft, ships), h) subversive activities (bomb threat, vandalism, sabotage, etc.), and i) transport incident.		
7.2.7.3.4	These types of emergencies shall be considered for: a) an incident within the facility, b) an incident occurring outside the facility where a hazardous material is the responsibility of the facility (for example off-site pipeline)	Yes	
7.2.8.1	The functions nominated for the facility and the local government, in the on and off site plans respectively, shall be listed in the plans, including associated roles, responsibilities and duties of personnel assigned to these functions, and arrangements for appropriate backup shall be recorded.	Yes	
7.2.8.2	The roles, responsibilities, functions and needs of all key stakeholders (for example. industry, the	Yes	

	community, affected and interested parties) shall be clearly identified.		
7.2.8.3	The emergency plan shall provide details of the command system, structure and people to be activated in an emergency, so that it is clear what actions will be taken, who will take these actions, and how, when and where they will be taken.	Yes	
7.2.9.1	The functions nominated for the facility and the local government, in the on an off-site plans respectively shall be listed in the plans together with assigned roles, responsibilities and duties. Arrangements for appropriate backup shall be recorded.	Yes	
7.2.9.2	The people performing duties within the organisational emergency preparedness structure or conducting assigned functions shall require clear methods of identification.	Yes	
7.2.9.3	The method of identification shall be described in the on and off site emergency plans	Yes	
7.2.10.1	EMERGENCY PROCEDURES The procedures shall describe at least the following: a) steps to be undertaken; b) the precautions;	Yes	

	c) personal protective clothing to be used during the emergency; d) equipment to be used during the emergency; e) Special conditions;		
7.2.10.2	At least the following emergency response procedures shall be included in the on-site emergency plan of the establishment and the off-site emergency plan of the local government: a) raising the alarm; b) receiving and responding to the alarm; c) activating the emergency plan; d) notifying and interaction with the emergency services and stake holders;	Yes	

	e) the safe evacuation and (or both) sheltering of affected persons, and accounting for all people, including visitors and contractors; f) control points and actions for utilities including for example gas supply, water and electricity; g) decontamination following an incident; h) health and safety functions such as first aid, fire-fighting, roll call and search and rescue; and i) terminating the emergency.		
7.3	Raising the on-site alarm The procedure shall at least indicate a) types of warning devices used on the site, their location and area covered.	Yes	

	b) the operation and function of the warning devices and circumstances for the activation. b) activation methods for initiation of the alarm. c) method of establishing that there is an emergency and confirmation of its level. d) persons authorised to activate the emergency plan after alarm initiation. e) where different alarms are deployed for different actions. f) ability of the public warning system to be effective throughout the community information area (where necessary). g) method, and frequency and recording of testing. h) Need for back-up systems for the alarm.		

	i) method of activating alarm if the facility is not staffed.		
7.4	Receiving and responding to the alarm The procedure shall at least indicate a) appropriate actions to be taken on hearing or observing the alarms and b) emergency plans and procedures activated by off-site emergency responders in relation to the alarms and notification received.	Yes	
7.5	Activation of the on-site or off-site emergency plan The procedure shall at least indicate a) the circumstances under which the emergency plan (s) is or are to be activated,	Yes	

	b) the method of activation (including all designated methods for raising the initial warning and sounding the alarm), c) the means of alerting all relevant stakeholders, d) the arrangements for activation when the facility is not staffed (such as maintaining a regular list of emergency contact numbers), and e) The means of addressing communication issues with the relevant emergency services and other stakeholders.		
7.6	Notifying the Emergency services 7.6.1 The on-site emergency procedure shall indicate the role, responsibility and duties of the persons nominated to advise the emergency services of the emergency. 7.6.2 Applicable information relevant to the establishment and the emergency shall be supplied to	Yes	

	the emergency services including at least the following: a) name and location of the facility (suburb, street, nearest cross street to relevant site entry); b) number of injured persons or casualties and the nature of injuries; c) the type and scale of emergency, including a brief description; d) hazards involved (including details of substances, namely UN Numbers, names of substances and quantities involved); e) telephone contact number (for any return messages); f) name of person making the call; and		

	g) any other useful information (for example, wind speed and wind direction). 7.6.3 The absence of any of the information listed in 7.6.2 , except the location of the emergency, shall not become a hindrance to informing the emergency services of an incident. 7.6.4 The off-site emergency procedure shall indicate at least the following: a) form of notification from an establishment; b) emergency agencies that will be required to respond; c) the role, responsibility and duties of the responding agencies; and d) inter-agency notification and communication.		
7.7	Termination of an emergency	Yes	

	The procedure for terminating an emergency and bringing the emergency incident to a safe, orderly and organised conclusion should include, as applicable: a) On-site debriefing by all on and off site responder command representatives, b) On-site Incident critique by all on and off site responder command representatives, c) The identification of immediate emergency plant equipment repairs, replacements and re-supply, which includes reinstatement of protection systems and related equipment, d) Contact person for follow up activity before emergency responders leave the area, and e) Termination of contact with any remote incident command centres.		
7.8	Emergency resources	Yes	

	7.8.1 Resources include manpower, consumables and equipment required to successfully mitigate emergencies. This can be the same for on and off-site. EXAMPLES Gas detectors, wind velocity detectors, sand, lime, neutralising agents, absorbents, spill bins and decontamination equipment. 7.8.2 Off-site emergency resources may also include arrangements for obtaining additional external resources (specific to the likely major incidents) to assist the control of major incidents and major incident hazards.		
8	Administration and control of the emergency plan 8.1 The emergency plan shall be properly managed. 8.2 The on-site and the off-site plan shall describe how the organization will address the following: a) continual training and awareness;	Yes	

	b) operational control; c) maintenance of equipment; d) documentation and record keeping; e) exercises and testing of the plan; f) monitoring and review; and g) updating of the plan.		
9.2	The supporting information (see annex C) shall be prepared in consultation with the emergency services to ensure that it meets their needs. Information required to support the plan includes: a) safety, health and environmental information, b) the location map, c) the site layout plan, d) a list of emergency contact phone numbers, and	Yes	

	e) other relevant supporting information.		
10.1	Training and awareness The general training and awareness programmes on the EP plan shall comply with the requirements of the relevant national legislation (see foreword).	Yes	
10.3	Training and awareness shall enable all responding personnel to develop and demonstrate skills in the use of emergency equipment and a working knowledge of emergency procedures. Areas to be covered should include at least: a) general duties, roles and responsibilities in terms of the on-site and off-site plans respectively, b) emergency functions of the Emergency Coordinating and Planning Committee and teams, c) emergency procedures, and d) emergency resources.	Yes	
10.4	The on-site and off-site emergency plans shall make provision for the dissemination of information and	Yes	

	awareness, to affected parties including neighbouring businesses and communities They shall be informed of the appropriate actions to be taken during an emergency and the means by which they will be warned of an emergency, and kept informed during and after an emergency		
11.1.2	Emergency equipment, operational control and readiness Facilities and local authorities shall establish and maintain controls to ensure that the on-site and off-site emergency plans, respectively, shall be effectively maintained and can be executed. This shall include ensuring that all equipment and resources are available, fully maintained and in a state of operational readiness at all times.	Yes	
11.2	Examples of control elements 11.2.1 Inspection, testing, servicing and maintenance actions to be conducted daily, weekly, monthly, yearly or such other intervals as required. 11.2.2 Emergency resources are accessible and generally not located in the hazard zone.	Yes	Section 2.5.1

	11.2.3 Emergency equipment (for example, batteries, detection systems, fixed installations) are functional and required spares are available. 11.2.4 Materials that have been consumed have been replaced (e.g. foam, neutralising agents). 11.2.5 New staff are also issued with emergency protective equipment. NOTE This is not an extensive list of control elements. These elements will be defined through the hazard identification and mitigation action determination process.		
11.3	Safe emergency shut down 11.3.1 Control and shutdown facilities shall be provided and shall address, as applicable: a) Automatic closure at loading facilities, b) Automatic pump stoppage at pumps,	Yes	

	c) Overflow control d) Surge control e) Sage gas release facilities, and f) Disconnection facilities 11.3.2 Consideration should be given in terms of operating shutdown facilities from both local and remote locations, and 11.3.3 These safe emergency shutdown procedures should be tested/ practised on scheduled intervals and whenever changes to procedures have been made.		
11.4	Maintenance of equipment 11.4.1 A maintenance plan shall be developed and should identify tasks and schedules, troubleshooting, corrective maintenance (repair), and spare parts	Yes	Section 2.5.1

	identification, stock (quantity), and any unique storage requirements. 11.4.2 Where any maintenance or break down results in the unavailability of emergency equipment the contingency preparations for such an event shall be addressed in the on-site and off-site emergency plan.		
12	Documentation and record keeping 12.1 Records should be retained by the on-site and off-site committees to verify the adequacy of the system.	Yes	
12.2	Circumstances for which records should be kept include, but are not limited to: a) all induction programs and ongoing training, including details of personnel trained, b) desktop simulations and practical exercises at the facility,	Yes	

	c) testing of the plan, including the dates of testing, methods, personnel responsible and the results of testing, d) equipment maintenance records, and e) training and awareness events including communication with affected and involved parties.		
12.3	The management system should control the distribution, presentation, revision and accessibility of the plan, and any supplementary information. The system should ensure that all official copies of the document are the latest version. All superseded copies should be accounted for and filed or disposed of, as appropriate.	Yes	
13	Testing of the emergency plan 13.1 The on-site and off-site emergency plan should be tested when first developed, and then in terms of relevant legislation (see foreword) to enable deficiencies to be identified and corrected,	Yes	

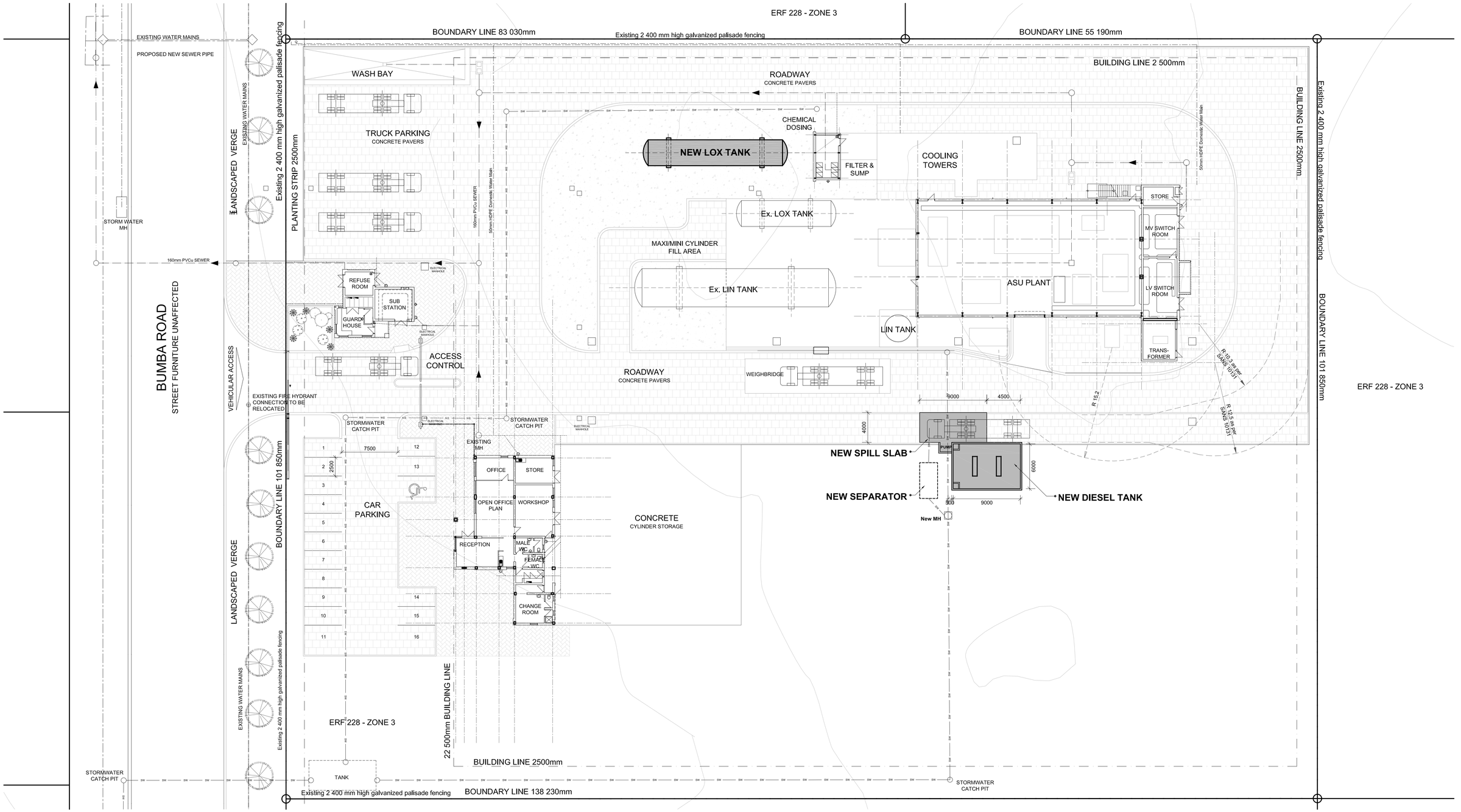
	13.2 The two usual methods of testing are desktop simulations and practical exercises or drills, 13.3 Testing should consider all components of the plan, including the effectiveness of training, and 13.4 Consultation between the off-site and on-site committees during planning exercises and testing is required.		
14	Review and updating the emergency plan 14.1 The emergency plan shall be reviewed in terms of relevant national legislation to ensure its continued suitability and effectiveness. 14.2 Reviews may be initiated by: a) changes in legislation, b) advances in technology and equipment, c) lessons learned from:	Partially	The ERP mentions the intention to update and review the plan periodically, however, MMRisk was unable to identify the interval of such update / review, in the plan. **MMRisk recommends that the interval of review / update be mentioned in the ERP.**

	1) incidents or near miss at the establishment or similar establishments, 2) emergency plan activation, whether real incidents or during testing, that highlighted shortcoming, 3) research and development information, and 4) findings of audits, reporting and communication d) modifications or alterations occurring at the facility, e) the type and quantities of hazardous materials on-site change significantly, f) changes to surrounding land use impact upon the emergency plan, and g) changes occur that will impact on the execution of the plan, such as resources, safety systems, personnel and contact numbers.		

	14.3 The plan shall be updated based on the outcomes of the review process. NOTE Temporary modifications to the plan shall may be considered when undertaking non-routine activities at the hazardous facility, such as maintenance, construction and start-up or shut-down		

APPENDIX F:

Layout Diagrams for future Oxygen storage (Options 1 and 2)



SITE PLAN - OPTION 1

A1 SCALE 1:250
A3 SCALE 1:500

REV	DATE	BY	DESCRIPTION
-	-	-	-

REV	DATE	BY	DESCRIPTION

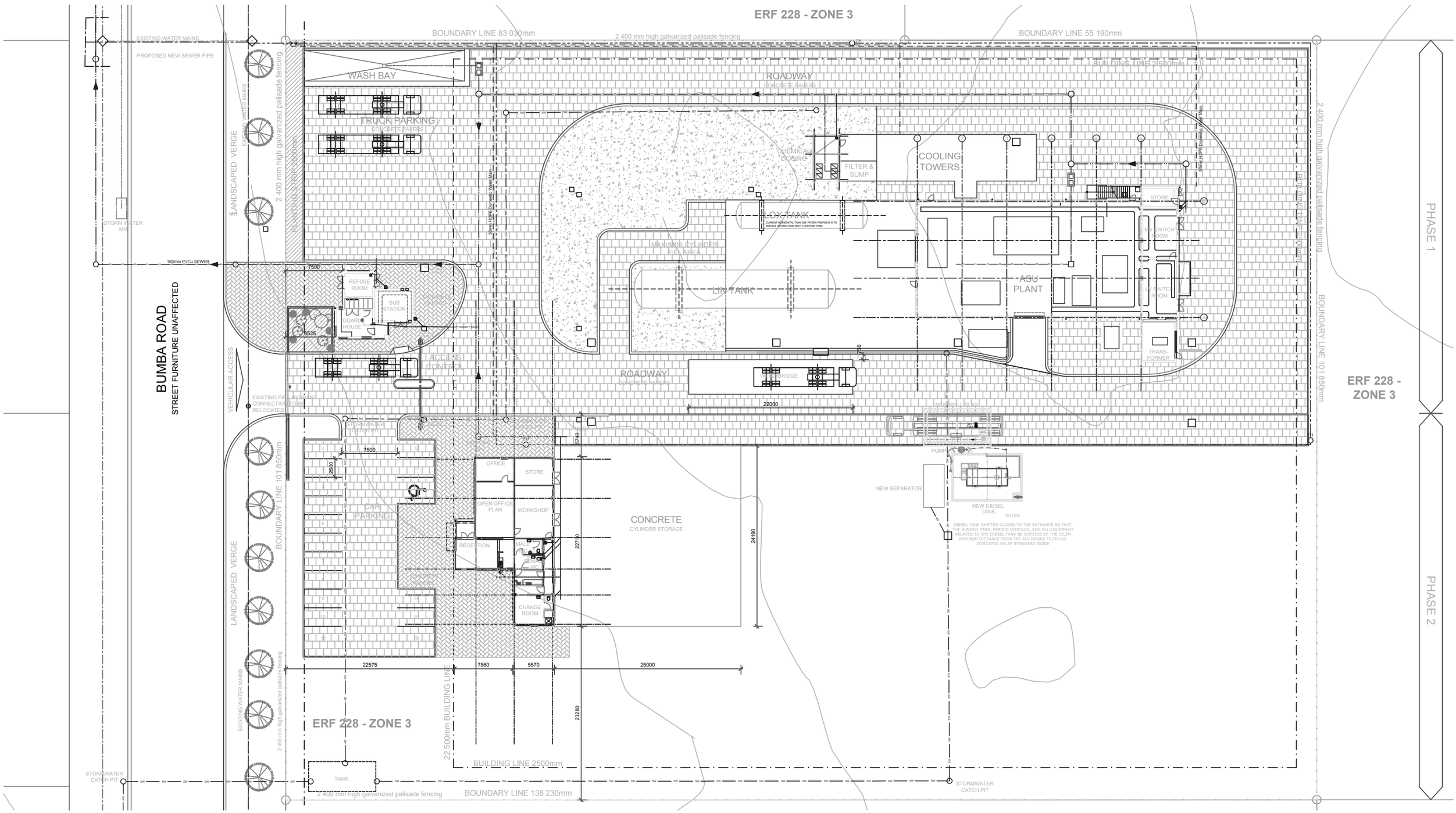
SCALE: AS INDICATED
DRAWN:
DISCIPLINE: ARCHITECTS
DATE OF DWG CREATION: 30.10.2019
DESIGNED BY: NAME: SIGNATURE:
CHECKED BY: NAME: SIGNATURE:

CLIENT:
AIR PRODUCTS SOUTH AFRICA (PTY) LTD

BALSHAW FOGARTY
111 CAPE ROAD, PORT ELIZABETH, www.balshawfogarty.co.za
PO BOX 12932, CENTRAHIL, 6006
TEL 041 373 4340, FAX 041 373 4324, mail@balshawfogarty.co.za
S.BALSHAW B.Arch (UPE), Pr.Arch (4869) S.FOGARTY B.Arch (UPE), Pr.Arch (7243)

PROJECT: DIESEL & LOX TANKS 2019
TITLE: SITE PLAN - OPTION 1
PRELIMINARY

SHEET	CONTRACT No.	DRAWING No.	REVISION
A1	19.1880	001	A



NORTH

SITE PLAN

A1 SCALE 1:250
A3 SCALE 1:500

DISCLAIMER

NOTE THAT THE ATTACHED DRAWINGS WI
PREPARED BY BALSHAW & FOGA
ARCHITECTS FOR SPECIFIC PURPO
WITHIN A DEFINED PROJECT CONTEXT , A
WE DO NOT WARRANT THE ACCURACY
SUITABILITY OF THESE DRAWINGS FOR A
USAGE OUTSIDE OF THIS OFFICE.

REV	DATE	BY	DESCRIPTION
A	2013.11.	CM	Additional parking added, Office building revised, dimensions added.
B	2013.11.	CM	SANS 10400 calculations added.
C	2014.04.11	CM	Concrete cylinder storage and weighbridge added.
D	2014.04.15	CM	Concrete cylinder storage revised, paving added and weighbridge revised.
E	2019.7.19	G.B	DIESEL STORAGE TANK AND LOX STORAGE TANK

SCALE: AS INDICATED
DRAWN:
DISCIPLINE: ARCHITECTS
DATE OF ORIG. CREATION: 28.10.2013
DESIGNED BY: NAME: SIGNATURE:
DRAWN BY: NAME: SIGNATURE:

CLIENT: AIR PRODUCTS SOUTH AFRICA (PTY) LTD

BALSHAW & FOGARTY ARCHITECTS cc
111 CAPE ROAD, PORT ELIZABETH, www.balshawfogarty.co.za
PO BOX 12932, CENTRAHIL, 6006
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(BBA GRAY, B.Arch (UPE), PI.Arch (RSA)) (S.FOGARTY, B.Arch (UPE), PI.Arch (SA))

HATCH GOBA
Member of the Hatch Group
Building No.5, Ascot Office Park, Corrynghame Street, Glendinningvale, Port Elizabeth
Tel. +27 41 373 6552, Fax.+27 41 373 6546

PROJECT: NEW FACILITY FOR AIR PRODUCTS
TITLE: SITE PLAN - PHASE 2
SHEET: A1
CONTRACT No.:
DRAWING No.: 13.1500-004

Air Products South Africa (Pty) Ltd
Reg. No. 1969/003571/07
Silver Stream Business Park
1st Floor, Building 3, 10 Muswell Road South,
Bryanston, 2191
Private Bag 784090, Sandton, 2146
T +2711.570.5000 F +2711.570.5281
www.airproducts.co.za

To	:Chief inspector-dpt of labour Tibor Szana	**From**	: Plant Supervisor Mr. Vincent Ntuli
Tel.	: 012 309 4000	**Tel.** **Fax** **Email**	: 041 405 9608 : 041 405 9607 : Vincent.Ntuli@apsap.co.za
Address	: Laboria House 215 Schoeman Street 0001	**Address**	: Bumba Road, Coega IDZ, Port Elizabeth, 6100

Date :27 February 2020

Subject: **NOTIFICATION OF AN EXISTING MAJOR HAZARD INSTALLATION**

Dear Sir / Madam

You are hereby notified, in accordance with Section 3 of the Major Hazard Installation Regulation which is part of the Occupational Health and Safety Act (Act 85 of 1993 as amended), that the Air Products South Africa (Pty) Ltd –Coega Facility falls within the scope of the provisions of the said Act.

The Risk Assessment review as required by the Occupational Health and Safety Act (Act 85 of 1993 as amended) has been carried out [on behalf of Air Products South Africa (Pty) Ltd] by MMRisk Pty Ltd, who are an Approved Inspection Authority, with Facility accreditation number MHI0037 for this type of work. Herewith receive is the Coega Facility MHI report that was conducted in November 2019. A complete copy of the same MHI report has been submitted to the local municipality, Fire department (fire and emergency services) and department of labour provincial office.

Please do not hesitate to contact me if you have any queries in this regard.

Yours Faithfully,

Vincent Ntuli
Plant Supervisor

RECEIVED BY: Ray Chauke

SIGNATURE :

DATE : 13/03/2020

Department of Labour
Occupational Health & Safety
Private Bag X 117
2020 -03- 13
Pretoria 0001
Construction, Explosives &
Major Hazard Installations