MONDI RICHARDS BAY CHEMICAL PLANT AND CONCENTRATED NON-CONDENSABLE GAS BOILER PROJECT

FINAL BASIC ASSESSMENT REPORT

20 AUGUST 2019

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MONDI

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EXECUTIVE SUMMARY

INTRODUCTION

Mondi Limited (Mondi) intends to submit an application for Environmental Authorisation (EA) to the Department of Economic Development, Tourism, and Environmental Affairs (EDTEA) for the following proposed changes at the Richards Bay Mill which are regulated in terms of the national Environmental Management Act (NEMA) 2014 Environmental Impact Assessment (EIA) Regulations, as amended:

1) **Chemical Plant Upgrades**: The upgrade of the chemical plant is necessitated due to deterioration of the structural integrity of the facility, and the need to prevent potential operational/production, and health and safety risks. The upgrade of the chemical plant is also required to ensure that the plant is capable of producing chlorate and Hydrochloric Acid (HCL) to enable Chlorine Dioxide (CLO_2) production on an optimised cost basis (compared with the cost of purchasing chlorate and HCL). Development variations include:
   - Chlor alkali section: Relocate or relocate and upgrade existing; or, decommission existing and construct new.
   - Chlorate section: Relocate or relocate and upgrade existing; or, decommission existing with no replacement.
   - Hydrochloric Acid Section: No change or additional HCl section.
   - Sodium Hypochlorite Section: No change or additional Hypochlorite Section.
2) **Concentrated Non-Condensable Gas (CNCG) Boiler**: Mondi proposes to install a new water tube boiler for combusting / thermally oxidising CNCG. The installation of the CNCG boiler is an environmental improvement initiative. It will enable Mondi to more reliably thermally oxidise odour causing CNCGs and will also improve the emission of Total Reduced Sulphur (TRS) and Nitrogen Oxide (NOx) that is currently being emitted during CNCG thermal oxidisation in the Lime Kiln.
3) **Expansion of Dangerous Goods Capacity**: Installation of additional storage capacity for Sodium Hydroxide (NaOH); Chlorate ($NaClO_3$) Dry; Hydrochloric Acid (HCl); Sodium Hypochlorite (NaOCl); and, White Liquor.
4) **Decommissioning of Activities for Dangerous Goods Storage**: Options being considered include 1) relocation of the existing Hydrogen tank; or 2) constructing a new hydrogen tank, followed by dismantling of the old tank. Option 2 will require Environmental Authorisation and is included in the application.

The application for the EA entails the undertaking of a Basic Assessment (BA) process, culminating in the preparation of a BA Report (this document). WSP Environmental (Pty.) Ltd (WSP) has been appointed in the role of Independent Environmental Assessment Practitioner (EAP) to undertake the BA process for the proposed project.

SUMMARY OF THE REGIONAL AND SITE ENVIRONMENTAL CONDITIONS

The built environment of the uMhlathuze Municipality is largely dominated by residential and industrial land uses, with the proposed site located in an area zoned as “High Impact Industrial”.

The Richards Bay area is characterised by a subtropical climate with a summer rainfall regime. Average total rainfall of the area varies over the years, from as high as 1296.4 mm in 2013 to as low as 611.6 mm in 2015. The highest monthly average temperatures occur during the summer months (January and February) and the lowest in the winter months (June and July). Stronger winds are generally measured during spring and summer, with prevailing wind from northerly to north-easterly and southerly to south-westerly directions.

An air quality study undertaken in 2005 for the uMhlathuze municipality identified industrial, vehicle tailpipe emissions and biomass burning as the main sources of emissions, while Sulphur Dioxide and fine particulate matter were identified as the primary air pollutants. In terms of potential noise emissions, the nearest sensitive receptors in the area include Alton, an industrial/commercial area (>500 m north-east), the central business district (CBD) (>2000 m north-east) and residential receptors in the areas of Arboretum and Wild En Weide (>3000 m east and north-east respectively).

The main geology of the area is typically underlain by Quaternary yellowish redistributed sand which likely overlies siltstone and sandstone of the St Lucia Formation.

The project site falls within the Usutu to uMhlathuze Water Management Area. The UMhlathuze River is the largest river system in the area supporting the most significant environmental services. It is, however, regarded as substantially modified over the last few decades. The aquifer underlying the area was formed by the layers of unconsolidated marine, aeolian and alluvial deposits. It is a shallow aquifer, forming extensive lakes and wetlands where the water table is at or immediately below the surface.

Two river systems flow in proximity to the site to join the Mhlathuze River; the Bhizolo River located approximately 230m east of the boundary of the Mondi operation, and the Nseleni River located 2km to the west of the site boundary. Lake Nsezi, located 1.3km to the west of the site, plays a significant role in water quality buffering and reducing flood risk downstream.

In terms of terrestrial ecology, Richards Bay falls within the 'Maputaland-Pondoland-Albany Biodiversity Hotspot', recognised as the 'second richest floristic region in Africa'. According to the South African National Biodiversity Institute (SANBI) data, and based on Mucina and Rutherford (2006), the proposed development site falls within vegetation classes categorised as transformed/built-up, Maputaland Coastal Belt and Subtropical Freshwater Wetland.

With regards to heritage, the occurrence of significant heritage resources is highly unlikely due to the transformed nature of the environment in the area and none have been observed to date within the proposed development area.

According to Statistics South Africa (2012), uMhlathuze Local Municipality has a population of 334, 459 and a population density of 422 persons per km2. The highest population densities are observed in rural settlement areas such as Nseleni and Esikhawini, with the lowest population densities in the non-tribal rural areas of the municipality. The unemployment rate in the area is at 36.28%, depicting a rate lower than that of the province at 47.4%. The economic sector in the area is dominated by manufacturing.

SUMMARY OF SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT

A scoping methodology was utilised to identify potential impacts through a systematic process whereby the various development and location alternatives were considered with respect to their potential to interact with resources and receptors. This enabled the subsequent environmental and social impact assessment to areas where significant positive or negative interactions are present.

Air Quality

The construction phase of the project will result in localised dust emissions which could result in a nuisance factor to sensitive receptors if unabated – Alton industrial area to the east during windy conditions.

An Atmospheric Impact Report (AIR) was conducted as part of the BA Process. Atmospheric dispersion modelling presented in the AIR predicted the impact of the project on the on-site and off-site ambient air quality in absolute and cumulative terms for the following air pollutants: HCL, chloride, sulphur dioxide (SO_2), nitrogen oxide (NOx), Total Reduced Sulphur (TRS) and Particulate Matter <10 microns (PM10).

The AIR concluded that whilst the project would result in marginal increases in the modelled pollutants, the cumulative concentrations at nearly all receptor locations were compliant with the relevant ambient air quality standards. The exception was a minor exceedence of the PM10 National Ambient Air Quality Standard (NAAQS) at the Meer En See receptor location (75.45 ug/m^3 vs. the NAAQS value of 75 ug/m^3). It is however evident in the discussion contained in the detailed AIR that the contribution of the project to the exceedence at this receptor location is low on the basis that 1) the model is conservative i.e. overestimates the emissions of the project, and 2) the impact is largely pre-existing.

Odour

The proposed CNCG boiler will enable Mondi to more reliably thermally oxidise odour causing CNCGs. As the new primary method of combusting CNCGs, the CNCG boiler will have a significantly improved uptime (expected time efficiency 99%) compared to the lime kiln (time efficiency 92%). It can therefore be inferred that the CNCG boiler will result in a reduction of odour complaints associated with the flare and lime kiln which accounted for 61% of the complaints in 2018 and 2019 (year to date).

Noise

The construction phase of the project will involve the use of construction machinery resulting in additional noise sources within the Mill premises. The operational noise contributions from the proposed activities towards the overall noise profile of the mill are not significant. No significant changes in noise levels are anticipated at the Mill boundary during construction or operation.

Geology, Soil and Groundwater

The handling of small quantities of chemicals (including waste) in the construction phase has the potential to result in localised soil contamination caused by accidental spillage of hazardous substances outside of secondary containment.

There is potential for the identification of latent (historical) subsurface contamination during construction related excavations. The handling of this material has the potential to cause occupational health and safety risks as well as environmental impacts on soil, groundwater and surface water. All excavated material must be considered as 'potentially hazardous waste' whether intended for backfilling/reuse on site or spoiling off-site. Confirmatory sampling must be undertaken and the results analysed to obtain representative determination of the presence of contamination. Mondi is also required to comply with the relevant legislation concerning the assessment and remediation of contaminated land, and the disposal of waste.

In the operational phase there will be an increase in the quantity of dangerous goods and pollutants stored on the site. Mitigation of impacts requires that the project is engineered to ensure adequate secondary containment systems and infrastructure in place.

Surface Water and Aquatic Ecology

Construction activities have the potential to generate stormwater contaminated with sediment and oil and grease from machinery. Contamination of stormwater in the 'clean' areas of the site has the potential to impact on downstream off-site wetlands and riparian habitat and associated ecological functioning.

Similarly, the accidental release of large quantities of chemicals from storage tanks and intermediate vessels during operation has the potential to impact downstream off-site wetlands and riparian habitat and associated ecological functioning.

Mitigation of impacts requires secondary containment of all small and large volume pollutants (including fire water). The stormwater management network/practices must also be reviewed and updated / designed to include the proposed activities.

Impacts to on-site wetlands may occur due to accidental / unplanned encroachment into wetland areas located within the Mill boundary. Encroachment must be proactively prevented.

Terrestrial Ecology

The proposed activities are located within existing built-up areas of the site, which are entirely devoid of ecological features. No impacts are anticipated.

Community Health and Safety

A minor increase in road traffic during the construction has the potential to increase risks to pedestrians. Mitigation requires Mondi to develop/update and implement procedures as part of the EMS to ensure vehicles making use of the external road network are roadworthy and that drivers hold a valid drivers licenced for respective class of vehicle.

Based on the specialist Major Hazard Installation (MHI) Risk Assessment, the off-site risk associated with the operational phase of the facility has been classified as acceptable. To ensure legal compliance and ongoing risk management Mondi is required to comply with the MHI Regulations under the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) as amended.

Worker Health and Safety

The construction and operational phases of the project will expose the workforce to a range of construction and industrial hazards. The management of worker health and safety falls outside of the remit of the EIA Regulations; however the BA report re-iterates the requirement by Mondi to manage worker health and safety in accordance with the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

Traffic and Transportation

Construction vehicular traffic is likely to be associated only with the delivery of equipment, supplies and chemicals, and removal of waste for off-site disposal. This will be intermittent and will not significantly increase road traffic.

During operation, the maximum increase in road traffic associated with the upgraded chemical plant, will be 4 deliveries per day. This increase is well within the existing capacity of key intersections along the main access routes to the Mill.

Socio-economics

During construction the project will create some indirect employment opportunities within contracting firms. These may lead to improvement in financial income and potential for improved living standards of employed individuals and households.

The potential to create direct employment opportunities in the operational phase is indeterminate at this stage; as is the potential socio-economic impact related to financial income and associated living standards of employed individuals and households.

Cultural Heritage Resources

The project is being undertaken on an existing industrial site. Previous investigations have indicated there are no cultural heritage features present. Whilst no impacts are anticipated, it is nevertheless possible that a resource may be encountered during excavation activities and therefore a chance find protocol is included within the Environmental Management Programme (EMPr).

CONCLUSION

The overall objective of the BA process was to provide sufficient information to enable informed decision-making by the authorities. This was undertaken through consideration of the proposed project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

All potential environmental and social impacts associated with the project have been assessed as having low residual significance (i.e. assuming that mitigation is implemented).

It is the opinion of WSP that the information contained in this BA Report is sufficient for an informed decision to be made in respect of the Environmental Authorisation being applied for by Mondi.

Mitigation measures have been developed where applicable for the above aspects and are presented within the EMPr (**Appendix E**). It is imperative that all impact mitigation recommendations contained in the EMPr are implemented.

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E ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

1 INTRODUCTION

1.1 BACKGROUND

Mondi Limited (Mondi) intends to submit an application for Environmental Authorisation (EA) to the Department of Economic Development, Tourism, and Environmental Affairs (EDTEA) for the following proposed changes at the Richards Bay Mill which are regulated in terms of the national Environmental Management Act (NEMA) 2014 Environmental Impact Assessment (EIA) Regulations, as amended:

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It is noted that the project is not an increase in production capacity of the Mill. The production capacity is, and will remain at 770 000 dry tons per annum as per the conditions contained in the Atmospheric Emissions License (AEL) for the facility.

1.2 THE PURPOSE OF THE BA PROCESS

The BA process is a simplified version of what may broadly be referred to as the environmental and social impact assessment (ESIA) process. It applies to activities contained in Listing Notice 1 of the EIA Regulations which are considered to have a relatively lesser environmental impact than those contained in Listing Notice 2 (requiring a Scoping and Environmental Impact Assessment).

The BA process is an interdisciplinary procedure to ensure that environmental considerations are included in decisions regarding projects that may impact the environment. Simply defined, the process helps identify the possible environmental effects of a proposed activity and how those impacts can be mitigated. In the context of this report, the purpose of the BA process is to inform decision-makers and the public of the environmental consequences of the proposed project. This document (the BA report) is a technical tool that identifies, predicts, and analyses impacts on the physical environment, as well as social, cultural, and health impacts. The report identifies alternatives and mitigation measures to reduce the environmental impact of the proposed project; it also

serves an important procedural role in the overall decision-making process by promoting transparency and public involvement.

Stakeholder engagement is a fundamental part of the BA process and aims to include potential Interested and Affected Parties (I&APs) in the process by notifying them of the proposed project. The stakeholder engagement process was initiated in May 2019. The process employed a number of techniques to establish contact and raise awareness amongst stakeholders with reference to the application. The objectives of the stakeholder engagement process are to:

- Ensure an open and transparent BA and consultation process;
- Enable stakeholders to register their interest and provide input into the BA process and share information; and,
- Ensure that all relevant issues are addressed as part of the BA process.

A Stakeholder Engagement Report (SER) is included in **Appendix A** of this report, detailing the project's compliance with the public participation requirements of the EIA Regulations.

1.3 ENVIRONMENTAL ASSESSMENT PRACTIONER

WSP Environmental (Pty.) Ltd (WSP) has been appointed in the role of Independent Environmental Assessment Practitioner (EAP) to undertake the BA process for the proposed project. **Table 1** outlines the details of the EAP and his expertise.

Table 1: Details of the Environmental Assessment Practitioner

NAME OF CONSULTANT: **WSP ENVIRONMENTAL (PTY.) LTD.**

Contact Person:	Nigel Seed
Postal Address:	Block A, 1 on Langford Langford Road Westville Durban 3629 South Africa
Telephone:	031 240 8860
Fax:	031 240 8861
E-mail:	Nigel.seed@wsp.com
Expertise to conduct this EIA	Nigel has 17 years' environmental and social consulting experience. Nigel has led complex ESIA and transaction related due diligence assessments across a range of sectors including aerospace, agro-processing, chemicals, healthcare, infrastructure (ports, roads, waste management), manufacturing, mining and beneficiation, oil & gas, pulp & paper power generation (thermal & renewables), and property development. Nigel has extensive experience working with South African and international regulations and procedures, including Equator Principles III, the IFC Performance Standards on Environmental and Social Sustainability (2012) and related policies, and the World Bank Group EHS and Industry Sector guidelines. Nigel has experience in South Africa, Swaziland, Mozambique, Angola, Nigeria, Kenya and Ghana.

The EAP Curriculum Vitae is attached in **Appendix B.**

1.4 BASIC ASSESSMENT REPORT STRUCTURE

For the purposes of demonstrating legal compliance, **Table 2** cross-references the sections within the BA Report with the requirements as per Appendix 1 of GNR 326 of 2017.

Table 2: Legislation Requirements as detailed in Appendix 1 of GNR 326

APPENDIX 4	LEGISLATED REQUIREMENTS AS PER THE NEMA GNR 326	SECTION
(a)	details of-	
	(i) the EAP who prepared the EMPr; and	Section 1.3 / Table 1
	(ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;	
(b)	the location of the activity, including:	Section 1.5 / Table 3
	(i) the 21 digit Surveyor General code of each cadastral land parcel;	
	(ii) where available, the physical address and farm name;	
	(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;	
(c)	a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale; or, if it is—	Section 3 / Figure 5
	(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken; or	N/A
	(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;	N/A
(d)	a description of the scope of the proposed activity, including— (i) all listed and specified activities triggered and being applied for; and (ii) a description of the activities to be undertaken including associated structures and infrastructure;	Section 1.6 and 3.1
	(i) planning and design;	Section 3
	(ii) pre-construction activities;	
	(iii) construction activities;	
	(iv) rehabilitation of the environment after construction and where applicable post closure; and	
	(v) where relevant, operation activities;	
(e)	(e) a description of the policy and legislative context within which the development is proposed including—	Section 1.6
	(i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report; and	
	(ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments;	
(f)	a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location;	Section 4
(g)	a motivation for the preferred site, activity and technology alternative;	Section 5
(h)	a full description of the process followed to reach the proposed preferred alternative within the site, including —	
	(i) details of all the alternatives considered;	

	(ii) details of the public participation process undertaken in terms of regulation 41 of the Regulations, including copies of the supporting documents and inputs;	Appendix A
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	
	(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 5
	(v) the impacts and risks identified for each alternative, including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts— (aa) can be reversed; (bb) may cause irreplaceable loss of resources; and (cc) can be avoided, managed or mitigated;	Section 8 / Appendix D
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives;	Appendix D
	(viii) the possible mitigation measures that could be applied and level of residual risk;	Section 8
	(ix) the outcome of the site selection matrix;	Section 5
	(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such; and	
	(xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity;	
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 8 /
(i)	a full description of the process undertaken to identify, assess and rank the impacts of the activity will impose on the preferred location through the life of the activity, including—	Appendix D
	(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and	Section 7 and 8
	(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;	Section 8

1.5 PROJECT LOCATION

Table 3 provides the required cadastral information for the proposed project, in terms of Annexure 1(3) of GN.R326.

Table 3: Cadastral Information

SITE LOCATION DETAILS SS PER GN.R326 ANNEX 1 (3)

(i) 21 digit Surveyor General code of each cadastral land parcel:	K00GU0421000067240000
(ii) Physical address and farm name:	Lot 6724, Richards Bay Western Arterial, Alton, Richards Bay, 3900

iii) Where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties	Centre Point of the Mill: Latitude: 28°45'45.13"S Longitude: 31°59'41.57"E North East Corner of the Mill: Latitude: 28°45'29.31"S Longitude: 32° 0'10.93"E South East Corner of the Mill: Latitude: 28°46'11.78"S Longitude: 31°59'55.52"E South West Corner of the Mill: Latitude: 28°45'49.93"S Longitude: 31°59'16.65"E North West Corner of the Mill: Latitude: 28°45'17.36"S Longitude: 31°59'36.04"E

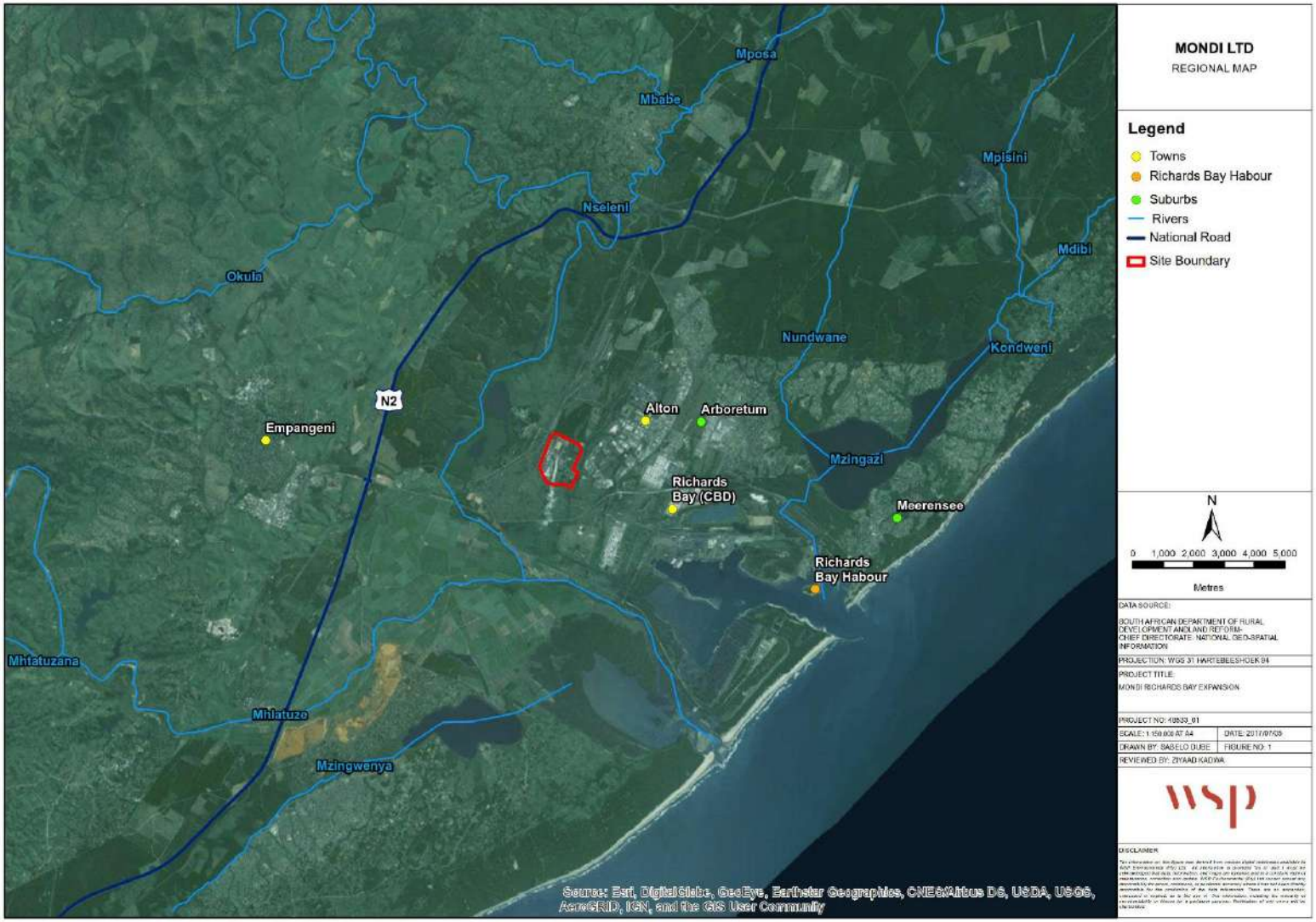


Figure 1: Regional location of the proposed project in KwaZulu-Natal (WSP, 2017)

Figure 2: Locality map indicating the location of the Mondi Richards Bay Mill (WSP, 2017)

1.6 POLICY AND LEGAL CONTEXT

The project will be carried out with due regard to local and international applicable legal and other environmental requirements. **Table 4** identifies of all legislation potentially applicable to the project.

Table 4 Summary of National Legislation Applicable to the Project

TITLE OF LEGISLATION, POLICY OR GUIDELINE	APPLICABILITY TO PROJECT
NEMA (No. 107 of 1998)	**GN. R.983 (2014) as amended: Listing Notice 1: List of Activities and Competent Authorities Identified in terms of Sections 24(2) and 24d (as amended by GN. R327 (2017)** ***GN. R327 (Listing Notice 1) (34): The expansion of existing facilities or infrastructure for any process or activity where such expansion will result in the need for a permit or licence or an amended permit or licence in terms of national or provincial legislation.*** Applicable – the project requires an amendment to the existing Atmospheric Emission License (AEL) is required (see relevant section below). ***GN. R327 (Listing Notice 1) (51): The expansion and related operation of facilities for the storage, or storage and handling, of a dangerous good, where the capacity of such storage facility will be expanded by more than 80 cubic metres.*** Applicable – the project involves the installation of additional storage capacity for dangerous goods, including: Sodium Hydroxide (NaOH); Chlorate ($NaClO_3$) Dry; Hydrochloric Acid (HCl); Sodium Hypochlorite (NaOCl); Weak White Liquor and Weak Acid/Alkaline effluent from the Demineralization plant. . ***GN. R327 (Listing Notice 1) (31): The decommissioning of existing facilities, structures or infrastructure for any development and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (ii) any expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014.*** Options being considered associated with hydrogen storage include 1) relocation of the existing hydrogen tank or 2) constructing a new hydrogen tank, followed by dismantling of the old tank. Hydrogen is a dangerous good (Hazard Statement Code H220 (Flammable gas) thus option 2 will require Environmental Authorisation.
National Environmental Management, Waste Act (No 59 of 2008)	**GN. R.921 (2013): List of Waste Management Activities that Have, or are Likely to Have, a Detrimental Effect on the Environment** Not Applicable.
National Environmental Management, Air Quality Act (No 39 of 2004)	**GN. R.893 - List of Activities requiring an AEL** ***Mondi Richards Bay Mill is currently in possession of an AEL (UDM/11-15/AEL0006/1), issued by the King Cetshwayo District Municipality, on the 30th September 2015, which is valid for five years (due for renewal not later than the 29th September 2020).*** Applicable – the project requires an amendment to the existing AEL due to 1) the addition of an emission point source associated with the CNCG boiler, 2) changes in the emissions from the Chemical Plant, and 3) general changes to the AEL including but not limited to emissions points and rates, process descriptions.

The National Water Act, (No 36 of 1998)	**Section 21 - Water uses for which a Water Use License (WUL) or General Authorisation is required.** Freshwater habitats (wetland and riparian systems) are present on the site and within a 500m radius area of the activities being proposed by Mondi. The Department of Water and Sanitation (DWS) has confirmed in its comments on the Draft Report that this project must be authorised by DWS prior to commencement of the activity. Mondi is required to apply for a Water Use Licence (WUL), as the activity will not be a permissible water use as stipulated in Section 22 of the National Water Act, Act 36 of 1998.
Occupational Health and Safety Act (No 85 of 1993)	**GN. R.692 (2001): The Major Hazard Installation Regulations (MHI Regulations)** The Richards Bay Mill is designated as a MHI due to the storage of ClO_2. In terms of the MHI Regulations it is necessary to undertake a risk assessment at existing MHIs prior to all modifications due to the change in procedures and capacity. A risk assessment was carried out by an approved inspection authority (AIA) specifically for the current project, which concluded that the project will not change the off-site risk posed by the Mill. A summary of the MHI risk assessment update and the off-site risk implications is provided in Section 8.6: Community Safety.
National Heritage Resources Act, 1999, (Act No. 25 of 1999)	***A cultural heritage impact assessment is required for projects at locations where there are culturally or historically significant elements including archaeological or palaeontological sites, on or within 20m of the site.*** Not Applicable – The project is being undertaken on an existing industrial site. Previous investigations have indicated there are no cultural heritage features on the site[1].

1 Proposed Mondi Mill Expansion (Upgrades) Final Basic Assessment Report (Royal HaskoningDHV, May 2013)

2 DESCRIPTION OF EXISTING OPERATIONS

The main steps in pulp and paper manufacturing are described below and illustrated in **Figure 3** below:

Raw Material Preparation - Wood is the predominant source of fibre for paper products at Mondi. The wood arrives at the mill as logs which is processed via the chipping process to produce chips of an adequate size and quality for pulp production. The bark and any other unsuitable wood material is removed and reused by burning it in controlled way in boilers at the site to produce steam and electricity.

Pulp Manufacturing - The woodchips are cooked in large vessels (digesters) together with chemicals which separates fibre from lignin which is the binding material in wood. When the cooking process is complete the inorganic cooking chemicals and dissolved organic material (referred to as 'black liquor') is removed from the pulp via a washing process. The pulp is then bleached in order to obtain the required brightness.

Cooking Liquor Regeneration - The black liquor removed in the pulping process is concentrated by a reduction in water content via an evaporation process. The concentrated black liquor is injected into a furnace (chemical recovery boiler) where it combusts due to its organic content. The heat generated during combustion is used to make steam which is used for process steam requirements and power generation. Inorganic chemicals in the black liquor are not destroyed in the combustion process but are recovered in the form of molten salts which are removed from the bottom of the furnace. The molten compounds are dissolved to produce 'green liquor'.

The green liquor is reacted with calcium hydroxide to reproduce the required cooking chemicals. As a result of this process lime mud is generated mainly consisting of calcium carbonate. The mud is treated in a high temperature kiln which converts the calcium carbonate back to lime. This lime is used to regenerate the calcium hydroxide hence repeating the cycle

Utilities - There are various utilities at paper mills that provide the necessary services to the production process. At the Mondi facility these include:

- An effluent treatment plant (ETP) which treats liquid waste generated in the process;
- Coal and biomass boilers to produce steam used in the process;
- Steam turbines which produce electricity required by the Mill;
- A system which collects dilute and concentrated gas (referred to as non-condensable gas - NCG) generated at various points in the manufacturing process, which are destroyed by combustion to prevent off-site odour; and,
- A chemical plant which produces the various chemicals used to make up the cooking liquor.

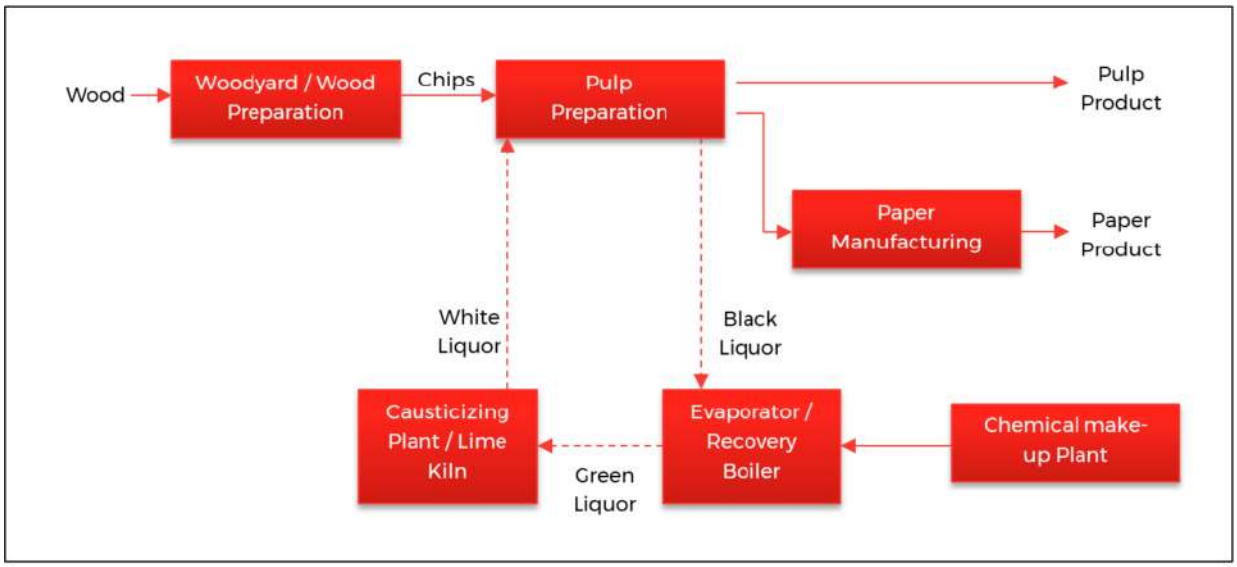


Figure 3: Simplified Diagram of the Pulp and Paper Manufacturing Process

3 DESCRIPTION OF PROPOSED ACTIVITIES

3.1 SUMMARY OF ACTIVITIES SEEKING ENVIRONMENTAL AUTHORISATION

The proposed activities that Mondi proposes to undertake, which are regulated in term of the EIA Regulations, are summarised in **Table 5** and detailed in the subheadings below.

Table 5: Summary of Activities requiring Environmental Authorisation

MAIN ACTIVITY	SUB-ACTIVITIES
Chemical Plant Upgrades	Development variations include: – **Chlor alkali section**: Relocate or relocate and upgrade existing; or, decommission existing and construct new. – **Chlorate section**: Relocate or relocate and upgrade existing; or, decommission existing with no replacement. – **Hydrochloric Acid Section**: No change, or additional HCl section – **Sodium Hypochlorite Section**: No change, or additional Hypochlorite Section.
Concentrated Non-Condensable Gas (CNCG) Boiler	Mondi proposes to install a new water tube boiler for combusting / thermally oxidising CNCG.
Expansion of Dangerous Goods Capacity	Installation of additional storage capacity for Sodium Hydroxide (NaOH); Chlorate ($NaClO_3$) Wet; Chlorate ($NaClO_3$) Dry; Hydrochloric Acid (HCl); Sodium Hypochlorite (NaOCl); and, White Liquor.
Decommissioning of Activities for Dangerous Goods Storage	Options being considered include 1) relocation of the existing Hydrogen tank or 2) constructing a new hydrogen tank, followed by dismantling of the old tank. Option 2 will require Environmental Authorisation and is this included in the application.
Note: In addition to the activities shown above, Mondi will undertake the following activities that are not regulated by the EIA regulations / not required to obtain EA: – *Installing a 250m^3 demineralised water neutralisation tank which will be used for pH buffering using HCl and caustic. This will enable Mondi to reduce pH related reactivity and reduced sulphur emissions at the Mill wastewater plant.* – *Increase sodium chloride (NaCl) brine treatment / ion exchange capacity to 16 litres/s. The activity involves replacement of the existing plant with three new towers, and decommissioning and dismantling of the old equipment.* – *Dismantling of the existing chemical plant once it becomes obsolete. Mondi will manage potential hazardous waste (e.g. tank residue and contaminated building material) through well-established on-site waste management procedures.* – *Relocation of the hydrogen gas tank. As confirmed by the EDTEA during the pre-application consultation, the relocation of the tank from one location to another within the mill does not constitute a decommissioning activity, thus does not require EA.*	

Alternate central point proposed locations for each sub-task are illustrated in **Figure 5**Error! Reference source n ot found.**.** It is noted, that the finalisation of locations, and 'micro-siting' within the confirmed location (i.e. final position and layout within a 50m radius of the central point) will be undertaken at the detailed design stage.

3.2 CHEMICAL PLANT UPGRADES

3.2.1 EXISTING CHEMICAL PLANT OPERATIONS

The chemical plant is essentially made up of six sections. Each section is described below in **Table 6** and illustrated in **Figure 4**.

Table 6 Description of the Chemical Plant

SECTION	DESCRIPTION
Chlor Alkali Plant	– The primary raw material input to the brine plant is a NaCL (310g/l), water (H_2O) and dechlorinated brine solution with calcium (Ca) and magnesium (Mg) impurities produced at the Brine – The brine is treated in two stages (primary and secondary) to remove the impurities. The secondary stage involves the use of ion exchange resin. Details as per above. – A process of electrolysis converts the 'pure' brine into liquid caustic (NaOH). – Chlorine gas (Cl_2) and Hydrogen gas (H_2) is generated during the electrolysis. Cl_2 gas is routed either to the 'HCl Plant' or the 'Sodium Hypochlorite Plant". The produced H_2 gas is sent to the hydrogen holder before being routed to the HCl plant.
Sodium Hypochlorite Plant	– If the HCl plant is not available, Cl_2 gas from the Chlor Alkali Plant is routed into the Sodium Hypochlorite Plant. – Cl_2 gas is scrubbed in two stages using a caustic (NaOH) solution which results in a chemical reaction producing sodium hypochlorite (NaOCl) and Hydrogen (H_2) gas. – The Hydrogen (H_2) gas is vented to the atmosphere. The sodium hypochlorite (NaOCl) is stored in a 100m^2 storage tank from where it is sold into the market (i.e. not used at the Richards Bay Mill). – The Sodium Hypochlorite Plant is an important safety feature of the chemical plant, as it ensures that Cl_2 gas (a toxic gas) is captured and prevented from being emitted from the plant. For this reason, the Sodium Hypochlorite Plant is connected to the emergency power supply to ensure availability during a power failure.
HCl Plant	– Cl and H gasses are combusted to produce gaseous Hydrochloric Acid (HCl). – Gaseous HCl is scrubbed with water to produce aqueous HCl which goes to the 'ClO_2 plant', to the Secondary Brine Plant (resin regeneration), the Demineralized water plant (resin regeneration), and the Chlorate plant (pH control) or is sold to market.
Chlorate Plant	– NaCl, water, HCl and various other chemicals are mixed into solution. – A process of electrolysis converts the solution into 'Chlorate' ($NaClO_3$). – H_2 Gas containing residual Cl is scrubbed in caustic scrubbers. The clean H_2 gas goes to storage before being routed to the HCl plant. – Chlorate goes to the ClO_2 plant.
CLO_2 Plant	– HCl (from HCl Plant), Chlorate (from Chlorate Plant, or purchased), and Sulphuric Acid (H_2SO_4) are reacted to produce ClO_2 gas, which is scrubbed to make liquid ClO_2, used in the bleaching process. – Sodium Sulphate by-product is sent to the recovery boiler.

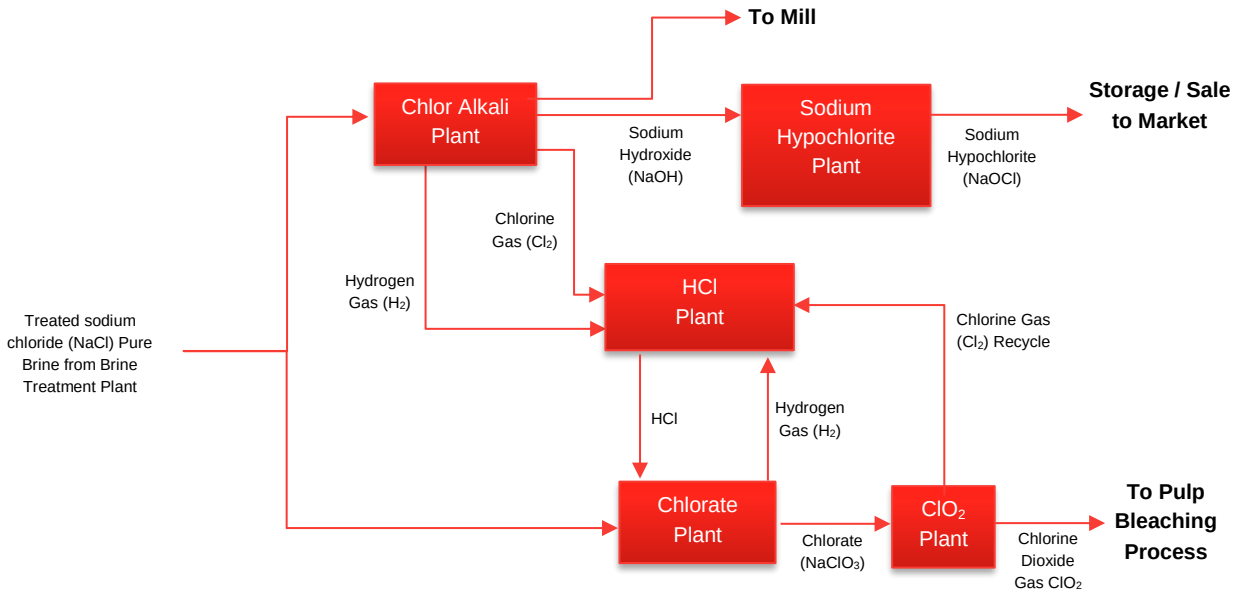


Figure 4 Simplified Diagram of the Chemical Plant

3.2.2 PROPOSED CHEMICAL PLANT UPGRADES

CHLOR ALKALI SECTION DEVELOPMENT AND LOCATION ALTERNATIVES

The following three development scenarios are being considered for the Chlor Alkali Plant:

1) Relocation of the existing 55 dry tons/day chlor alkali plant to a new location at the Mill.
2) Relocation of the existing chlor alkali plant to a new location on the Mill and upgrade the plant capacity from 55 dry tons/day to 75 dry tons/day
3) Install a new 110 dry tons/day chlor alkali plant at a new location on the Mill. Decommission and dismantle the existing chlor alkali plant.

CHLORATE PLANT DEVELOPMENT AND LOCATION ALTERNATIVES

The following three development scenarios are being considered for the Chlorate Plant:

1) Relocation of the existing 39 dry tons/day chlorate plant to a new location at the Mill.
2) Relocation of the existing 39 dry tons/day chlorate plant to a new location at the Mill, and upgrading of the plant capacity from 39 dry tons/day to 55 dry tons/day
3) Decommission and dismantle the existing chlorate plant with no replacement. In this development scenario chlorate will be 100% imported.

HCL PLANT DEVELOPMENT AND LOCATION ALTERNATIVES

The following three development scenarios are being considered for the HCl Plant:

1) No change. The existing 16 tons/day and 55 tons/day HCl plants will be utilised.
2) Development of an additional 55 tons/day HCl plant at a new location on the Mill. The combined capacity of the existing plants and new plant will be 126 tons/day.
3) Development of an additional 20 tons/day HCl plant at a new location on the Mill. The combined capacity of the existing plants and new plant will be 91 tons/day.

SODIUM HYPOCHLORITE PLANT DEVELOPMENT AND LOCATION ALTERNATIVES

The following three development scenarios are being considered for the Sodium Hypochlorite Plant:

1) No change. The existing 19 tons/day sodium hypochlorite plant will be utilised.
2) Development of an additional 25 tons/day sodium hypochlorite plant at a new location on the Mill. The combined capacity of the existing and new plant will be 44 tons/day.
3) Development of an additional 10 tons/day sodium hypochlorite plant at a new location on the Mill. The combined capacity of the existing and new plant will be 29 tons/day tons/day.

3.3 PROPOSED CONCENTRATED NCG (CNCG) BOILER

Presently, non-condensable gas (NCG) generated during the pulp cooking processes is collected and separated into either dilute or concentrated gas streams. Concentrated NCG (CNCG) is scrubbed and introduced into the lime kiln where it is combusted.

Mondi proposes to install a new boiler which will have the sole function of combusting CNCG. The main support fuel of CNCG boiler burner will be methanol. Sasol natural gas will be used as a start-up fuel. The CNCG boiler will produce medium pressure steam, which will be utilised by Mondi in the production process. Advanced emissions controls on the boiler will improve the emission of NO_x and total reduced sulphur (TRS) emissions in comparison with the current emissions from the lime kiln due to more complete combustion. The CNCG boiler will have a significantly improved uptime (expected time efficiency 99%) compared to the lime kiln (time efficiency 92%).

3.4 EXPANSION OF DANGEROUS GOODS STORAGE

3.4.1 DANGEROUS GOODS ASSOCIATED WITH THE CHEMICAL PLANT

Mondi proposes an increase in the storage capacity of hazardous chemical substances. The required storage capacity will vary dependant on the final chemical plant development options. The information provided in **Table 7** represents the largest capacity increase, for which the EA is applied for.

Table 7 Hazardous Chemical Substances (Chemical Plant)

CHEMICAL NAME **STORAGE CAPACITY**

	SANS 10234 Hazard Type	**Current**	**Max Increase**	**Max Total (Proposed)**
Sodium Hydroxide (NaOH)	At >10%: Skin Corrosive / Eye Damage	1000m^3	3500m^3	4500m^3
Chlorate ($NaClO_3$) Wet	Oxidising	1375m^3	No Change	1375m^3
Chlorate ($NaClO_3$) Dry	Oxidising / Acute Toxicity / Chronic Aquatic	0	3500 tons / approx.1378 m^3	3500 tons / approx.1378 m^3
Hydrochloric Acid (HCl)	At >25%: Skin Corrosive / Eye Damage / Specific Target Organ Toxicity (Respiratory)	1150m^3	1600m^3	2750m^3
Sodium Hypochlorite (NaOCl)	At > or = to 16 % available chlorine Skin Corrosive / Eye Corrosive	150m^3	200m^3	350m^3

3.4.2 DANGEROUS GOODS ASSOCIATED WITH THE LIQOUR CLARIFIERS

Presently, cooking liquor regeneration is a key step in the pulp production process (see description in **Section 1.6**: Description of the Pulp and Paper Manufacturing Process. A stage in the liquor regeneration process involves the 'clarification' of partially regenerated liquor (green liquor) in two clarifiers. Clarification is a process where unwanted material in the liquor settle to the bottom of the clarifier tank under gravity, and is then collected from the bottom of the tank as a sludge (referred to as 'dregs').

Mondi proposes to install a new clarifier in addition to the existing two clarifiers. The new clarifier will enable Mondi to maintain capacity through the clarifiers when one of the clarifiers is taken out of service e.g. due to maintenance.

When not in use for green liquor clarification, the new clarifier will serve a dual purpose as a storage facility for the storage of more refined liquor (weak white liquor and white liquor). When used for storage, the additional liquor clarifier will be regarded as a facility for the storage of a dangerous good, as per the table below:

Table 8 Hazardous Chemical Substances (Liquor Clarifier)

CHEMICAL NAME	STORAGE CAPACITY			
	SANS 10234 Hazard Type	**Current**	**Max Increase**	**Max Total (Proposed)**
White Liquor and Weak White Liquor	Conservatively assumed to be white liquor containing sodium Hydroxide (NaOH) at concentration >10%: Skin Corrosive / Eye Damage	0 – existing clarifier is used as a processing vessel, and is not classed as 'storage'	5000m^3	5000m^3

The proposed clarifier vessel will be an above ground, steel structure located within a concrete bund. Fumes from the stored liquor within the vessel will be collected and routed into the site-wide dilute non-condensable gas (NCG) collection system (see description of the NCG system in **Section 1.6:** *Description of the Pulp and Paper Manufacturing Process*).

3.5 DECOMMISSIONING OF ACTIVITIES FOR DANGEROUS GOODS STORAGE

Options being considered associated with hydrogen storage include 1) relocation of the existing hydrogen tank or 2) constructing a new hydrogen tank, followed by dismantling of the old tank. Hydrogen is a dangerous good (Hazard Statement Code H220 (Flammable gas) thus option 2 will require Environmental Authorisation.

The decommissioning process will involve the removal of the hydrogen from the tank followed by the dismantling of the tank and associated pipework. Due to the flammability of hydrogen, a detailed methodology will be developed by the contractor for ensuring safety during the process. The dismantled tank will be largely recycled as scrap metal.

CHLOR ALKALI SECTION

Present Location	A
Alternate Location A	B
Alternate Location B	C
Alternate Location C	D

CHLORATE SECTION

Present Location	E
Alternate Location A	F
Alternate Location B	G
Alternate Location C	H

HCL AND SODIUM HYPOCHLORITE SECTION

Present Location / New Section location	I

CNCG BOILER

Proposed Location	J

DANGEROUS GOODS STORAGE

Sodium Hydroxide	K
Chlorate Dry	L
Hydrochloric Acid	M
Sodium Hypochlorite	N
White Liquor	O
Hydrogen	P

Figure 5 Chemical Plant Upgrade: Layout of Development Options and Alternative Locations (WSP, 2019)

3.6 GENERAL CONSTRUCTION ACTIVITIES

3.6.1 GENERAL CONSTRUCTION ACTIVITIES

The construction process will follow industry standard methods and techniques. Key activities associated with the construction process are described in **Table 9**.

Table 9 Construction Activities

ACTIVITY	DESCRIPTION
Contractor's facilities and materials lay-down areas	These will be strictly located within laydown areas inside the existing Mill premises. Activities within these areas are likely to include: — Temporary offices and administration facilities (e.g. containers, portable cabins). — General materials storage and laydown areas. — Construction of chemicals storage facilities (oil, grease, solvents etc.) and associated infrastructure (bunds, secured / roofed areas etc.). — Above ground fuel storage (e.g. gasoil/ petrol) – it is unlikely that volumes would be stored in quantities exceeding 9000L which is considered sufficient for normal construction site requirements. — Workshops / areas (e.g. welding, mechanical repair, electrical etc.). — Change-houses, chemical toilets and showering facilities (linked to conservancy tanks – removal of contents by exhauster vehicle and disposal at permitted facility). — Temporary waste storage areas; these shall be established and managed in accordance with Environmental management Programme (EMPr) requirements.
Sourcing of construction materials and equipment	Bulk materials (aggregate, cement, steel etc.) will be sourced from existing lawful commercial sources; there will be no direct mining, harvesting or extraction of natural resources. Where possible, equipment will be sourced locally based on the latest information on South African Rand / US Dollar exchange rate. Equipment will be purchased outside of South Africa where this makes commercial sense.
Decommissioning of equipment	Decommissioning of the equipment. The removal activities may include decontamination and interim storage prior to scrapping or removal off-site.
Excavation and earthworks	Subject to the determination of founding specifications for the new plant and equipment to be constructed, it is envisaged that earthworks will be required. This is likely to entail: — Removal of existing surfacing material (concrete, asphalt etc.) which could involve excavation below ground level. — Levelling and compaction using heavy machinery / earthmoving equipment – it is noted that the topography within the Mill is flat, therefore no major cut/fill or earth spoiling will be required. — Potential for excavations and trenching in order to prepare foundations and laying of below ground level equipment (cables, pipes, sumps, drainage etc.). — Piling / drilling depending on the identified construction / founding technique.
Use of general mechanical equipment	This will be undertaken within construction areas and includes the use of generators, cutting and welding equipment, compressors etc.
Working Hours	Due to the heavy industrial nature of the Mill, it is not envisaged that daytime working hours would need to be adhered to; the exception would be in the case of excessively noisy activities which would be limited to normal daytime working hours if practical.

4 NEED AND DESIRABILITY ANALYSYIS

The need and desirability of each of the main elements of the project are as follows:

5) **Chemical Plant Upgrade** (various development scenarios) - The upgrade of the chemical plant is necessitated due to deterioration of the structural integrity of the facility, and the need to prevent potential operational/production, and health and safety risks. The upgrade of the chemical plant is also required to ensure that the plant is capable of producing chlorate and HCL to enable CLO_2 production on an optimised cost basis (compared with the cost of purchasing chlorate and HCL).

6) **Expansion of dangerous goods storage capacity** - the expansion of the storage capacity for hazardous substances is required in order for Mondi to optimise cost and operational efficiency.

7) **CNCG Boiler** - The installation of the CNCG boiler is an environmental improvement initiative. It will enable Mondi to more reliably thermally oxidise odour causing CNCGs and will also improve the emission of TRS and NOx that is currently being emitted during CNCG thermal oxidisation in the Lime Kiln.

5 ALTERNATIVES ANALYSIS

5.1 SITE ALTERNATIVES

The proposed capacity increase occurs within the existing Mondi Richards Bay site. The proposed additional infrastructure, equipment and processes are inextricably linked to the existing facility, therefore no site alternatives have been considered.

5.2 LAYOUT ALTERNATIVES

The layout of the project is illustrated in ***Chemical Plant Upgrade: Layout of Development Options and Alternative Locations*.**

Due to the early stage of design of the project, a number of location alternatives have been presented for each activity / sub-activity. The selection of the preferred layout will be made by Mondi in the detailed design stage. The final location selection will be based on the optimal use of space within the existing Richards Bay Mill, specifically integration into the existing mill circuit for easy transfer of product and utilities (steam, water, etc.).

The final layout is determined by a number of factors including availability of the required footprint for the new equipment and ease of integration to existing equipment; as well as construction and maintenance requirements.

Concerning the CNCG Boiler, only one location is being proposed. This location has been selected due to its proximity to existing steam distribution system and the existing NCG and methanol handling systems. It is also located within the confines of the Power and Recovery business unit where operational staff are already familiar with operating boilers and steam generating systems.

As is evident in **Figure 5**, all of the alternate locations are at existing Mill premises, within areas highly transformed from their natural state. The selection of the preferred locations and layouts has no bearing on the environmental and social impact of the project (with the exception of stack locations[2]).

5.3 TECHNOLOGY ALTERNATIVES

The final project design will be aligned with international experience and international best practice. Specifically the best practice guidelines referred to as the Best Available Techniques (BAT) guidelines published by the European Integrated Pollution Prevention and Control (IPPC) Bureau will be considered where applicable. Essentially these guidelines give information on the techniques and processes used in specific sectors, current emission and consumption levels, and techniques to consider in the determination of the BAT and emerging technology.

5.4 NO-PROJECT ALTERNATIVE

In this option the status quo will be retained and the following impacts would be expected:

Chemical Plant Upgrades:

- Mondi will not be able to produce the chlorate and HCL required for the production of CLO_2. This will require these raw materials to be imported resulting in higher production costs.
- Mondi will not be able to prevent continued structural deterioration, resulting in an increase of operational and occupational health and safety risks.

[2] The location of stacks will influence the off-site concentrations of airborne pollutants. Stack positions have been selected based on technical optimisation, and would only be revised subject to the need being determined in the air quality impact assessments.

Expansion of dangerous goods storage capacity:

- Mondi will be unable to optimise cost and operational efficiency.

CNCG Boiler

- Mondi will not be able to improve the reliability and efficacy of CNGC thermal oxidisation. This will prevent an improvement in the air quality and odour related environmental impacts of the Mill.

In conclusion, the no project alternative is not considered to be reasonably viable.

6 DESCRIPTION OF ENVIRONMENTAL ATTRIBUTES

This section includes a description of the environmental attributes of the project area. The descriptions encompass the geographical, physical, biological, social, economic, heritage and cultural aspects in accordance with GN. R.326 (Appendix 1).

6.1 CLIMATE AND METEOROLOGY

Meteorological conditions affect how pollutants emitted into the air are directed, diluted and dispersed within the atmosphere. Dispersion comprises vertical and horizontal components of motion. The stability of the atmosphere and the depth of the atmospheric mixing layer control the vertical component. The horizontal dispersion of pollution in the boundary layer is primarily a function of the wind field. The wind speed determines both the distance of downwind transport and the rate of dilution as the plume 'stretches' away from its source. Mechanical turbulence is influenced by wind speed in combination with surface roughness. A discussion of local climate and associated weather systems and their effect on air pollution dispersion in Richards Bay is provided below.

6.1.1 MACROSCALE CLIMATE

The climate along the east coast and adjacent interior of South Africa is influenced predominantly by subtropical high pressure with temporary disruptions by low pressure cells or fronts. This high pressure zone is centred at approximately 30°S latitude and is associated with strong divergence at the surface and convergence in the upper atmosphere **Figure 6** shows the predominant macroscale atmospheric circulations over the subcontinent. Easterly waves and lows tend to be summer phenomena, while westerly waves and lows tend to be autumn to spring phenomena.

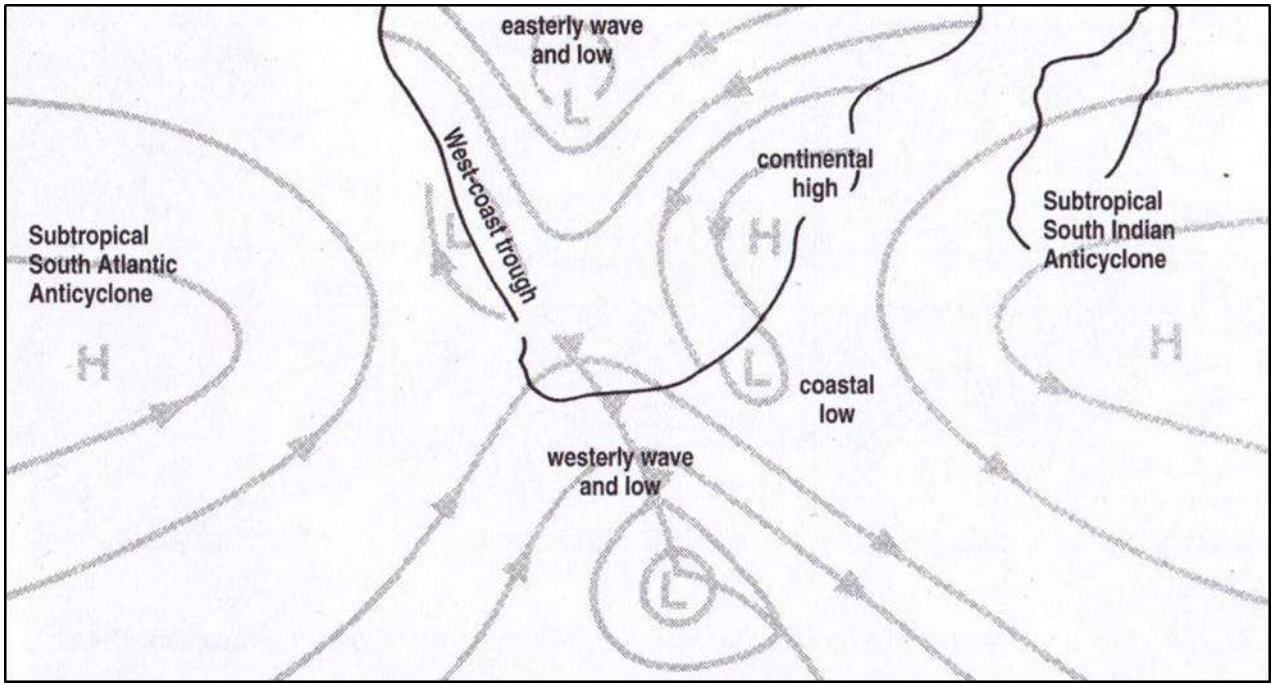


Figure 6: Location of major pressure cells across South Africa (Preston-Whyte and Tyson, 1988: 179)

6.1.2 MICROSCALE CLIMATE

Along the coastline, sea and land breeze circulations influence the diurnal wind profile. During the day, the land heats up more rapidly than the ocean surface, which has a higher heat capacity. The warmer air over the land rises causing a low pressure to develop. The cool air over the sea subsides and flows along the pressure gradient, causing a sea-land breeze to develop. The converse is true for night time conditions, when the air above the land cools due to a lack of insulation, while the air above the sea remains warm. A land-sea breeze then develops.

The use of reliable data in an air quality assessment is of the utmost importance. Local data has been sourced from the Richards Bay Clean Air Association for the period 2016 - 2018. Temperature and wind field data was provided from the Brackenham station while rainfall was provided from the CBD station. An analysis of this dataset is presented in the sections below.

6.1.3 TEMPERATURE AND RAINFALL

Figure 7 presents the average monthly temperature and total monthly rainfall between 2016 and 2018 at Richards Bay. A seasonal pattern is evident in recorded temperature and rainfall. The east coast of South Africa is a summer rainfall region. Summer temperatures increase evaporation from the warm Indian Ocean and this warm moist air is advected towards the coastline around the South Indian High. Increased convection over the land surface then promotes uplift, cloud formation and subsequent rainfall. During winter, ocean temperatures cool and the South Indian High migrates south-westwards, reducing advection of moisture onto the east coast. Cooler temperatures also limit convectional uplift over the land surface and rainfall becomes less frequent. Rainfall removes dust and gases from the atmosphere via a process called wet precipitation or wet scavenging. Thus, if all else is the same, higher rainfall regions have lower pollutant concentrations.

Figure 7 shows that the highest monthly average temperatures occur during summer (25.6°C during January 2016, 24.9°C during February 2017 and 24.4°C during January 2018) and the lowest monthly average temperatures occur during winter (17.1°C during July 2016, 18.5°C during July 2017 and 11.6°C during September 2018).The total rainfall received was 1783.5 mm during 2016, 2249.5 mm during 2017 and 1818.9 mm during 2018. The high rainfall for winter represents a deviation from expected rainfall levels. This could be related to an increase in frequency and/or strength of cold fronts over this period.

6.1.4 WIND SPEED AND DIRECTION

The expected prevailing wind trajectories for the eastern portion of South Africa are north-easterly and south-westerly (Preston-Whyte and Tyson, 2004). The north-easterly winds are associated with high atmospheric pressure and fine weather systems whilst the south-westerly winds are associated with the passage of coastal low pressure systems such as cold fronts with inclement weather. Wind roses below present wind speeds and wind directions at Richards Bay using data from the RBCAA Brackenham meteorological station for the period of 2016 to 2018. Wind roses summarize wind speed and directional frequency at a location. Each directional branch on a wind rose represents wind originating from that direction. Each directional branch is divided into segments of colour, representative of different wind speeds. Calm conditions were defined as wind speeds less than 0.5 m/s. In each wind rose plotted, the angle of an element represents the wind direction and the radial distance from the centre represents the frequency of occurrence.

Figure 8 shows the annual, day and night wind roses for 2016 to 2018 from the Brackenham monitoring station. Winds primarily originate from the northerly to north-easterly and southerly to south-westerly directions. Fastest winds originated from the south-west, at times exceeding 11.1 m/s.

Figure 9 shows the seasonal wind rose plots for spring (September to November), summer (December to February), autumn (March to May) and winter (June to August) at the Brackenham station. During winter months, stronger southerly to south-westerly winds prevail and are associated with the passage of cold fronts along the east coast of South Africa.

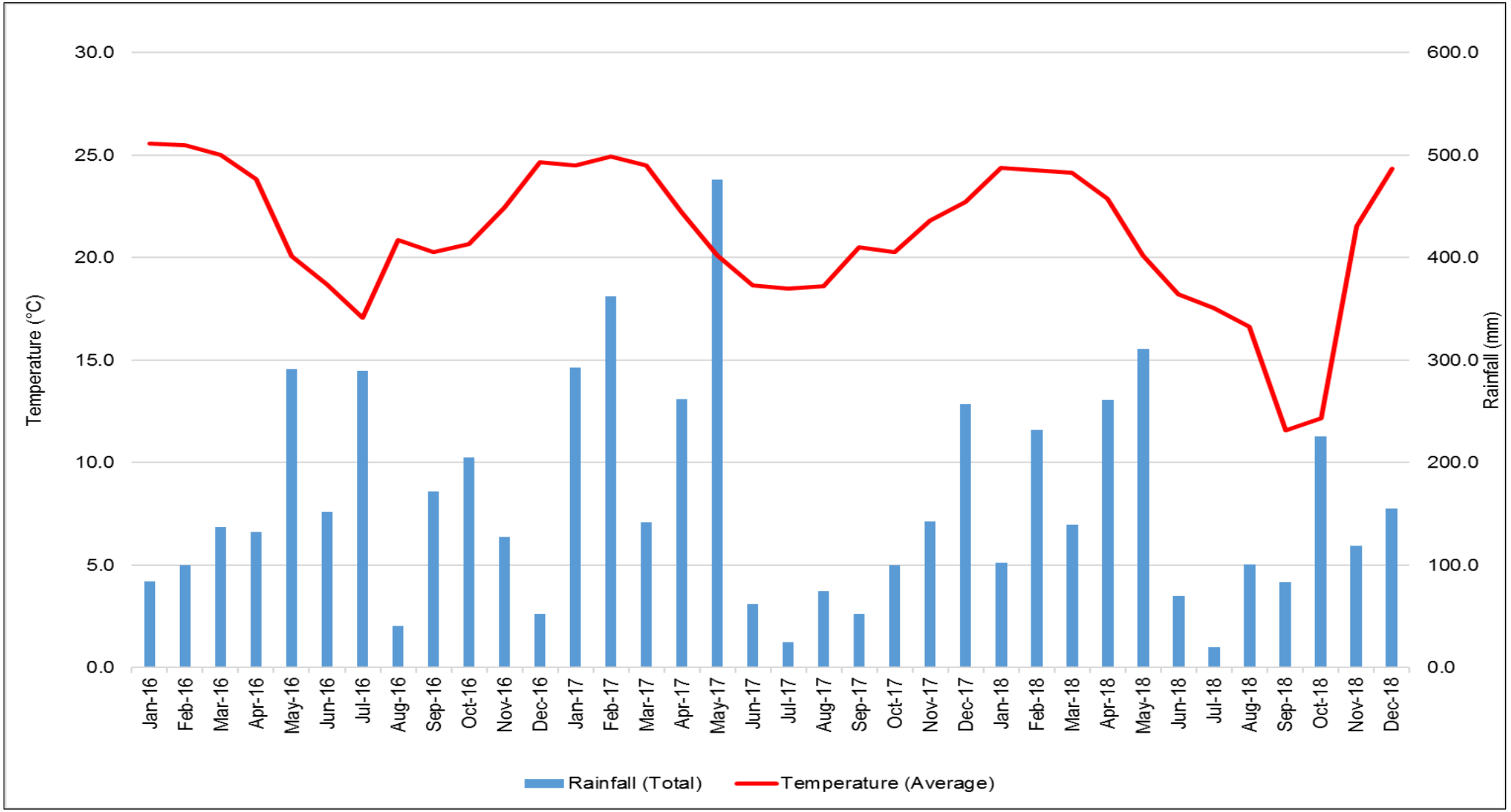


Figure 7 Total monthly rainfall and average temperatures for 2016 to 2018 at CBD and Brackenham respectively.

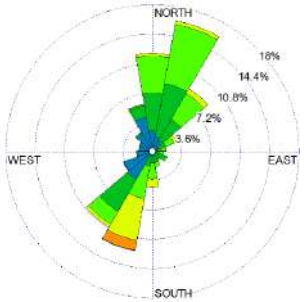
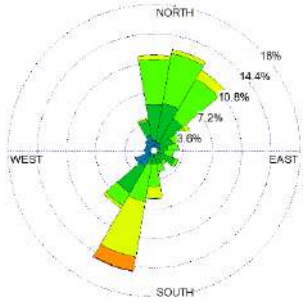
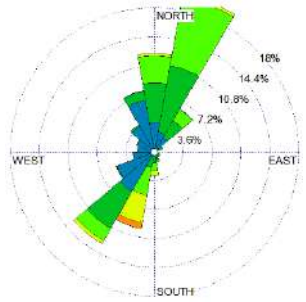
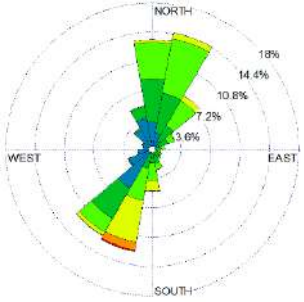
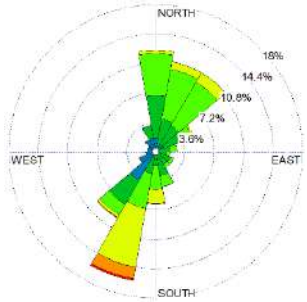
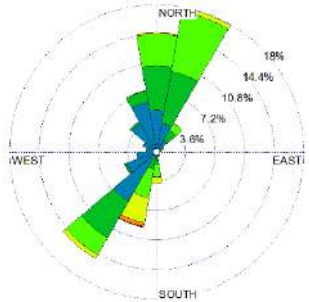
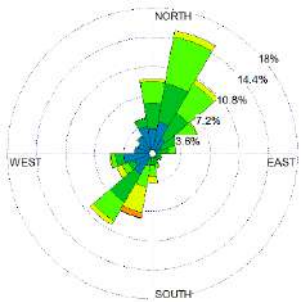
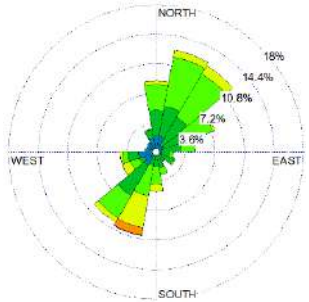
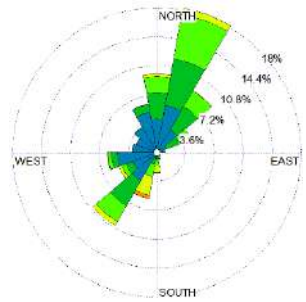
Key	2016 Annual (Calms: 1.31%)	2016 Day (Calms: 7.69%)	2016 Night (Calms: 2.30%)
WIND SPEED (m/s) >= 11.1 8.8 - 11.1 5.7 - 8.8 3.6 - 5.7 2.1 - 3.6 0.5 - 2.1			
2017 Annual (Calms: 4.08%)	**2017 Day (Calms: 1.28%)**	**2017 Night (Calms: 6.87%)**	
			
2018 Annual (Calms: 4.57%)	**2018 Day (Calms: 1.55%)**	**2018 Night (Calms: 7.58%)**	
			

Figure 8 Annual wind rose plots for the period 2016 to 2018 at Brackenham

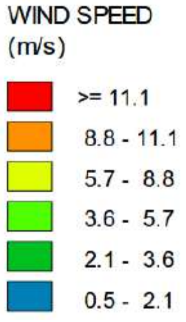
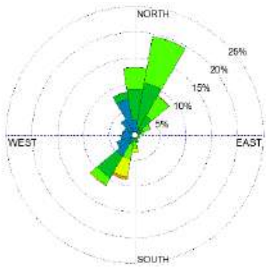
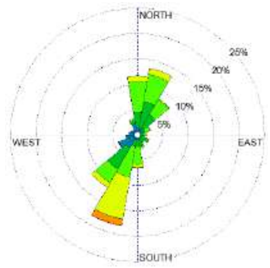
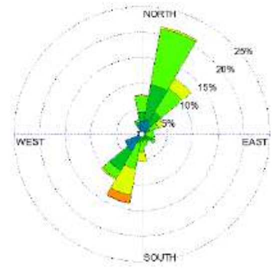
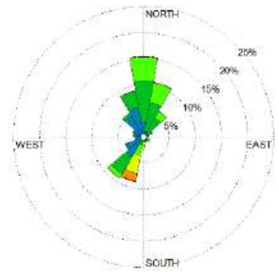
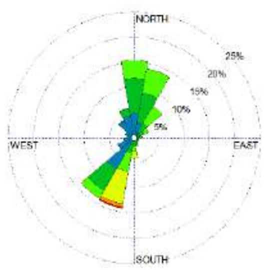
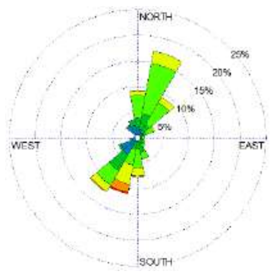
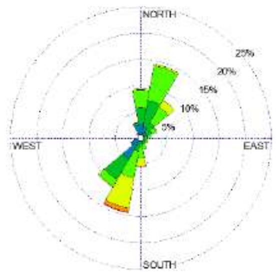
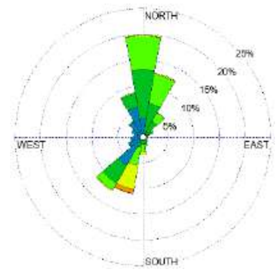
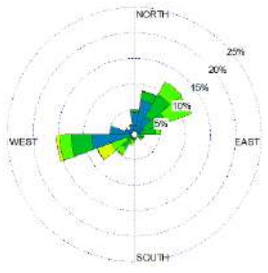
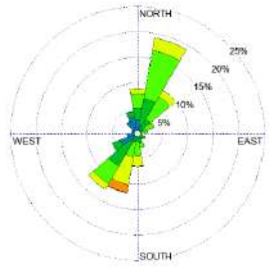
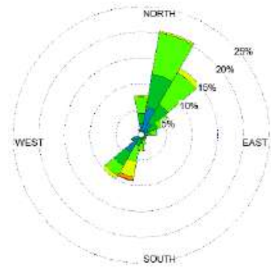
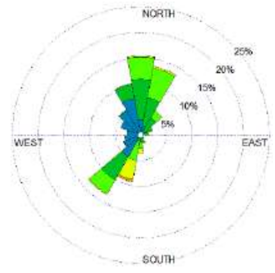
Key	2016 Autumn (Calms: 1.49%)	2016 Spring (Calms: 1.01%)	2016 Summer (Calms: 1.83%)	2016 Winter (Calms: 0.91%)
				
	2017 Autumn (Calms: 2.04%)	2017 Spring (Calms: 5.31%)	2017 Summer (Calms: 5.37%)	2017 Winter (Calms: 3.62%)
				
	2018 Autumn (Calms: 3.40%)	2018 Spring (Calms: 0.23 %)	2018 Summer (Calms: 13.75%)	2018 Winter (Calms: 1.04%)
				

Figure 9 Seasonal wind rose plots for the period 2016 to 2018 at Brackenham

6.2 AIR QUALITY

6.2.1 REGIONAL DESCRIPTION

Localised air quality issues occur throughout Richards Bay and a study to assess air quality within the municipality was initiated in 2005 with the aim of informing spatial development planning. The study identified the air pollution sources in the area (**Table 10**) and emphasized industrial, vehicle tailpipe emissions and biomass burning as the main sources of emissions. The primary air pollutants are Sulphur Dioxide (SO_2) and fine particulate matter (PM_{10}), while fluoride has also been identified as a pollutant of potential concern. The Richards Bay area has an established industrial development zone with two aluminium smelters, chemical fertilizer plants, several woodchip plants, a paper mill, coal handling industries, and numerous other smaller scale industries. Many of the larger industries operate continuous combustion processes.

Table 10: Summary of the main sources of air pollution in Richards Bay (EMF, 2009)

CLASS	CHARACTERISTICS
Industrial sources	– The main industry sources include Hillside Aluminium, Mondi Paper & Pulp Mills, Richards Bay Coal Terminal, Foskor, Tongaat Hulett, Lafarge Cement, Tronox, Richards Bay Alloys, Mpact and the National Ports Authority.
Mining operations	– The two main mines in the municipality are Ticor Hillendale mine (closed) and Hlanganai Sandwork Operations. – Richards Bay Minerals falls outside the municipal boundaries but has air quality impacts on the City.
Transport-related emissions	– Vehicles (roads), railroad, airport and shipping.
Biomass burning	– Crop-residue burning and general wild fires associated with agriculture (sugar cane) and forestry.
Waste treatment facilities	– Two water treatment facilities and three landfill sites in the municipal area. – Mondi paper mill has their own landfill site – Mpact Felixton has their own landfill site – current state of operation not investigated. – Bayside Aluminium operates an ash site – closed.
Miscellaneous	– Wind-blown dust from open areas and agricultural activities – Informal refuse burning – Tyre burning – Regional transported (imported) pollutants

Sensitive receptors are sites where there is a potential health impact of emissions from the proposed activity. Examples of sensitive receptors include, but are not limited to, schools, shopping centres, hospitals, office blocks and residential areas. In this project, sensitive receptors were selected on the basis of population exposure and comprise suburbs, industries or commercial enterprises (**Figure 10**).

Figure 10: Map showing the location of discrete receptors in relation to Mondi Richards Bay

The Richards Bay Clean Air Association (RBCAA) formed in 1997 in response to ongoing concerns over the levels of air pollution in Richards Bay. This non-profit organisation continues to represent community concerns on air quality issues in various fora. The RBCAA comprises representatives from a number of local industries. One of the organisation's aims is to ensure that local ambient concentrations of airborne pollutants remain below the National Ambient Air Quality Standards (NAAQS) and runs an independent air quality monitoring network. The organisation retains a register of community complaints regarding air quality, and conducts investigations in response to these. The organisation does not possess any regulatory powers but maintains pressure on the Municipality to fulfil its enforcement role.

The RBCAA's monitoring network comprises eight SO_2 monitoring stations, five PM_{10} stations, three total reduced sulphur (TRS) monitoring stations and seven meteorological stations (Okello and Allan, 2015). None of these stations measure ambient HCl or Cl_2 concentrations. The air quality monitoring network meets South African National Accreditation System (SANAS) requirements. **Figure 11** shows the location of each monitoring station in Richards Bay. Error! Reference source not found.**Table 11** shows data recovery from the CBD, Felixton, Brackenham and eSikhaleni monitoring stations. It must be noted that the Felixton and Brackenham stations only measure PM_{10} and SO_2 concentrations. WSP has actively engaged with the RBCAA in all air quality related issues and have ensured that this assessment was undertaken in a transparent manner. Air quality data requests were lodged with the RBCAA. The air quality data provided was processed for the period 2016 and 2018.

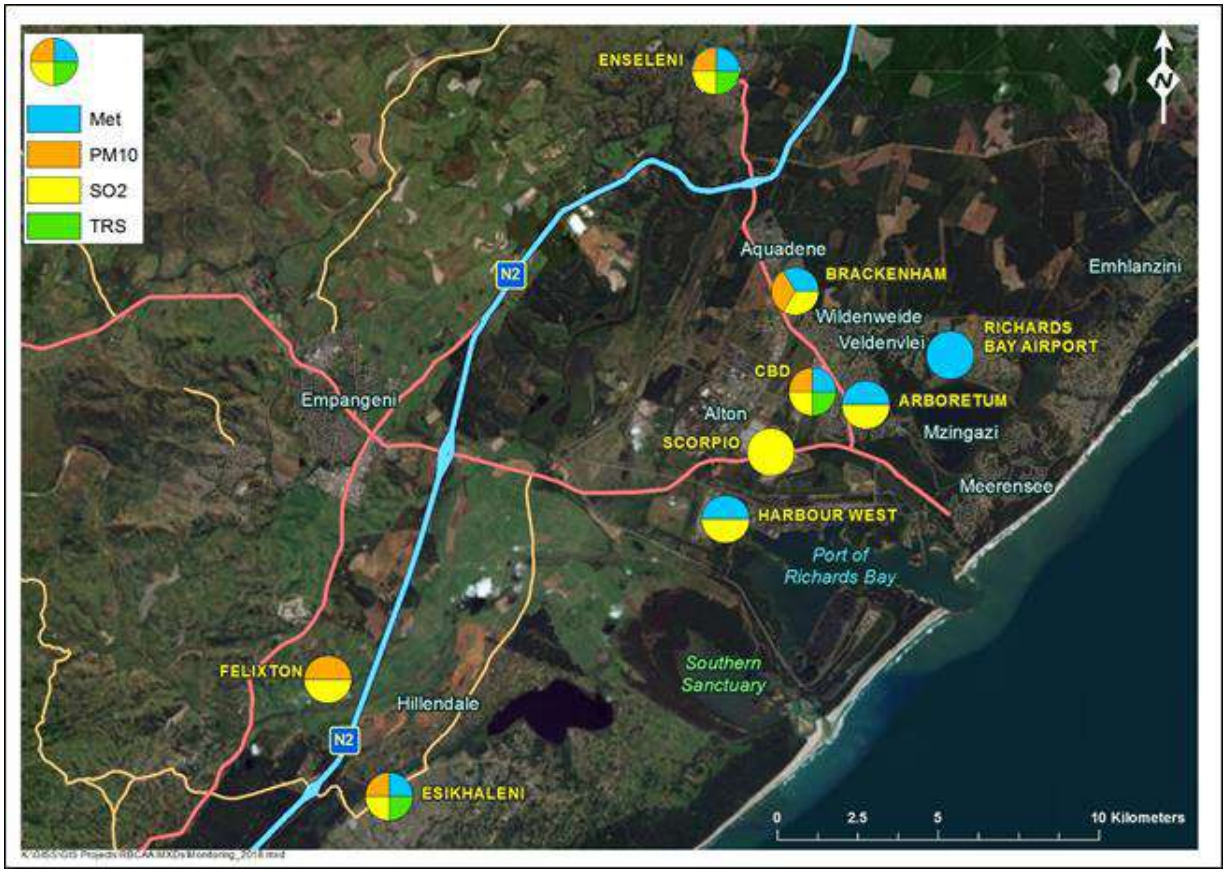


Figure 11 RBCAA's air quality and meteorological monitoring network

Table 11 Data recovery summary for monitoring stations closest to Mondi Richards Bay Mill

PARAMETER	CBD	FELIXTON	BRACKENHAM	ESIKHALENI
Longitude	32.049242	31.895446°	32.038988	31.911679
Latitude	-28.756224	-28.825148°	-28.731297	-28.865283
Date of establishment	2001	No data	2004	2014
Environment	Central Business District, traffic	No data	Residential, traffic site	Residential, traffic, domestic fuel burning
PM_{10}	2016 – 95% 2017 – 97% 2018 – 97%	2016 – 99% 2017 – 96% 2018 – 100%	2016 – 95% 2017 – 99% 2018 – 99%	2016 – 97.5% 2017 – 89.88% 2018 – 95.76%
SO_2	2016 – 96% 2017 – 97% 2018 – 99%	2016 – 95% 2017 – 93% 2018 – 98%	2016 – 95% 2017 – 99% 2018 – 89%	2016 – 97.85% 2017 – 90.77% 2018 – 95.40%
TRS	2016 – 90% 2017 – 96% 2018 – 98%	Not measured	Not measured	2016 – 97.43% 2017 – 90.28% 2018 – 94.48%

6.2.2 PARTICULATE MATTER (PM10)

Average daily PM_{10} concentrations measured at the Brakenham, CBD, Felixton and eSikhaleni monitoring stations are summarised as follows:

- The period average ambient concentrations at the Brakenham, CBD, Felixton and eSikhaleni monitoring stations was 31 µg/m3, 14 µg/m3 and 25 µg/m3 respectively and are below the PM_{10} annual NAAQS (40 µg/m3).
- Ambient concentrations at the Brakenham station exceeded the PM_{10} 24-hour NAAQS (75 µg/m3, four exceedances permitted) once in 2016, three times in 2017 and six times in 2018. The 2018 results demonstrate noncompliance with the 24-hour NAAQS, while the 2016 and 2017 results demonstrate compliance.
- Ambient concentrations at the Felixton station exceeded the PM_{10} 24-hour NAAQS once in 2017 and are therefore compliant. No exceedance measured in 2018.
- Ambient concentrations at the eSikhaleni station exceeded the PM10 24-hour NAAQS (75 µg/m3, four exceedances permitted) once in 2016 and once in 2017 and are therefore compliant. No exceedance measured in 2018.
- No exceedances were measured at the CBD between 2016 and 2018.

6.2.3 SULPHUR DIOXIDE (SO_2)

Average daily and hourly SO_2 concentrations measured at the Brakenham, CBD, Felixton and eSikhaleni monitoring stations all calculated SO_2 period averages were the SO_2 annual NAAQS (50 µg/m^3) No exceedances of the SO_2 24-hour NAAQS (125 µg/m^3) and SO_2 1-hour NAAQS (350 µg/m^3) were measured between January 2016 and December 2018 inclusive. The highest period average SO_2 concentrations were measured at the CBD while the lowest was measured at Brakenham.

6.2.4 TOTAL REDUCED SULPHUR (TRS)

Average daily TRS concentrations are measured at the CBD and eSikhaleni monitoring stations. In the absence of a South African ambient air quality standard for H_2S, the concentrations were compared with the World Health Organisation (WHO) Air Quality Guideline for human health (24-hour average). No exceedances of the H_2S 24-hour ambient WHO Guideline of 150 µg/m^3 were measured at these stations between January 2016 and December 2018 inclusive.

6.3 ENVIRONMENTAL NOISE

6.3.1 SENSITIVE RECEPTORS

The nearest sensitive receptors to potential noise emissions include Alton, an industrial/commercial area (>500 m north-east), the central business district (CBD) (>2000 m north-east) and residential receptors in the areas of Arboretum and Wild En Weide (>3000 m east and north-east respectively). The SANS recommended residual sound levels for these land-use districts are shown in **Table 12**.

Table 12: SANS 10103 (2008) Recommended residual sound levels for (relevant) land-use districts

SENSITIVE RECEPTOR	Type of District	Classification	Equivalent Continuous Rating level for Noise ($L_{Req,T}$) (dB(A)) (Outdoors)	
-	-	-	**Day-time ($L_{Req,d}$)**	**Night-time ($L_{Req,n}$)**

-	Rural	A	45	35
Arboretum and Wild En Weide	Suburban (with little road traffic)	B	50	40
-	Urban	C	55	45
-	Urban (with one or more of the following: workshops, business premises and main roads)	D	60	50
CBD	Central Business Districts	E	65	55
Alton	Industrial District	F	70	60

6.4 GEOLOGY AND SOILS

6.4.1 REGIONAL DESCRIPTION

Richards Bay is located within a large coastal plain which varies in altitude from 0 metres above mean sea level (mamsl) (i.e. sea level) at the coast to approximately 200 mamsl 20 km inland from the coast at Empangeni. The coastline is characterized by a steep sandstone ridge and a strip of 1 to 4 dune ridges up to approximately 1 km wide which run parallel to the coast, and reach a height of approximately 100 m. The entrances to the Richards Bay Harbour and Richards Bay Estuary constitute the only breaks within the coastal dune ridge.

The Department of Mineral and Energy, Geological Map Sheet 27½32 (St Lucia) 1:250,000 scale (Steyn, 1985) specifies the area to be typically underlain by Quaternary yellowish redistributed sand which likely overlies siltstone and sandstone of the St Lucia Formation. The geographical topography is mainly plains and relatively flat. The soils are closely related to the geology and landforms.

At a regional level, Richard Bay lies atop the unconsolidated Cenozoic Era sediments of the Maputaland Lithological Group that stretches along the Maputaland coastal plain and into Mozambique. The sedimentary sequence of the Maputaland Group, overlying the Cretaceous mudstone, forms the main stratigraphic features of the primary coastal aquifer.

6.5 HYDROLOGY

6.5.1 REGIONAL DESCRIPTION

SURFACE WATER

At a regional level, Richards Bay forms part of the Mhlathuze catchment. The site is located in the Usutu to Mhlathuze Water Management Area.

The Mhlathuze River is the largest river system in Richards Bay and is characterised by a large flood plain that is exposed to intense exploitation and impacts upstream. The Mhlathuze River and its catchment have been substantially modified over the last couple of decades. The extent of local modification has reduced water inputs from the river to surrounding water features affecting hydrological pathways and ecosystem maintenance. The river's significance in terms of environmental service supply has been rated as high.

The study-site is located in the 'Bhizolo (canal) to uMhlatuze estuary' river system. Surface flows move through the swamp forest into the Bhizolo Canal (a canalized stream) which then flows into the uMhlatuze Estuary (Port of Richards Bay). The Bhizolo Canal is separated for the uMhhlatuze River by an interfluve.

GROUND WATER

The aquifer underling the Richards Bay Region was formed by the layers of unconsolidated marine, aeolian and alluvial deposits. It is a shallow aquifer and water levels are strongly influenced by topography. The aquifer forms extensive lakes and wetlands where the water table is at or immediately (<1m) below the surface.

The Port of Richards Bay falls within quaternary catchment W12F and is associated with the marine waters of the Indian Ocean. Surface water runoff generated on site is anticipated to eventually flow towards the port. The natural flow of the ground water is towards the estuaries and Indian Ocean. Groundwater in the region has strong linkages to all the other water resources that function as drainage boundaries.

6.5.2 SITE DESCRIPTION

The Mill is located at the lower reaches of the W12F quaternary catchment (Usuthu to uMhlathuze Catchment). The Bhizolo River is located approximately 230m east of the boundary of the Mondi operation and flows in southerly direction where it joins the uMhlathuze River and enters into the Indian ocean.

The Nseleni River and Lake Nsezi lie 2km and 1.2km respectively, to the west of the site boundary. The lake performs significant water quality buffering and plays a role in reducing flood risk downstream.

The natural geology is considered to represent a major aquifer, with high vulnerability and high susceptibility to contamination. The mean annual recharge is between 50mm and 75mm, and annual base flow contributions range from 10mm to 25mm.

The natural groundwater flow is towards the estuaries and ultimately, the Indian Ocean. Groundwater levels mimic the topography of the region. The Rivers, lakes and drainage features are considered part of the groundwater system with the Indian Ocean and the estuaries considered groundwater flow boundaries. The main drainage features comprise of the Nseleni River and Wetland, the Mhlatuze River and lagoon and Lake Cubu. Regionally, groundwater quality is classified as Type D, dominated by sodium and potassium cations, and chloride and sulphate anions. Electrical conductivity is typically less than 70mS/m, and the concentration of dissolved solids is expected to be less than 300mg/l.

6.5.3 SENSITIVE FEATURES

The natural geology is considered to represent a major aquifer, with high vulnerability and high susceptibility to contamination.

6.6 ECOLOGY

6.6.1 REGIONAL DESCRIPTION

TERRESTRIAL ECOLOGY

At a regional level, Richards Bay falls within the ‘Maputaland-Pondoland-Albany Biodiversity Hotspot’ which is recognised as the “second richest floristic region in Africa” containing approximately 80% of South Africa’s remaining forests, rich bird life and many other significant flora and fauna species. Umhlathuze supports a total of 174 Red Data Species which has been reported as one of the highest in country (uMhlathuze IDP, 2014). A large proportion of this hotspot is being transformed and degraded by human activities, resulting in many vegetation types being vulnerable to further disturbances.

WETLAND ECOLOGY

The site is located within the Zululand Coastal Aquifer (ZCA) and is characterised by a shallow water table (0-1.6m deep). There are two aquifers present at the site, a near surface sandy unconfined aquifer responsible for the shallow water table and a deeper sandy aquifer (~2.5 m). The two aquifers are separated by a clay layer. Research has shown that in ZCA the groundwater baseflows contribute significantly to total surface flows (>20% of the

total) suggesting the aquifer is very important in driving the development of wetland habitats in the area. There is an abundance of wetland habitat at the site.

The wetlands tend to begin as seepage and then transition into channelled wetland systems once sufficient surface flows gather to allow for the formation of a channel. Historically, it is likely that most of the wetland habitat would have been herbaceous vegetation (grasses and sedges) with woody vegetation (i.e. swamp forests) persisting in areas with sufficient inundation and protection from fire. Within the site there is a proliferation of woody vegetation within the wetlands probably as a consequence of anthropogenic fire exclusion, particularly near infrastructure. Various developments over the last 30 years have split some wetlands which are now separated by portions of fill material that are now non-wetland and by roads.

6.6.2 SITE DESCRIPTION

TERRESTRIAL ECOLOGY

The portion of land on which the facility is proposed to be developed overlays vegetation classes categorised as transformed/built-up, Maputaland Coastal Belt and Subtropical Freshwater Wetland as defined by South African National Biodiversity Institute (SANBI) and based on the Mucina and Rutherford.

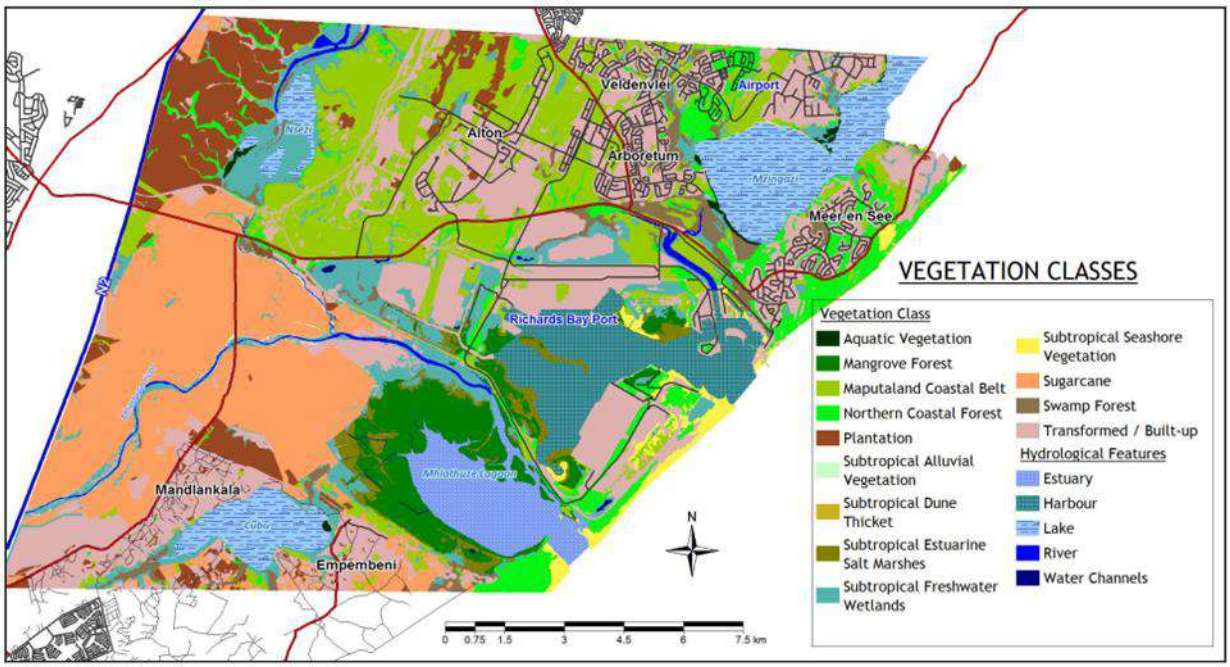


Figure 12: Vegetation Classes (Richards Bay EMF, 2009)

The Maputaland Coastal Belt vegetation unit (known as CB1) includes the terrestrial vegetation of the coastal plain, originally densely forested, but including dry grassland, palmveld, hygrophilous grassland and thicket. Now extreme sugar cane fields and timber plantations occur here. It is not protected extensively in many statutory conservation areas due to its high potential for commercial timber and sugar cane plantations, and in the Richards Bay area specifically due to shortage of land for industrial development. Currently, only 17 % of this habitat type is conserved in South Africa and this habitat type is endangered (Mucina & Rutherford 2006).

Sub-tropical Freshwater Wetlands are classified as least threatened with a national conservation target of 24%; this target refers to wetlands which are still in a relatively unaltered state. However, fine scale mapping of wetlands has been undertaken which has revealed wetlands that are of national conservation status due to unique local conditions.

The majority of the proposed site where upgrades will occur is considered to be fully transformed and built-up. There are no known vegetation types or species of concern in the affected areas.

WETLAND ECOLOGY

The desktop review and subsequent infield assessment carried out as part of previous EIA studies for Mondi, identified a Channelled Valley-Bottom (CVB) wetland associated with the Bhizolo River, as well as various seeps and artificial systems within a 500 m radius of the proposed Mill expansion. The ecological systems were divided into artificial, offsite and onsite systems.

The onsite wetland systems were identified as potentially forming part of a larger historical seep system, extending beyond the operational site boundary of the Mill, which has been significantly modified. As the predominant environmental sensitivity associated with the Mondi site, wetlands in relation to the project activities are illustrated in **Figure 13**.

Figure 13 Location of Wetlands and Watercourses

6.7 SOCIO-ECONOMIC ENVIRONMENT

6.7.1 REGIONAL DESCRIPTION

uMhlathuze Local Municipality (KZN282) has a population of 334, 459 people and a population density of 422 persons per km2. The service levels within uMhlathuze are reasonably good with the municipality providing 53.5% of households with waste removal, 50.3% with piped water inside dwellings and 93.5% with electricity for lighting (93.5%). Thirty-eight percent of the population has a form of primary education and 18.8% has completed secondary education (Statistics South Africa, 2012).

Thirty-eight percent of the municipality's population is located within formal urban areas, 27% in rural nodes and 35% in the remaining rural areas of the municipality. The highest population densities are observed in rural settlement areas such as Nseleni and Esikhaweni. The lowest population densities are found in the non-tribal rural

areas of the municipality. Although population growth has been decreasing in the District Municipal Area, the opposite seems to be true for the uMhlathuze Local Municipal Area.

The unemployment level in the area is high at 36.28% whilst that of the province lies at 47.4%. Manufacturing is the dominant economic sector in the area. Most industries are capital intensive with low employment opportunities.

6.8 HERITAGE AND CULTURAL ASPECTS

6.8.1 REGIONAL DESCRIPTION

During the Cenozoic sea-level began to fall from the high levels experienced during the Cretaceous period. A series of large coast-parallel dune complexes developed along most of the KwaZulu-Natal coastline. In Durban these now form the Berea and Bluff Ridges. In most areas deep weathering of old dunes has produced a dark red coloured sand called the Berea Red Sand. In more recent times, fluctuations in sea-level have continued to shape the KwaZulu-Natal coastline. Recent coastal dunes contain economic concentrations of minerals such as ilmenite, rutile and zircon, which are mined near Richards Bay.

6.8.2 SITE DESCRIPTION

The entire Mill area has been transformed. The transformed nature of the environment implies that the occurrence of heritage resources of any significance is highly unlikely overall, and none have been observed to date within the proposed development area. It is nevertheless possible that a resource may be encountered during excavation activities, and therefore a “chance find” protocol should be included within the EMPr for the project.

6.9 LAND USES AND ZONING

The urban areas of the uMhlathuze Municipality are dominated by residential and industrial land uses. The proposed site is zoned as “High Impact Industrial”. The area has a well-developed road and stormwater network, and there are tracts of undeveloped areas which comprise indigenous grassland, wetland and riparian habitats.

7 SCOPING OF ENVIRONMENTAL AND SOCIAL ISSUES

A scoping process was used to identify potential impacts through a systematic process whereby the various development and location alternatives were considered with respect to their potential to interact with resources and receptors (**Table 13**).

The scoping was conservative i.e. did not consider the actual sensitivity of the site specific receptor, nor the ability to mitigate the source or effects of the impacts. Interactions were classified in one of four categories

Table 13 Scoping Significance Assessment Criteria

SYMBOL	INTERACTION CATEGORY	DESCRIPTOR
+	Positive interaction	There is likely to be a positive interaction, and the resultant impact has a positive effect on the resource or receptor.
-	No interaction	The Project is unlikely to interact with the resource/receptor.
L	Interaction likely, but not likely to be significant	There is likely to be an interaction, but the resultant effect is unlikely to change baseline conditions in an appreciable way.
S	Significant interaction	There is likely to be an interaction, and the resultant impact has a reasonable potential to cause a significant effect on the resource or receptor.

Various project features and activities that could reasonably act as a source of impact were identified. These are listed down the vertical axis of the scoping matrix (**Table 14**). The resources and receptors relevant to the baseline environment are listed across the horizontal axis of the matrix. Each resulting cell on the scoping matrix thus represents a potential interaction between a project activity and a resource or receptor. Those interactions with the potential for significant effects are subjected to a detailed assessment as part of the environmental and social impact assessment process.

Table 14 Scoping Matrix

PROJECT ACIVITY	PHYSICAL						BIOLOGICAL					SOCIOECONOMIC								
	Air Quality	Ambient Noise	Soils and Geology	Surface Water	Groundwater	Landscape and Visual	Flora	Fauna	Avifauna (birds)	Aquatic Ecology	Protected Areas	Community Health and Safety	Worker Health and Safety	Local Community Demographics	Social and Cultural Structure	Landuse and Livelihoods	Local and Macro Economy	Traffic and Transportation	Tourism / Recreation	Cultural Heritage
Construction Phase																				
Transportation of equipment and materials to site	-	-	-	-	-	-	-	-	-	-	-	L	-	-	-	-	-	L	-	-
Site Clearance	-	-	-	-	-	-	L	-	-	L	-	-	-	-	-	-	-	-	-	-
Establishment of contractors camp and laydown areas	-	-	-	-	-	-	L	L	-	L	-	-	-	-	-	-	-	-	-	-
Handling of small volumes of construction chemicals	-	-	L	S	L	-	-	-	-	S	-	-	-	-	-	-	-	-	-	-
Operation of construction machinery, equipment and generators	-	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Demolition and dismantling activities	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Removal of chemical contaminated material and equipment	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Generation of general and hazardous waste	-	-	L	L	L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
General Construction Activities	L												S	-	-	-	-	-	-	L
Operational Phase																				
Transportation of raw materials and product	-	-	-	-	-	-	-	-	-	-	-	L	-	-	-	-	-	L	-	-
Handling of large quantities hazardous chemicals and environmental pollutants	-	-	S	S	S	-	-	-	-	S	-	-	S	-	-	-	-	-	-	-
Normal operation of production plant and equipment	S	L	-	-	-	-	-	-	-	-	-	S	S	-	-	-	+	-	-	-
Major Accidental Hazard	-	-	-	-	-	-	-	-	-	-	-	S	S	-	-	-	-	-	-	-

8 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

In this section the potential impacts of the project on the physical, biological and socio-economic environmental components has been assessed. The assessment is limited to the following environmental components where potential positive or negative interactions are present (**Section 7 - Scoping of Environmental and Social Issues**):

- Air Quality Incl. Odour
- Ambient Noise
- Soils and Geology
- Surface Water (incl. Aquatic Ecology)
- Groundwater
- Terrestrial Ecology (Flora and Fauna)
- Local and Macro Economy (socio-economics)
- Community Health and Safety
- Worker Health and Safety
- Traffic and Transportation
- Socio-economics
- Cultural Heritage

8.1 ATMOSPHERIC EMISSIONS INCL. ODOUR

The following section is based on the Atmospheric Impact Report (AIR) prepared for the project (Ref: WSP, 41101741/June 2019) (**Appendix C**). The AIR was prepared in order to assess the ambient air quality impacts as a result of the proposed Chemical Plant changes as well as the proposed new CNCG Boiler

8.1.1 IMPACT SOURCES

CONSTRUCTION PHASE

The use of vehicles and equipment in the work areas and the contractor laydown area has the potential to generate dust emissions. With the exception of very windy conditions these emissions are likely to be confined to the immediate area.

OPERATIONAL PHASE

The following section is based on the Atmospheric Impact Report (AIR) prepared for the project (Ref: WSP, 41101741/June 2019) (**Appendix C**). The AIR was prepared in order to assess the ambient air quality impacts as a result of the proposed Chemical Plant changes as well as the proposed new CNCG Boiler. The sources of atmospheric impacts associated with the operational phase of the project are twofold:

1) The proposed CNCG boiler will enable Mondi to more reliably thermally oxidise odour causing CNCGs and will also improve the emission of Total Reduced Sulphur (TRS) and Nitrogen Oxide (NOx) that is currently being emitted during CNCG thermal oxidisation in the Lime Kiln. This is predicted to result in appositive environmental impact.
2) Depending on the selected development scenario, the proposed chemical plant upgrade will increase the releases of HCl and Chloride (Cl_2) to atmosphere.

The AIR used dispersion modelling to assess the above scenarios using a Level 3 (CALPUFF) atmospheric dispersion model. The AIR built upon the baseline assessment conducted for previous Mondi studies and the existing meteorological, topographical and land use modules set up for dispersion modelling[3]. The AIR assessed the following project aspects:

CNCG Boiler

The AIR Assessed particulate matter less than 10 micrometres (PM_{10}), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and total reduced sulphur (TRS) from the proposed CNCG Boiler.

To assess ambient air quality impacts related to the proposed CNCG Boiler, predicted long-term and short-term 99th percentile 24-hour and 1-hour average concentrations are compared with National Ambient Air Quality Standards (NAAQS) and World Health Organisation (WHO) guidelines as applicable.

To determine the proposed cumulative impact of the proposed CNGC Boiler, predicted PM_{10}, SO_2 and NO_2 concentrations from the Mondi upgrade scenarios have been added to the predicted concentrations from all other industries that have an AEL in the King Cetshwayo District Municipality (formerly the uThungulu District Municipality).

Furthermore, to determine Mondi's percentage contribution to existing ambient PM10 and SO_2 concentrations, predicted (modelled) contributions have been compared to the measured PM10 and SO_2 concentrations at CBD, Brackenham and Felixton monitoring stations operated by the RBCAA.

Chemical Plant Upgrades

The AIR assessed ll significant releases of HCl and Chloride (Cl_2) to atmosphere under four conservative (worst case) emissions scenarios for the Chemical Plant (**Table** 15 **15**).

Table 15 Chemical Plant AIR Scenarios

AIR SCENARIO	CHLOR ALKALI	CHLORATE
Scenario 1 (Baseline)	Existing plant (55 dry tons/day)	Existing plant (39 dry tons/day)
Scenario 2	Install a new plant at a new location on the Mill with capacity of 110 dry tons/day	Decommission existing plant (no replacement)
Scenario 3	Install a new plant at a new location on the Mill with capacity of 110 dry tons/day	Relocation and upgrading from 39 dry tons/day to 55 dry tons/day
Scenario 4	Relocation of the existing chlor alkali plant to a new location on the Mill and upgrade the plant capacity from 55 dry tons/day to 75 dry tons/day	Relocation and upgrading from 39 dry tons/day to 55 dry tons/day

In order to assess impacts related to the Chemical Plant upgrades, predicted long-term (period) and 99th percentile short-term (1-hour) average concentrations are compared with the Texas Commission on Environmental Quality's (TECQ) Effects Screening Levels (ESLs) for guidance in the absence of national standards for HCl and CL_2.

[3] WSP have retained use of the CALMET-ready MM5 dataset as this is the dataset used to build the original Mondi baseline CALPUFF model. As such, making use of a more recent dataset (i.e. 2016 – 2018) to calculate the ambient air quality impact from the proposed Chemical Plant changes as well as the proposed new CNCG Boiler wouldn't allow for a fair comparison in relation to the plants baseline emissions already calculated making use of 2013 – 2015 data (WSP, 2016). Both analysed datasets show that prevailing winds originate from the northerly to north-easterly and southerly to south-westerly directions with peak wind speeds recorded along a south-south-westerly wind trajectory. As such, the CALMET-ready MM5 dataset (period 2013 – 2015) is deemed representative of recent meteorological conditions at Richards Bay and thus remains adequate for dispersion modelling applications in this study.

To ensure a cumulative assessment of HCl and CL_2 concentrations was undertaken for the Richards Bay airshed, emissions from the proposed Elegant Afro Chemicals (Pty) Ltd (EAC) chlor-alkali plant in the Richards Bay Industrial Development Zone (RBIDZ) were considered. Unfortunately none of the RBCAA monitoring stations measure ambient HCl or Cl_2 concentrations.

IMPACT ASSESSMENT

A guide to the terminology used in this section is provided below:

- *"P99" refers to the 99th percentile concentration. Essentially, when P99 is stated in relation to an averaging period (1 hour, 24 hour etc) it means that the highest predicted concentrations generated by the model have been ignored because they could be unrealistically high. This approach is acceptable in terms of the South African Regulations Regarding Air Dispersion Modelling (GN. R 533 of 2014).*

A) CONSTRUCTION PHASE DUST IMPACTS

Impact Description:	No impact anticipated			
Mitigation:	Notwithstanding the absence of impacts, Mondi should implement good practice measures specified in the EMPr, including inter alia: – Limit vehicle speeds on un-surfaced areas. – Avoid dust-generating activities (i.e. grading and moving of soil) during windy periods. – Cover and / or maintain appropriate freeboard on trucks hauling any loose material that could produce dust when travelling. – Re-vegetate or hard surface disturbed areas as soon as possible – Dust suppression methods to active areas and stockpiles			
Significance Rating:	Without Mitigation:	Neutral	With Mitigation:	Neutral

B) OFF-SITE AIR QUALITY IMPACTS ASSOCIATED WITH THE CHEMICAL PLANT (HYDROGEN CHLORIDE (HCL))

Impact Description:	A marginal increase in the cumulative P99 1 hour average HCl concentrations is predicted for all scenarios. However, all concentrations remain an order of magnitude below their Texas Commission on Environmental Quality's (TECQ) Effects Screening Levels (ESLs). The cumulative ambient air quality contribution (at the RBCAA monitoring stations) could not be determined, as the RBCAA monitoring network does not measure this pollutant.			
Mitigation:	No mitigation recommended			
Significance Rating:	Without Mitigation:	Low (negative)	With Mitigation:	Low (negative)

C) OFF-SITE AIR QUALITY IMPACTS ASSOCIATED WITH THE CHEMICAL PLANT (CHLORIDE (CL))

Impact Description:	A marginal increase in the cumulative P99 1 hour average Cl concentrations is predicted for all scenarios. However, all concentrations remain an order of magnitude below their respective TCEQ ESL. The cumulative ambient air quality contribution (at the RBCAA monitoring stations) could not be determined, as the RBCAA monitoring network does not measure this pollutant.
Mitigation:	No mitigation recommended

Significance Rating:	Without Mitigation:	Low (negative)	With Mitigation:	Low (negative)

D) OFF-SITE AIR QUALITY IMPACTS ASSOCIATED WITH THE CNCG BOILER (PM10)

Impact Description:	Predicted period and P99 24-hour average PM10 concentrations are expected to marginally increase at all off-site receptors. Concentrations are below their respective NAAQS for all receptors with the exception of the Meer En See Receptor. The non-compliance at this receptor is due to the pre-existence of PM10 concentrations marginally below the NAAQS standard at this location (i.e. high existing baseline). The AIR however notes that while the CNCG Boiler is fuelled by gas, the emission concentrations were calculated based on the minimum emission standards (MES) to provide an environmentally conservative estimate of its impact on the surrounding ambient air quality. Mondi's contribution, as a result of the proposed CNCG Boiler, to the existing baseline PM10 concentrations in the Richards Bay airshed remains marginal. The cumulative ambient air quality contribution (at the monitoring stations) show that concentrations associated with the proposed CNCG Boiler at Mondi will contribute marginally to the existing long-term (period average) and short-term (P99 24-hour average) PM10 concentrations measured at the CBD, Felixton, Esikhaleni and Brakenham stations. The future cumulative PM10 concentrations remain below the relevant NAAQS at all stations, with the impact on the receiving environment remaining negligible post commissioning of the CNCG Boiler.			
Mitigation:	No mitigation recommended			
Significance Rating:	Without Mitigation:	Low (negative)	With Mitigation:	Low (negative)

E) OFF-SITE AIR QUALITY IMPACTS ASSOCIATED WITH THE CNCG BOILER (SO2)

Impact Description:	A marginal increase in the cumulative P99 1 hour average SO_2 concentrations is predicted for all scenarios. However, all concentrations remain an order of magnitude below their respective NAAQS. The cumulative ambient air quality contribution (at the monitoring stations) shows the following: – Future long-term SO2 concentrations are likely to remain relatively unchanged when compared to existing measured concentrations at the CBD, Felixton, Esikhaleni and Brakenham stations. – Future 1-hour and 24-hour SO2 concentrations will increase slightly, although concentrations will remain well below the respective NAAQS when compared to existing measured concentrations at the CBD, Felixton, Esikhaleni and Brakenham stations. Impacts on the receiving environment post commissioning of the CNCG Boiler are likely to remain low.			
Mitigation:	No mitigation recommended			
Significance Rating:	Without Mitigation:	Low (negative)	With Mitigation:	Low (negative)

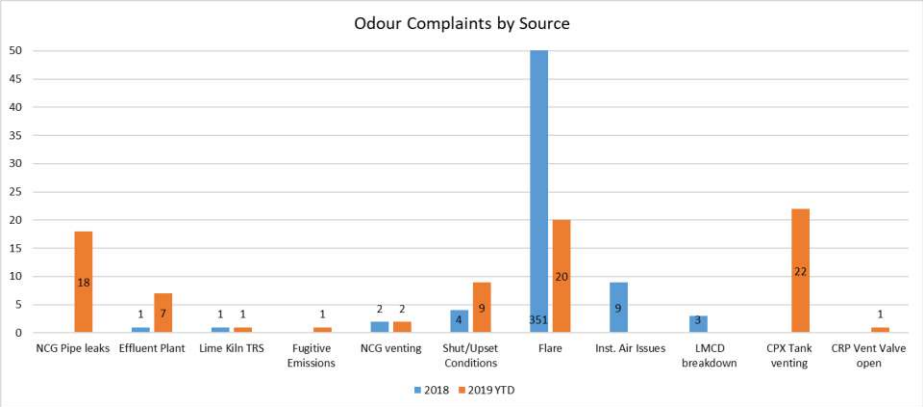
F) OFF-SITE AIR QUALITY IMPACTS ASSOCIATED WITH THE CNCG BOILER (NO_2)

Impact Description:	A marginal increase in the cumulative P99 1 hour average NO_2 concentrations is predicted for all scenarios. However, all concentrations remain an order of magnitude below their respective NAAQS. The cumulative ambient air quality contribution (at the RBCAA monitoring stations) could not be determined, as the RBCAA monitoring network does not measure this pollutant.			
Mitigation:	No mitigation recommended			
Significance Rating:	Without Mitigation:	Low (negative)	With Mitigation:	Low (negative)

G) OFF-SITE AIR QUALITY IMPACTS ASSOCIATED WITH THE CNCG BOILER (TRS)

Impact Description:	Predicted P99 24-hour average TRS concentrations are expected to increase marginally at all receptors. However, all concentrations are an order of magnitude below their respective Air Quality Guidelines for Human Health (24-hour average) for all receptors. Predicted P99 30-minute average TRS concentrations are expected to increase marginally at all receptors. However, all concentrations are an order of magnitude below their respective WHO Odour Threshold Guidelines (30-min average) for all receptors. Cumulative TRS concentration was not assessed due to this pollutant not being emitted by other facilities. The cumulative ambient air quality contribution from the CNCG Boiler at the monitoring stations remains low, with future 24-hour TRS concentrations remaining relatively unchanged when compared to existing measured concentrations with negligible impact on the receiving environment.			
Mitigation:	No mitigation recommended			
Significance Rating:	Without Mitigation:	Low (negative)	With Mitigation:	Low (negative)

H) OFF-SITE AIR QUALITY IMPACTS ASSOCIATED WITH THE CNCG BOILER (ODOUR IMPROVEMENT)

Impact Description:	Upset conditions currently occur when the principal method of combusting CNCGs in the lime kiln is not available. When this occurs the CNCGs are routed to the flare, resulting in the emission of partially-combusted CNCGs, which have the potential to triggering off-site odour complaints. The high prevalence of odour complaints associated with this type of flaring incident is evident in the analysis of the complaints received by Mondi in 2018 and 2019 (**Figure 14**). These comprise on average 61% of the complaints over the last 2 years (96% in 2018; and 26% in 2019) (**Figure 14**). The proposed CNCG boiler will enable Mondi to more reliably thermally oxidise odour causing CNCGs. As the new primary method of combusting CNCGs, the CNCG boiler will have a significantly improved uptime (expected time efficiency 99%) compared to the lime kiln (time efficiency 92%). It can therefore be inferred that the CNCG boiler will result in a reduction of odour complaints associated with the flare and lime kiln which accounted for 61% of the complaints in 2018 and 2019 (year to date). Carbon filters installed in 2008 as part of the abatement programme used in the case of burning zones being unavailable (e.g., in the event of power failure) will remain in use on the strong gas system. It is noted that the CNCG Boiler is being introduced as an alternative burning zone and will not contain additional carbon filters. Although the lime kiln and flare will remain as a back-up systems; it is anticipated that the prevalence of flare related odour complaints from these sources will reduce altogether (and not just in frequency).  **Figure 14 Odour Complaints by Source (Mondi, July 2019)**			
Mitigation:	Ambient TRS monitoring to quantify reduction (in the case of continued odour complaints).			
Significance Rating:	Without Mitigation:	Moderate (Positive)	With Mitigation:	Moderate (Positive)

8.2 AMBIENT NOISE

8.2.1 IMPACT SOURCES

CONSTRUCTION PHASE

Construction activities will be intermittent (non-continuous) in nature throughout the construction period, with only some equipment active at any given time. The following noise sources are anticipated during the construction phase:

- Earth moving equipment (bull-dozers, front end loaders, graders, scrapers, etc.)
- Material handling equipment (concrete mixers, cranes, etc.)
- Power units (generators, compressors, etc.)

- Other equipment (compressed air blowers, power saws, electric drills, pneumatic breakers, grinders, etc.)

OPERATIONAL PHASE

The mill is inherently a noisy environment due to the large amount of mechanical equipment, transport vehicles, physical activities (such as wood chipping), and energy usage. Two major sources of noise are wood debarking in pulp mills and the paper machine in paper mills.

The noise contributions from the proposed activities (chemical plant upgrades, dangerous good storage, and the CNCG boiler) towards the overall noise profile of the mill are not significant. Significant changes in noise emissions from the site are therefore not anticipated.

8.2.2 IMPACT ASSESSMENT

A) CHANGES IN OFF-SITE AMBIENT NOISE LEVELS (CONSTRUCTION PHASE)

Impact Description:	Due to the relatively low noise levels and distances of the construction areas to the mill boundary no significant changes in noise levels are anticipated at the Mill boundary.			
Mitigation:	Notwithstanding the absence of environmental impacts, implement good practice: – Maintain vehicles and machinery in good working order. – Investigate all instances of excessive noise and assess possibilities for mitigation. – Undertake noisy construction activities during daylight hours if practical. – Notify surrounding residents well ahead of time should any excessive 'out of hours' noise be necessary. – Avoid noisy activities during weekend non-working hours.			
Significance Rating:	Without Mitigation:	Very Low Negative	With Mitigation:	Very Low Negative

B) CHANGES IN OFF-SITE AMBIENT NOISE LEVELS (OPERATIONAL PHASE)

Impact Description:	Due to the relatively low contribution of the project activities towards the overall noise profile of the Mill, no significant changes in noise levels are anticipated at the Mill boundary.			
Mitigation:	In order to mitigate impacts, the following mitigation measures are recommended: – Engineer the project in the detailed design stage to reduce noise emissions to the highest practicable level. – As a precautionary measure, it is recommended that environmental noise monitoring at the Mill boundary is undertaken prior to, and following the commissioning of the chemical plant upgrades. – The requirement for ongoing monitoring shall be determined subject to the results of the post commissioning monitoring as well as determined necessary if any complaints are received.			
Significance Rating:	Without Mitigation:	Very Low Negative	With Mitigation:	Very Low Negative

8.3 GEOLOGY, SOIL AND GROUNDWATER

8.3.1 IMPACT SOURCES

CONSTRUCTION PHASE

Construction activities have the potential to generate stormwater contaminated with sediment, and oil and grease from machinery. Construction activities also have the potential to result in the handling and storage of additional waste materials which may be contaminated (e.g. from the decommissioning of the existing chemical plant infrastructure). Unless these pollutants are contained, there is potential for localised contamination of the soil.

There is potential for the identification of latent (historical) subsurface contamination during construction related excavations.

OPERATIONAL PHASE

The project will increase the quantity of dangerous goods and pollutants stored on the site. Accidental release of these substances into the environment has the potential to contaminate the underlying soil. Due to the large quantities of chemicals, soil contamination has the potential to migrate into the aquifer, resulting in groundwater contamination.

8.3.2 IMPACT ASSESSMENT

A) SOIL AND GROUNDWATER CONTAMINATION (CONSTRUCTION PHASE)

Impact Description:	There is potential for localised soil contamination caused by accidental spillage of hazardous substances outside of secondary containment.			
Mitigation:	– Storage of hazardous materials should be undertaken within impermeable bunded, ventilated and covered storage areas, capable of containing 110% of total volume. – All storage containers are to be labelled, sealed and stored in accordance with Material Safety Data Sheets (MSDS) requirements. – Drip trays must be used on vehicles and machinery that are prone to oil leaks. – Contaminated soil must be removed as soon as possible and managed appropriately as hazardous waste. Spill and response equipment must be accessible on-site.			
Significance Rating:	Without Mitigation:	Low (Negative)	With Mitigation:	Very Low (Negative)

B) MANAGEMENT OF LATENT SUBSURFACE CONTAMINATION (CONSTRUCTION PHASE)

Impact Description:	There is potential for the identification of latent (historical) subsurface contamination during construction related excavations. The handling of this material has the potential to cause occupational health and safety risks as well as environmental impacts on soil, groundwater and surface water.

Mitigation:	– All excavated material must be considered as 'potentially hazardous waste' whether intended for backfilling/reuse on site or spoiling off-site. Confirmatory sampling must be undertaken and the results analysed to obtain representative determination of the presence of contamination. – In the event that material is contaminated it must be treated as hazardous waste and classified in accordance with GN. R635 (National Norms and Standards for the Assessment of Waste for Landfill Disposal). Specifically, the re-use and disposal of contaminated material on-site is not permitted. – The above mitigation does not release Mondi from compliance with the current legislation concerning the assessment and remediation of contaminated land under the National Environmental Management Waste Act (2008).			
Significance Rating:	Without Mitigation:	Moderate (Negative)	With Mitigation:	Very Low (Negative)

C) SOIL AND GROUNDWATER CONTAMINATION (OPERATIONAL PHASE)

Impact Description:	Accidental spillage of hazardous substances outside of contained areas and loss of primary containment could result in contamination of groundwater and soils.			
Mitigation:	– Engineer the project in the detailed design stage to ensure secondary containment (essentially bunding) of all process chemical storage tanks. – Implement procedures as part of the EMS to ensure the integrity of secondary containment is monitored and maintained.			
Significance Rating:	Without Mitigation:	Low (Negative)	With Mitigation:	Very Low (Negative)

8.4 SURFACE WATER AND AQUATIC ECOLOGY

8.4.1 IMPACT SOURCES

CONSTRUCTION PHASE

Construction activities have the potential to generate stormwater contaminated with sediment and oil and grease from machinery. Construction activities also have the potential to result in the handling and storage of additional waste materials which may be contaminated (e.g. from the decommissioning of the existing chemical plant infrastructure). Unless these pollutants are contained, there is potential for their release into the stormwater system and ultimately for downstream watercourses to be contaminated.

Potentially contaminated runoff from the proposed activities will be collected in the existing onsite stormwater collection system which discharges to the effluent treatment system

OPERATIONAL PHASE

The project will increase the quantity of dangerous goods and pollutants stored on the site. Accidental release of these substances into the environment has the potential to contaminate downstream watercourses.

8.4.2 IMPACT ASSESSMENT

A) IMPACTS ON NATURAL WATERCOURSES AND ECOLOGY (CONSTRUCTION PHASE)

Impact Description:	Contamination of the wetlands and riparian habitat on the site in the event of spills in the 'clean' site area. This is applicable in the southern portion of the site which drains directly to a wetland area via a stormwater channel. Contamination of wetlands and riparian habitat may impact negatively on the ecological functioning of these systems.			
Mitigation:	– Waste should be stored in separate and secure skips / containers depending on management options – opportunities should be determined, in consultation with waste service providers, for re-use, recycle, or disposal options. – Hazardous waste (including used oils and material containing oils, solvents, empty chemical containers etc.) should be undertaken within impermeable bunded and ventilated storage areas, capable of containing 110% of total volume. All storage containers are to be labelled, sealed and stored in accordance with Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) requirements. – General waste should be stored within waste skips within a designated area with consideration given to stormwater management.			
Significance Rating:	Without Mitigation:	Low (Negative)	With Mitigation:	Very Low (Negative)

B) IMPACTS ON OFF-SITE NATURAL WATERCOURSES AND ECOLOGY (OPERATIONAL PHASE)

Impact Description:	The potential loss of containment of large quantities of chemicals from storage tanks and intermediate vessels has the potential to cause severe impacts on wetlands and riparian habitat and associated ecological functioning.			
Mitigation:	– The design of the project must ensure that all new process areas and chemical storage tanks are located within a robust secondary containment system e.g. bunding, or containment and drainage into the site effluent system. – Firefighting systems at all new process areas and chemical storage tanks must be designed to ensure that contaminated fire water is contained on the site / prevented from discharging into the stormwater system. – The current stormwater management network/practices must be reviewed and updated / designed to include the proposed activities. – Procedures must be in place as part of the Environmental Management System (EMS) to ensure that the integrity of secondary containment is monitored and maintained.			
Significance Rating:	Without Mitigation:	Low (Negative)	With Mitigation:	Very Low (Negative)

C) IMPACTS ON ON-SITE WETLANDS (OPERATIONAL PHASE)

Impact Description:	Impacts on wetlands may occur due to accidental / unplanned encroachment into wetland areas located within the Mill boundary.			
Mitigation:	– The location and layout of the construction activities (contractor's camp, laydown areas, pathways and access roads etc.) must take cognisance of the presence of on-site natural wetland areas (**Figure 13**). – It is recommended that a 23m buffer is established around the wetland areas. This buffer distance is adopted from a Mondi commissioned study and report entitled "A Wetland Delineation and Assessment at the Mondi Mill, Richards Bay, South Africa" prepared by Ikhwane Wetland Science (2015). – During construction the on-site wetlands should be temporarily fenced off to prevent encroachment. Signage should also be erected in all relevant languages prohibiting access to these areas.			
Significance Rating:	Without Mitigation:	Low (Negative)	With Mitigation:	Very Low (Negative)

8.5 TERRESTRIAL ECOLOGY

8.5.1 IMPACT SOURCES

CONSTRUCTION PHASE

The proposed activities are located within existing built-up areas of the site, which are entirely devoid of ecological features.

Limited activities may be required on undeveloped (open) portions of land within the Mill e.g. for the establishment of a contractors camp and laydown areas.

OPERATIONAL PHASE

No sources of impacts on terrestrial ecology are anticipated.

8.5.2 IMPACT ASSESSMENT

No impacts on terrestrial ecology anticipated.

8.6 COMMUNITY SAFETY

8.6.1 IMPACT SOURCES

CONSTRUCTION

A minor increase in road traffic during the construction phase (See Section 8.2 – Traffic and Transportation) has the potential to increase risks to pedestrians.

OPERATION

a) Risks to Pedestrians

A minor increase in road traffic during the operational phase (See Section 8.2 – Traffic and Transportation) has the potential to increase risks to pedestrians.

b) Major Accidental Hazards

The Mondi Richards Bay Mill is classified as a Major Hazard Installation (MHI) in terms of the MHI Regulations which form part of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) as amended. The purpose of the regulations is to ensure that chemical companies reduce the risk of major accidental hazards (MAH) to the employees and community as low as reasonably possible (ALARP).

In order to assess the effect of the proposed activities on risk profile of the Mill, in April 2019, a specialist risk assessment was undertaken by the Bureau for International Risk Assessments Pty. Ltd. (BIRA). The purpose of the risk assessment was to determine whether any increase in risk would occur specifically associated:

- Chlorine dioxide
- Hydrogen sulphide
- Chlorine
- Sulphur dioxide
- Hydrochloric acid

- Sulphuric acid
- Sodium Chlorate (dry storage)

The analysis confirmed that Mill poses a fatality risk to the public associated with the cumulative release of chlorine dioxide, sulphur dioxide, chlorine, and hydrogen sulphide. The risk is expressed as a worst case probability of a fatality occurring at a certain distance downwind of the source if the incident. **Figure 15** indicates that shows that the probability of an individual fatality occurring off-site will range from one in 10 000 000 per year ($1E^{-7}$) shown as the green line, to one in 1 000 000 per year ($1E^{-6}$) shown as the yellow line. As these probabilities are less than one in 100 000 per year ($1E^{-5}$) the risk is acceptable.

Although the probability of occurrence for all scenarios are very low, it does not exclude the possibility that such an event may occur. For that reason the specialist recommended [sic] *that the facility must be classified as a Major Hazard Installation in accordance with the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) as amended.* It is noted that the Mill is already registered; Mondi will thus engage with the Competent Authority to establish requirements (if any) specifically related to the project.

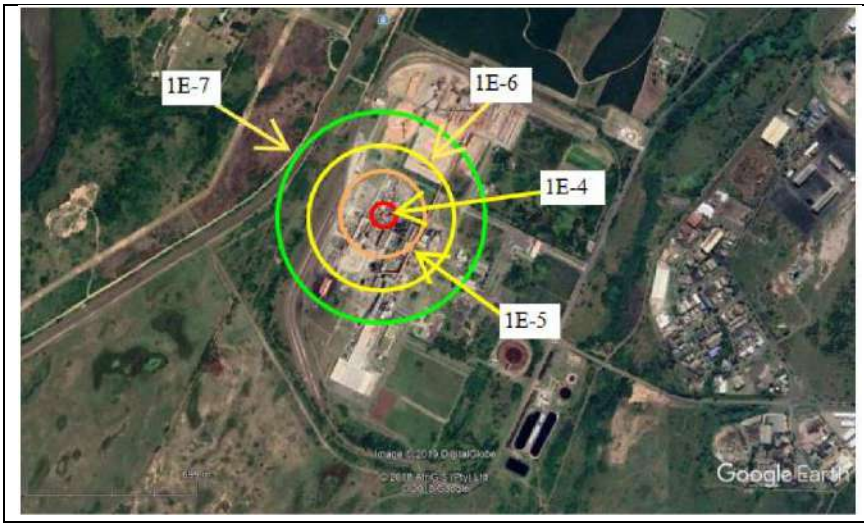


Figure 15 Societal Risk Contours Superimposed on the Chemical Plant (Source: Risk Assessment on the Operations of Mondi Limited, Richards Bay. Revision 6 – April 2019.

8.6.2 IMPACT ASSESSMENT

A) PEDESTRIAN SAFETY RISKS (CONSTRUCTION AND OPERATIONAL PHASES)

Impact Description:	Despite the small increase in traffic, there may be additional safety risks to pedestrians in the absence of adequate controls.			
Mitigation:	In order to mitigate this risk, Mondi should develop/update and implement procedures as part of the EMS to ensure vehicles making use of the external road network are roadworthy and that drivers hold a valid drivers licenced for respective class of vehicle.			
Significance Rating:	Without Mitigation:	Low (Negative)	With Mitigation:	Very Low (Negative)

B) OFF-SITE IMPACTS DUE TO MAJOR ACCIDENTAL HAZARD (OPERATIONAL PHASE)

Impact Description:	Based on the specialist MHI Risk Assessment, the off-site risk associated with the operational phase of the facility has been classified as acceptable.
Mitigation:	– Mondi is required to comply with the Major Hazard Installation Regulations under the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) as amended. – Specific consultation with the Competent Authority is recommended in order to determine the regulatory requirements associated with the project.

Significance Rating:	Without Mitigation:	Very Low (Negative)	With Mitigation:	Very Low (Negative)

8.7 WORKER HEALTH AND SAFETY

8.7.1 IMPACT SOURCES

CONSTRUCTION PHASE

There is a risk of worker exposure to hazardous chemical substances (HCS) during the construction phase, including:

- Construction chemicals (oil, grease, fuel, solvents)
- Excavated material that has potential to be contaminated
- Contaminated building material and equipment generated during decommissioning

In addition to HCS risks, the labour workforce may be involved in high risk activities typically associated with construction including:

- Working at heights
- Working in confined spaces
- Working in proximity to mechanical equipment and machinery
- Working in proximity to an operational pulp and paper Mill with associated hazards

OPERATIONAL PHASE

The storage of additional quantities of HCS during the operational phase has the potential to change the hazard profile of the Mill and the associated occupational exposure risk to staff.

8.7.2 IMPACT ASSESSMENT

D) WORKER HEALTH AND SAFETY INCIDENTS (CONSTRUCTION AND OPERATIONAL PHASE)

Impact Description:	Potential increase in occupational health and safety risk associated with project related construction and operational hazards.			
Mitigation:	– The management of worker health and safety falls outside of the remit of the EIA Regulations and this BA Report and the associated EMPr thus excludes mitigation measures. Mondi is required to manage worker health and safety in accordance with the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993). This must include: – Detailed project / activity specific hazard identification and risk assessment (HIRA) process; and; – Implementation of appropriate mitigation measures e.g. safe work procedures, use of PPE; design safety, occupational monitoring, training and awareness programmes, and performance assessment and reporting.			
Significance Rating:	Without Mitigation:	Moderate (Negative)	With Mitigation:	Very Low (Negative)

8.8 TRAFFIC AND TRANSPORTATION

8.8.1 IMPACT SOURCES

CONSTRUCTION PHASE

Increased vehicular traffic is likely to be associated only with the delivery of equipment, supplies and chemicals, and removal of waste for off-site disposal, however this will be intermittent and will not significantly increase road traffic.

OPERATIONAL PHASE

The upgrade of the chemical plant will result in changes in the quantities of sodium chloride (NaCl) and chlorate (ClO_3) quantities being imported to the site by road. The scenario resulting in the maximum increase (i.e. worst case) will be an increase in the chlor alkali plant to 100 dry tons per day, coupled with the decommissioning of the chlorate plant. The total change is presented below in terms of tons and road trips per month (number of return trips to the site).

SCENARIO	MASS	ROAD TRIPS PER MONTH
Current	– 3350 tons/month sodium chloride (NaCl) – 190 tons/month Chlorate (ClO_3)	– 112 – 8 – **Total: 120**
Increase chlor alkali to 110 dry tons/day and decommission chlorate plant (increase chlorate imports)	– 5800 tons/month sodium chloride (NaCl) – 1250 tons/month Chlorate (ClO_3)	– 193 – 50 – **Total: 243**

Based on the above, the maximum increase in road traffic associated with the operational phase of the upgraded chemical plant, will be 4 deliveries per day.

A traffic impact assessment undertaken by Mondi associated with a proposed increase in the production capacity at the Richards Bay Mill (Ref: Traffic Impact Assessment (WSP, July 2017: Report No. 22908-01) concluded that an increase in traffic volumes of between 49 and 150 trucks per day would remain within the existing capacity of the following key intersections along the main access routes to the Mill:

- John Ross Parkway (R34/MR496) & Western Arterial
- Western Arterial & Kraft Link / Mondi Main Access
- Western Arterial & Mondi Weighbridge Access
- Western Arterial & South Central Arterial
- R619 (MR231) & Arterial 2-4

The proposed maximum increase of 4 trucks per day is well within these parameters (less than 10% of the volumes assessed). From the findings of the previous study it is therefore inferred that the proposed activities will not result in operational traffic and transportation impacts.

8.8.2 IMPACT ASSESSMENT

D) IMPACTS ON THE ROAD NETWORK (CONSTRUCTION AND OPERATION)

Impact Description:	Due to the small increase in road traffic, impacts on existing road users and congestion of the road network are not anticipated.			
Mitigation:	– N/A			
Significance Rating:	Without Mitigation:	Very Low (Negative)	With Mitigation:	Very Low (Negative)

8.9 SOCIO-ECONOMICS

8.9.1 IMPACT SOURCES

CONSTRUCTION

The construction phase will result in the creation of employment opportunities to the contractors. This will indirectly contribute to employment generation and sustainability. As these numbers are indirect they cannot be accurately quantified.

OPERATION

The operational phase of the project is unlikely to significantly directly affect employment numbers. Employment numbers cannot be accurately quantified until such time as operability studies have been undertaken in the advanced design process.

8.9.2 IMPACT ASSESSMENT

A) INDIRECT EMPLOYMENT WITHIN SUPPLY CHAINS (CONSTRUCTION PHASE)

Impact Description:	The project will create limited indirect employment opportunities within contracting firms in the construction phase. These may lead to improvement in the financial income and potential for improved living standards of employed individuals and households			
Mitigation:	– Tender processes must include the prioritisation of local businesses contractors and labour throughout the construction phase, where feasible. – All contractors will be obliged to use local labour where possible.			
Significance Rating:	Without Mitigation:	Moderate (Positive)	With Mitigation:	Moderate (Positive)

B) DIRECT EMPLOYMENT OPPORTUNITIES (OPERATIONAL PHASE)

Impact Description:	The potential to create direct employment opportunities in the operational phase is indeterminate at this stage; as is the potential socio-economic impact related to financial income and associated living standards of employed individuals and households.			
Mitigation:	– Manpower requirements to be determined in the detailed design phase as part of operability studies.			
Significance Rating:	Without Mitigation:	Neutral	With Mitigation:	Neutral

8.10 CULTURAL HERITAGE

8.10.1 IMPACT SOURCES

CONSTRUCTION AND OPERATION

The project is being undertaken on an existing industrial site. Previous investigations have indicated that there are no cultural heritage features present.

8.10.2 IMPACT ASSESSMENT

A) DAMAGE TO OR LOSS OF CULTURAL HERITAGE RESOURCES (CONSTRUCTION)

Impact Description:	No impact anticipated.			
Mitigation:	– Whilst no impacts are anticipated, it is nevertheless possible that a resource may be encountered during excavation activities, and therefore a chance find protocol is included within the EMPr.			
Significance Rating:	Without Mitigation:	Very Low (Negative)	With Mitigation:	Very Low (Negative)

9 CONCLUSION AND RECOMMENDATIONS

9.1 SUMMARY OF IMPACT ASSESSMENT

The EIA process has found that both construction and operational phases of the proposed project will involve activities which will lead to direct and indirect impacts (negative and positive) on the biophysical and socio-economic environment. These impacts were found to vary in terms of their consequence and probability. Where appropriate, mitigation measures to ameliorate negative impacts, and enhance positive impacts have been proposed, and detailed in the EMPr (**Appendix E**). Both the initial and residual (post-mitigation) significance of impacts have been presented in **Section 8.** So as to obtain an indication of the effectiveness of the mitigation measures. A summary of the environmental impact assessment is provided below (**Table 17**).

Table 16 Summary of Impacts and their Significance (Pre-and Post-Mitigation)

RECEPTOR / RESOURCE	IMPACT SUMMARY	SIGNIFICANCE	
		Without Mitigation	**With Mitigation**
Air Quality	Construction phase dust impacts	Neutral	Neutral
	Ambient air quality impacts associated with the Chemical Plant (Hydrogen Chloride (HCl) (operational phase)	Low (-)	Low (-)
	Ambient air quality impacts associated with the Chemical Plant (Chloride (HCl) (operational phase)	Low (-)	Low (-)
	Ambient air quality impacts associated with the CNGC Boiler (PM10) (operational phase)	Low (-)	Low (-)
	Ambient air quality impacts associated with the CNGC Boiler (SO_2) (operational phase)	Low (-)	Low (-)
	Ambient air quality impacts associated with the CNGC Boiler (NOx) (operational phase)	Low (-)	Low (-)
	Ambient air quality impacts associated with the CNGC Boiler (TRS) (operational phase)	Low (-)	Low (-)
	Reduction in odour impacts / complaints Associated with the CNGC Boiler (Odour) (operational phase)	Moderate (+)	Moderate (+)
Ambient Noise	Changes in off-site ambient noise levels (construction phase)	Very Low (-)	Very Low (-)
	Changes in off-site ambient noise levels (operational phase)	Very Low (-)	Very Low (-)
Geology, Soil and Groundwater	Soil and groundwater contamination (construction phase)	Low (-)	Very Low (-)
	Management of latent subsurface contamination (construction phase)	Moderate (-)	Very Low (-)
	Soil and groundwater contamination (operational phase)	Low (-)	Very Low (-)
Surface Water and Aquatic Ecology	Impacts on natural watercourses and ecology (construction phase)	Low (-)	Very Low (-)
	Impacts on off-site natural watercourses and ecology (operational phase)	Low (-)	Very Low (-)
	Impacts on on-site wetlands (operational phase)	Low (-)	Very Low (-)
Terrestrial Ecology	Impacts on terrestrial ecology (construction and operational phase)	Neutral	Neutral

Community Safety	Pedestrian safety risks (construction and operational phases)	Low (-)	Very Low (-)
	Off-site impacts due to Major Accidental Hazard (operational phase)	Very Low (-)	Very Low (-)
Worker Health and Safety	Worker health and safety incidents (construction and operational phase)	Moderate (-)	Very Low (-)
Traffic and Transportation	Impacts on the road network (construction and operational phases)	Very Low (-)	Very Low (-)
Socio-Economics	Indirect employment within supply chains (construction phase)	Moderate (+)	Moderate (+)
	Direct employment opportunities (operational phase)	Neutral	Neutral
Cultural Heritage	Damage to or loss of cultural heritage resources (construction phase)	Very Low (-)	Very Low (-)

9.2 CONCLUSION

The overall objective of the BA process was to provide sufficient information to enable informed decision-making by the authorities. This was undertaken through consideration of the proposed project components, identification of the aspects and sources of potential impacts and subsequent provision of mitigation measures.

All potential environmental and social impacts associated with the project have been assessed as having low significance (residual i.e. assuming that mitigation is implemented).

It is the opinion of WSP that the information contained in this BA Report is sufficient for an informed decision to be made in respect of the Environmental Authorisation being applied for by Mondi.

Mitigation measures have been developed where applicable for the above aspects and are presented within the EMPr (**Appendix E**). It is imperative that all impact mitigation recommendations contained in the EMPr are implemented.

APPENDIX

A STAKEHOLDER ENGAGEMENT REPORT

APPENDIX

B EAP CURRICULUM VITAE

NIGEL SEED, B.Soc.Sc. EAP

Director (Environmental Science), Environment & Energy

Years with the firm

16

Years of experience

16

Professional qualifications

EAP

Areas of expertise

Environmental and Social Impact Assessment (ESIA)

Environmental and Social (E&S) Due Diligence

Environmental Legal Compliance

Waste Management

CAREER SUMMARY

Nigel has 16 years' environmental and social consulting experience. He is a Technical Director as well as the Africa lead for the environmental and social impact assessment (ESIA) service and Power in Africa.

Nigel has led complex ESIA and transaction related due diligence assessments across a range of sectors including aerospace, agro-processing, chemicals, healthcare, infrastructure (ports, roads, waste management), manufacturing, mining and beneficiation, oil & gas, pulp & paper power generation (thermal & renewables), and property development.

Nigel has extensive experience working with national and international regulations and procedures, including Equator Principles III, the IFC Performance Standards on Environmental and Social Sustainability (2012) and related policies, and the World Bank Group EHS and Industry Sector guidelines.

Nigel has experience in South Africa, Swaziland, Mozambique, Angola, Nigeria, Kenya and Ghana.

EDUCATION

Bachelor of Social Science, Environmental Management & Geography, University of Natal, Durban, South Africa	2000

ADDITIONAL TRAINING

Resettlement as Part of Environmental and Social Impact Assessment, Inter-Social Consulting	2018
Nuclear Engineering Short Course (Reactor Technology), South African Network for Nuclear Education, Science and Technology (SAN-NEST).	2017
ISO 9001:2015 Awareness workshop, DQS Training Academy	2016
Understanding International Project Finance, International Project Finance Association	2016
Hazard Identification and Risk Assessment Training, EOH Legal Services	2015

PROFESSIONAL MEMBERSHIPS

Certified Environmental Assessment Practioner	EAP
Institute for Waste Management South Africa	IWMSA
International Association for Impact Assessment	IAIA

Oil and Gas

- Environmental Assessment of Tetra Ethyl Lead Facilities Decommissioning Projects, South Africa (2012 - 2015). Client: SAPREF.
- E&S and Legal Due Diligence for the proposed acquisition of a bulk petrochemical depot (2015). Client: Confidential Black Economically Empowered Private Equity Investor
- ESIA for the Expansion of the 90 000 bpd SAPREF Crude Oil Refinery to achieve EURO 5 Fuel Specifications, South Africa, (2013): Client: SAPREF.

Mining, Beneficiation and Processing

- Site Screening for the establishment of calcium carbonate calcining facilities (2017). Client: Grasland Ondernemings.
- E&S Due Diligence for the Accra Cement Grinding Facility (2016). Client: DEG
- ESIA of underground Chrome Mine, South Africa (2011): Samancor Chrome Ltd.
- ESIA for South Uranium Plant SX Circuit Replacement, South Africa (2011): Client: AngloGold Ashanti (Pty) Ltd.
- ESIA for Smelter SO_2 Abatement Projects, Polokwane / Rustenburg, Limpopo / North West Province, South Africa (2012) (Technical Support) Client: Anglo American Platinum Ltd.

Effluent and Waste Management

- Waste management plan for all Total South Africa manufacturing, commercial, retail and administration facilities located in South Africa, Namibia, Botswana and Swaziland (2016): Client: Total South Africa Limited.
- Waste management plan for all PPC cement manufacturing and quarry sites in South Africa (2016): Project Lead. Client: PPC Limited.
- Waste management plan for all Transnet Port Terminal sites in South Africa (2015): Project Lead. Client: Transnet Port Terminals.
- AngloGold Waste Management Strategy, Vaal River, Gauteng, South Africa (2008): Project Manager. Client: AngloGold Ashanti (Pty) Ltd.

Power

- E&S Due Diligence for the Aggeneys and Konkoonsies Solar Renewable Energy Projects (2016). Client: Nedbank Ltd.
- ESIA for the 120MW combined cycle gas turbine power project and associated Light Crude Oil and Natural Gas pipelines and storage facilities in the Tema Free Zone Enclave in Ghana (2016). Client: Atlantic Electric Company / LMI Holdings.
- ESIA for Photovoltaic and Concentrated Solar (trough) Power Generation Facilities in Northern Cape Province, South Africa (2015) (Project Director) Client: Biotherm Energy.
- ESIA for Wind Power Generation Facilities in Western Cape Province, South Africa (2015) (Project Director and technical specialist) Client: Biotherm Energy.
- ESIA for the 140 – 170 MW Mozambique Gas Engine Power Project (2011), Mozambique. Client: SASOL

Food and Agriculture

- ESIA for Ubombo Mill Furfural project, Swaziland (2015): Client: Illovo Southern Africa.
- ESIA Screening and TOR for Tea Manufacturing Facility, Kenya (2011): Client: Unilever Limited.

Manufacturing Sector

- ESIA for the expansion of the Mondi Richards Bay paper mill (2017). Mondi Limited.
- ESIA for Anhydrous Hydrofluoric Acid Plant, South Africa (2012): Client: Foskor (Pty) Ltd. Lead Auditor.
- E&S Due Diligence for the Bakassi Deep Water Port, Cross River State, Nigeria (2018): Client: Cross River State.

- ESIA for the Pemba Oil and Gas Port and Logistics Centre, South Africa (2014) Client: Sonils/ENH.
- EIS for the South Sudan Feeder Roads Environmental Review (2017) (Project Director). Client: United Nations Office for Project Services

APPENDIX

C AIR IMPACT REPORT

APPENDIX

D IMPACT ASSESSMENT METHODOLOGY AND ASSESSMENT CALCULATIONS

IMPACT IDENTIFICATION

Potential environmental impacts were identified through detailed analysis of the proposed project activities and the following impact sources.

- Atmospheric Emissions
- Noise Emissions
- Waste / Effluent Emissions and Management
- Traffic Flows and Trip Generation
- Hazardous Substances including Major Accidental Hazards (MAH)
- Coastal Processes – Sediment Transport
- Dredging Plumes

These detailed analyses are contained separately in **ESIA Volume 3 (Addendum 2 / Analysis of Impact Sources)**:

ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluated the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to validate impacts identified through a matrix, identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts.

A standard risk assessment methodology was used for the ranking of the identified environmental impacts pre- and post-mitigation. The significance of environmental aspects was determined and ranked by considering the criteria presented in **Table 17**. Detailed scoring tables for each impact assessed in the ESIA report are contained in **Appendix A.**

Table 17 Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low	Low	Medium	High	Very high
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite

Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probably	Definite
ENVIRONMENTAL SIGNIFICANCE = (MAGNITUDE + EXTENT + REVERSIBILITY + DURATION) x PROBABILITY					
TOTAL SCORE	4 to 15	16 to 30	31 to 60	61 to 80	81 to 100
ENVIRONMENTAL SIGNIFICANCE RATING (-)	Very low	Low	Moderate	High	Very High
ENVIRONMENTAL SIGNIFICANCE RATING (+)	Very low	Low	Moderate	High	Very High

IMPACT MITIGATION

The following mitigation hierarchy (illustrated in **Figure 16**) was applied when proposing prevention, compensation and mitigation measures:

- **Avoid / Prevent:** Avoidance or prevention refers to the consideration of options in project location, siting, scale, layout, technology and phasing to avoid impacts on biodiversity, associated ecosystem services, and people. This is referred to as 'the best option', but it is acknowledged that avoidance or prevention is not always possible.
- **Minimise:** Minimisation refers to the consideration of alternatives in the project location, siting, scale, layout, technology and phasing that would minimise impacts on biodiversity, ecosystem services and people. As defined in IFC PS1; "acceptable options to minimise will vary and include: abate, rectify, repair, and/or restore impacts, as appropriate".
- **Rehabilitate / Restore:** Rehabilitation refers to the consideration of the rehabilitation of areas where impacts are unavoidable and measures are provided to return impacted areas to a near-natural state or an agreed land use.
- **Offset:** Offsetting refers to the consideration of measures over and above rehabilitation to compensate for the residual negative effects on biodiversity ecosystem services and people, after every effort has been made to minimise and then rehabilitate impacts.

Figure 16 Impact Assessment Mitigation Hierarchy

Impact Statement	Stage	Characte	Pre-Mitigation							Post-Mitigation						
			(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Construction Phase Dust Impacts	Construction	Neutral						0	#N/A						0	#N/A
Significance			#N/A							#N/A						
Ambient Air Quality Impacts Associated with the Chemical Plant (Hydrogen Chloride (HCl) (operational phase)	Operation	Negative	1	3	3	1	2	16	N2	1	3	3	1	2	16	N2
Significance			N2 - Low							N2 - Low						
Ambient Air Quality Impacts Associated with the Chemical Plant (Chloride (HCl) (operational phase)	Operation	Negative	1	3	3	1	2	16	N2	1	3	3	1	2	16	N2
Significance			N2 - Low							N2 - Low						
Ambient Air Quality Impacts Associated with the CNGC Boiler (PM10) (operational phase)	Operation	Negative	1	3	3	1	2	16	N2	1	3	3	1	2	16	N2
Significance			N2 - Low							N2 - Low						
Ambient Air Quality Impacts Associated with the CNGC Boiler (SO2) (operational phase)	Operation	Negative	1	3	3	1	2	16	N2	1	3	3	1	2	16	N2
Significance			N2 - Low							N2 - Low						
Ambient Air Quality Impacts Associated with the CNGC Boiler (NOx) (operational phase)	Operation	Negative	1	3	3	1	2	16	N2	1	3	3	1	2	16	N2
Significance			N2 - Low							N2 - Low						
Ambient Air Quality Impacts Associated with the CNGC Boiler (TRS) (operational phase)	Operation	Negative	1	3	3	1	2	16	N2	1	3	3	1	2	16	N2
Significance			N2 - Low							N2 - Low						
Ambient Air Quality Impacts Associated with the CNGC Boiler (Odour) (operational phase)	Operation	Negative	1	3	3	1	2	16	N2	1	3	3	1	2	16	N2
Significance			N2 - Low							N2 - Low						
Changes in off-site ambient noise levels (construction phase)		Negative	1	1	1	2	3	15	N1	1	1	1	2	3	15	N1
Significance			N1 - Very Low							N1 - Very Low						
Changes in off-site ambient noise levels (operational phase)		Negative	1	1	1	2	3	15	N1	1	1	1	2	3	15	N1
Significance			N1 - Very Low							N1 - Very Low						
Soil and groundwater contamination (construction phase)		Negative	1	2	1	2	3	18	N2	1	1	1	2	2	10	N1
Significance			N2 - Low							N1 - Very Low						
Management of Latent Subsurface Contamination (construction phase)		Negative	2	2	3	4	3	33	N3	2	1	3	4	1	10	N1
Significance			N3 - Moderate							N1 - Very Low						
Soil and groundwater contamination (operational phase)		Negative	5	2	3	4	2	28	N2	5	2	3	4	1	14	N1
Significance			N2 - Low							N1 - Very Low						
Impacts on natural watercourses and ecology (construction phase)		Negative	1	2	1	2	3	18	N2	1	1	1	2	2	10	N1
Significance			N2 - Low							N1 - Very Low						
Impacts on Off-site Natural Watercourses and Ecology (operational phase)		Negative	4	2	4	3	2	26	N2	4	2	4	3	1	13	N1
Significance			N2 - Low							N1 - Very Low						
Impacts on on-site wetlands (operational phase)		Negative	4	2	4	3	2	26	N2	4	2	4	3	1	13	N1
Significance			N2 - Low							N1 - Very Low						
Impacts on terrestrial ecology (construction and operational phase)		Neutral						0	#N/A				1		0	#N/A
Significance			#N/A							#N/A						
Pedestrian safety risks (construction and operational phases)		Negative	5	2	5	1	2	26	N2	5	1	1	1	1	8	N1
Significance			N2 - Low							N1 - Very Low						
Off-site Impacts Due to Major Accidental Hazard (Operational Phase)		Negative	5	2	5	1	1	13	N1	5	2	5	1	1	13	N1
Significance			N1 - Very Low							N1 - Very Low						
Worker health and safety incidents (construction and operational phase)		Negative	5	1	5	1	3	36	N3	5	1	5	1	1	12	N1
Significance			N3 - Moderate							N1 - Very Low						
Impacts on the road network (construction and operational phases)		Negative	1	2	1	1	1	5	N1	1	2	1	1	1	5	N1
Significance			N1 - Very Low							N1 - Very Low						
Indirect employment within supply chains (construction phase)		Positive	2	3	1	1	5	35	P3	2	3	1	1	5	35	P3
Significance			P3 - Moderate							P3 - Moderate						
Direct employment opportunities (operational phase)		Neutral						0	#N/A				1		0	#N/A
Significance			#N/A							#N/A						
Damage to or loss of cultural heritage resources (construction phase)		Negative	2	1	1	1	1	5	N1	2	1	1	1	1	5	N1
Significance			N1 - Very Low							N1 - Very Low						

APPENDIX

E ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)